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Spatial analysis of cement production and consumption in Turkey

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SPATIAL ANALYSIS OF CEMENT PRODUCTION AND CONSUMPTION IN TURKEY

(assigned to session M4)

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Abstract

After 1950's, the rapid urbanization of Turkey stimulated the production and consumption of cement and the number of cement factories increased since then. In addition, construction of highways, bridges, dams and industrialization also contribute to the consumption of cement. Construction industry became a locomotive of the economy of the country and cement industry is the most element of the construction industry.

This study analyzes the growth of population and urbanization according to new provinces and regions between 1960-1990. Further, the growth of the number of cement factories, and production is illustrated in the provinces and the regions within the same period. Then, the relationships between the growth of cement production and consumption and Urbanization of population is analyzed by the use of multiple regression analysis at the regional and national level.

Like other developing countries both number of cities and population living in cities have increased as result of industrialization. In Turkey, population increases very rapidly and in parallel to this, number of cities and number of people living in these cities are increasing. However, while around 60% of the population live in the urban area today, the proportion of these people to agricultural activities, service and industrial sectors are not the same with that of the developed industrial countries .non-agricultural activities in Turkey are gaining speed. Especially, developments in the industrial sector and the cement industry, which is a sub-industrial sector, have proved a major bounce. In this study, we will examine and analysis on the graphical basis, the industrialization starting from the 50s, relations between various sectors, construction sector and its sub-sector, the cement industry.

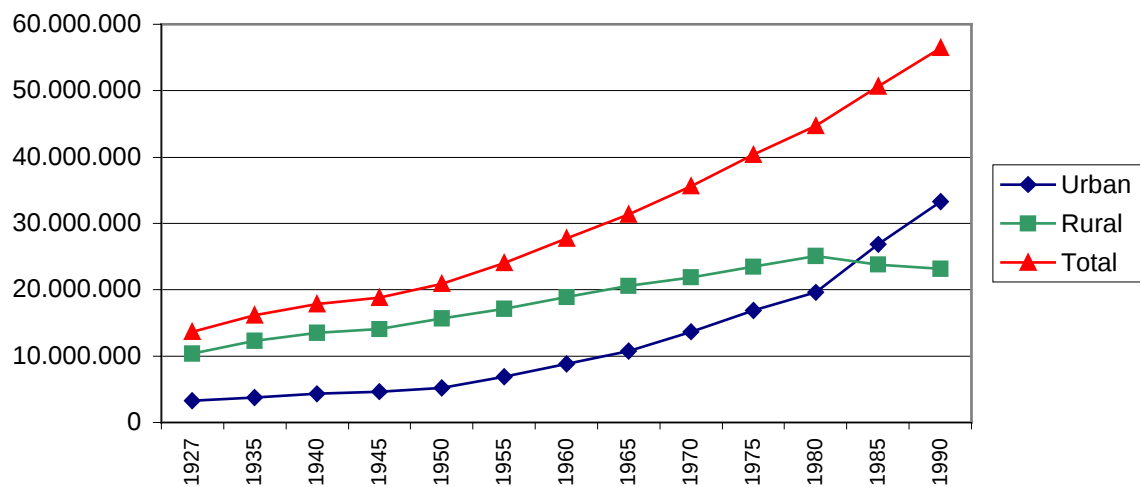
URBANIZATION DEMOGRAPHIC TRANSITION IN TURKEY

Like in other developing countries, the population grows rapidly in Turkey, too while the population was only 13 million in 1927. According to non-confirmed results of the recent census (1997), the population has reached to 65 million. From 1923 until today, there have been changes in the general characteristics of the population as well as the increase in population. In this context, the transition in Turkey can be divided into three unique periods as 1923-1950, 1950-1985 and years after that. Besides the increase in the number of deaths during the World War II years the birth rate has also soared. In this period, Turkey's population was almost doubled increased from 13 million (1923) to 24 million (1955). In the second stage of transition (1955-1985), Turkey experienced the highest rate of population growth by 2.8%. In this period, the population has increased twice as much from 24 million to 51 million. The main characteristic of the third stage an irrevocable declining period. In 1990, the natural growth rate of population was 1.8%. (1). Urbanization movement which has gained speed especially after 1950s, can be described in general as the increase in number of cities and number of people living in these cities(2) In such case, number of settlements of which population is higher than 10.000 is also increasing. While there were only 66 cities in 1927, this number increased to 102 in 1950, to 147 in 1960, to 238 in 1970, to 320 in 1980 and to 380 in 1985. Number of cities has increased 3.8 times in between 1950-1985 (2).

A series of economy-politics based on cities has been supported by the government after 1950s and an important progression has been achieved. (3) Since the view that future expectations of families regarding education, health and employment needs can be more satisfied in urban areas than the rural areas has gained more credit – again with the increasing communication opportunities - it accelerated the migration to cities (2).

Graphic 1

Change of urban population, rural population and total population in Turkey.



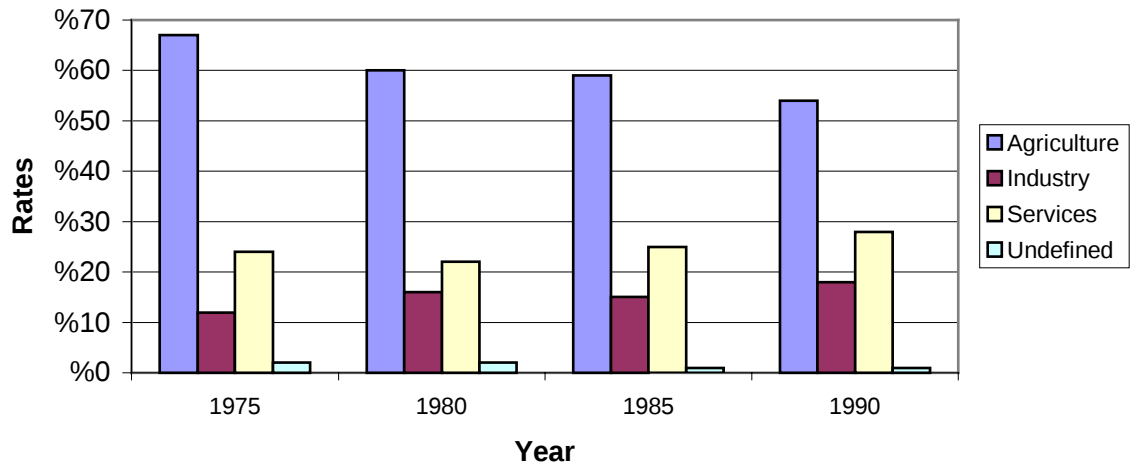
DISTRIBUTION OF LABOUR TO SECTORS

In Turkey, especially after the rapid urbanization of 1950s, a decline in agricultural production has been witnessed. However, an increase in industrial and service production is also observed. As result of the economic crisis in 1970 and some changes in the world conjuncture, private sector has inclined to invest more in the construction sector rather than production sector. (4) As result of all these developments, construction sector has showed a more rapid development than the industrial production sector. Graphic 2

Sectoral changes can be clearly understood when five year shares and increases of these sub sectors are observed from 1965 to 1990. Wholesale-retail trading has increased by 2.7 from 2.9% to 7.9%, service sector increased by 2.6 from 6.2% to 16.6%, construction sector increased by 19.0 from 2.6% to 5.1% and production industry increased by 16.0 from 7.1% to 11.9%. This fast growth in the construction sector has naturally caused increase of the cement production which has become an important sector in the sub-branches of the production industry.

Graphic 2

Distribution of Labor in Turkey (1975-1990)



GEOGRAPHIC REGIONS AND DISTRIBUTION OF INDUSTRY

There is always an incongruity between the regions of countries during the process of development as result of economic advantages due to unequal distribution of economic sources and piling up in certain regions.

DEVELOPMENT PLANS AND RELATIONSHIP BETWEEN URBANIZATION AND INDUSTRIALIZATION

In principle, we can talk about the west and east of Turkey, in other words developed and undeveloped regions of Turkey. Between 1923-1950, the state spent much efforts to develop the eastern regions. Industrial investments are generally distributed equally across the country. Between 1950-1960, which was a period without a plan, the state did not have a specific economic policy for the East and investments ventured by the private sector have deepened the discrepancy in favor of the West. (3) In the planned period, for the first time precautions have been taken to improve the discrepancies between the regions and efforts have been spent to have the undeveloped regions have more share from the public services (1963-1967). The basic idea was to have the industries, which were planned to be established in the development priority regions, realized in the areas which would activate the sources and which would become a motivating power in the development of the area. It has also been emphasized that not only big scale industrial investments but also small scale investments have to be supported. (5-6)

POPULATION AND DISTRIBUTION OF POPULATION TO REGIONS

Graphic 3 also exposes percentages of population increase for each decade in Turkey general as well as in the geographic regions from 1960 to 1990. Those regions of which increase ratios are marked darker are those regions which showed an increase over Turkey's 10-year increase ratio.

Graphic 3

Distribution of Population to Regions (1960-1990)

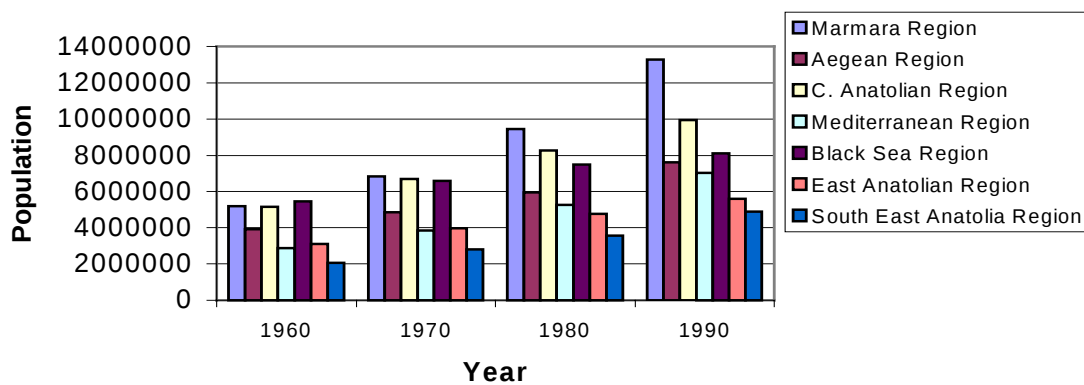


Table 1 shows Marmara, Aegean and Mediterranean Regions have always had a level of urbanization higher than average of Turkey from 1940 until today.

Table 1

Urbanization Levels of Regions (1940-1985)

Regions	1940	1960	1980	1985
Marmara Region	35.1	43.3	68.7	74.1
Aegean Region	23.3	30.3	48.6	54.8
C. Anatolia Region	14.8	24.8	47.4	53.3
Mediterranean Region	20.1	31.6	49.8	52.7
Black Sea Region	7.2	11.4	24	29.2
East Anatolia Region	9.3	13.4	27.2	31.1
South East Anatolia Region	15.8	16.1	36.5	39.9
TURKEY	18	25.2	45.4	50.9

CEMENT SECTOR IN GENERAL AND RECENT DEVELOPMENTS

The world production of cement in 1992 was 1.173 million tons. Turkey is the 9th among the 18 biggest cement producers of the world.

Table 2

World's 18 Biggest Cement Producing Countries and Production Quantities (1992).

<u>Country</u>	<u>Production (million tons)</u>
1. China	250.0
2. CIS	105.0
3. Japan	95.8
4. United States of America	69.5
5. India	54.0
6. South Korea	43.3
7. Italy	41.4
8. Germany	30.2
9. Turkey	30.2
10. Mexico	26.9
11. Spain	25.1
12. Brazil	23.9
13. France	22.6
14. Thailand	22.4
15. Taiwan	22.0
16. Indonesia	19.7
17. Egypt	16.0
18. Iran	15.7

Table 3

Turkish Cement Industry from the establishment until today

Years	Population (1000 people)	Production (1000 tons)	Import (1000 tons)	Export (1000 tons)	Consumption (1000 tons)
1913		45	87	-	132
1920		5	5	-	10
1930	14540	82	60	-	142
1938	17136	268	44	-	332
1947	19625	350	3	-	358
1950	20497	396	135	-	529
1960	27755	2038	4	69	1949

1st 5-Year Development Plan Period

1963	29883	2698	91	3	2777
1967	33014	4249	211	-	4455

2nd 5-Year Development Plan Period

1968	33856	4731	442	1	5176
1972	37431	8425	-	1446	7267

3rd 5-Year Development Plan Period

1973	38379	8946	-	966	8273
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1978	42927	15343	-	1241	14186
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4th 5-Year Development Plan Period

1979	43882	13812	-	1172	12727
1984	49419	15738	-	1932	13931

5th 5-Year Development Plan Period

1985	50664	17581	-	1853	15747
1989	55260	23801	507	1102	23376

6th 5-Year Development Plan Period

1990	56473	24416	1220	2681	23799
1992	58979	28607	267	4420	25965

Source: Association of Cement Producers

* Including Clinker

** Unconfirmed values

LOCATIONS of CEMENT FACTORIES

Cement is usually considered under the section of industries producing intermediate goods in the industrial development plans (3). This sector includes hydraulic binding agents which are produced through integration of half-finished product clinkers that are extracted from raw materials composed of Silicium (Si), Aluminum (Al), Calcium (Ca) and Ferro oxides (Fe_2O_3), matured until becoming cinder through various technologic methods with more additives. There are 47 cement factories in Turkey of which 40 are integrated facilities and 7 is grinding–packaging facilities. Local distribution of these factories, owners and capacities – both clinker and grinding – are indicated in Table 4.

Table 4

Regions	Clinker Product	Cement Grind
Maramara Region	8355	13307
Aegean Region	3852	5902
C. Anatolia Region	3196	5600
Mediterranean Region	3839	5050
Black Sea Region	3230	4650
East Anatolia Region	995	1580
South East Anatolia3 Region	3035	4295
TURKEY	26504	40384

As evident in Table 4 and Map 1, production units of cement sector show a more balanced distribution in the country in opposition to other industrial branches. The reason is cement is a low priced but heavy product. In case the demand is not met on spot, the cost of the

product would increase and therefore cement factories are built around places where urban substructure is developed . There are 9 cement factories and 1 grinding facilities in 10 provinces of Marmara Region; 6 cement factories and 2 grinding facilities in 15 provinces of Black Sea Region; 3 cement factories and 1 grinding facility in 7 provinces of the Mediterranean Region and 6 cement factories in 7 provinces of Southeast Anatolia Region. (Table 4) There are 3 factories in Istanbul, 3 in Ankara and 2 in Izmir; distribution of other factories is one factory per each province. Those provinces without any cement factory supply the cement need from neighboring provinces. (7). After the rapid urbanization movement started in 1950s, there has been an increase in the number of factories. Upon the demand, the sector has not only advanced with public investments but also with investment and interest of the private sector. After the privatization of public factories, share of the public production in the total production has continuously regressed. In 1988, public sector had realized 32.36% of the total production with its 22 factories and 11.85% of total production with 5 public establishments. In the first half of 1993, however, the public sector could only realize 5.9% of the total production with its 8 factories. Gradually, private sector's share in the total production is increasing and foreign capital is continuously investing in the sector.

PRODUCTION CAPASITY – CONSUMPTION

While production capacity of two factories in the pre-Republic era was 40.000 tons/year, this increased in 1950s to 370.000 tons/year. This increase in production has been provided through 4 new factories. (8). In 1953, Türkiye Çimento Sanayi T.A.Ş. (ÇİSAN) (Turkish Cement Industry Inc.) was established as a public enterprise. Its name was changed to Türkiye Çimento ve Toprak Sanayi (Turkish Cement and Soil Industry) in 1984. With the rapid urbanization, cement has become a fast consumed basic product and great leaps have been achieved during the planned developing periods both in respect of production and consumption. Increase in the production of cement in the country followed the below course: In 1962, that is before the planned developing periods, annual production was 2.3 million tons; at the end of the 1st Five-Year Developing Plan (1967) it was 4.5 million tons; at the end of the 2nd Five-Year Developing Plan (1972) it was 7.3 million tons; at the end of the 3rd Five-Year Developing Plan (1977) it was 12.8 million tons. While cement production by person was 80 kg in 1962, it increased to 135 kg in

1967, to 194 kg in 1972 and to 307 kg in 1977 (6-8). In 1978, which is accepted as a transition to the 4th Five-Year Developing Plan period, the demand reached its peak value with 14.2 million tons (9) Cement consumption by person was 330 kg. After 1978, the economic crisis Turkey faced has also effected the cement sector and demand for cement has dropped gradually and at the end of the 4th Developing Plan period (1983), it has came down to 11.6 million tons. Cement consumption by person in 1983 was 238 kg. (9). In 1984, which is accepted as transition to 5th Five-Year Developing Plan period, there has been an increase in the demand to cement and consumption increased to 13.8 million tons and consumption by person to 277 kg. In 1985 and 1986, cement consumption has increased to 15.8 million and 18.9 million, consecutively, and consumption by person increased to 307 kg and 358 kg. (5).

In 1989, cement consumption dropped by 1.6% to 23.4 million tons. In 1989, 81 tons clinker and 448 thousand tons of cement have been imported by the private sector. In 1989, cement consumption by person in Turkey was 423 kg. (6) In 1992, cement consumption in Turkey increased by 6.72% to 26 million tons. In the same year, 130.5 thousand tons clinker and 267.1 thousand tons cement have been imported and, on the other hand, 1586.2 thousand tons clinker and 2830.7 thousand tons cement have been exported. Cement consumption by person in 1992 was 440 kg.

Table 5

Cement Consumption at the end of planned development periods.

YEARS	CEMENT CONSUMPTION (100 tons)	INCREASE and DECREASE (%)	
		FIVE YEARS	ANNUAL AVERAGE
1962	2328	91.37	13.86
1967	4455	63.12	10.28
1972	7265	77.85	12.20
1977	12924	-	9.76
1978	14186	18.50	-4.01
1983	11562	-	19.62
1984	13831	-	-
1989	23377	69.02	11.07

On the other hand, while production in the cement sector was around 2-3 million tons in 1962, It increased to 4.2 million tons at the end of the 1st Five-Year Development Planning Period (1967), to 4.8 million tons at the end of the 2nd Five-Year Development Planning

Period (1972), to 13.8 million tons at the end of the 3rd Five-Year Development Planning Period (1977). In 1978, which is accepted as the transition year to the 4th Five-Year Development Planning Period, the cement production increased to 15.3 million tons but with the effect of the economic crisis the figure regressed to 12.9 million tons in 1980. However, in 1981, it has again climbed to 15 million tons through efforts spent in the exportation field; while at the end of the 4th Five-Year Development Planning Period (1983), the cement production was 13.6 million tons and in the end of 1984 it was 15.7 million tons. Cement produced in 1985 and 1986 was 17.6 million tons and 20 million tons. In 1989, cement production increased by 5.0% to 23.8 million tons. In 1990, cement production increased by 2.6% in comparison to previous year and reached to 24.4 million tons. Production in 1991 and 1992 was 26.3 million tons and 28.6 million tons. Increase rates in comparison to previous years were 7.56% and 8.93%, consecutively. (6).

Table 6

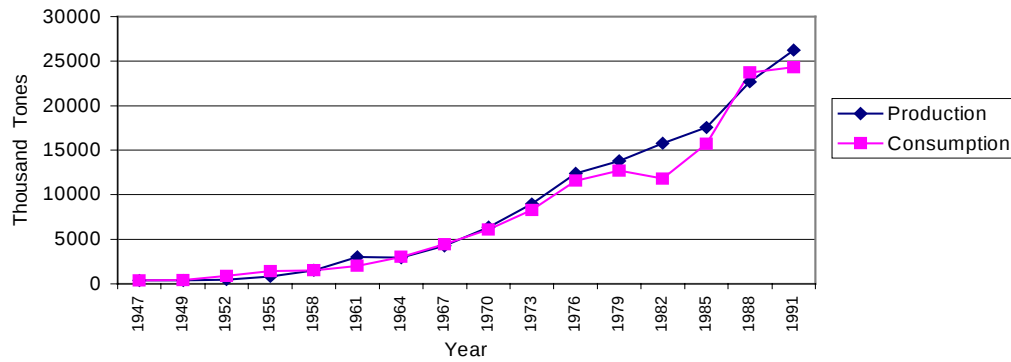
Cement Production at the end of planned development periods.

YEARS	CEMENT CONSUMPTION (100 tons)	INCREASE and DECREASE (%)	
		FIVE YEARS	ANNUAL AVERAGE
1962	2323	-	-
1967	4249	82.91	12.86
1972	8425	98.28	14.67
1977	13832	64.18	10.42
1978	15343	-	10.92
1983	13595	-11.39	-239
1984	15738	-	15.76
1989	23801	51.23	8.62

After 1950s, production and consumption of cement has gained speed and showed a graphical increase until today. Cement production and consumption values were parallel until 1978 and due to economic crisis serious ups and downs have been experienced. (Graphic 4). From 1984-85, when the effect of the crisis seemed to lose its seriousness, the sector gathered itself to continue to draw a rising line.

Graphic 4

Cement Production-Consumption from 1950s on.



After the convulsion in the last 10-15 years experienced prior to 1985, the cement industry pulled up itself and continued its routine production line. Regional production and consumption values of 1988-1992 are clear indication of that (Table 7) Production and consumption values of 1990 reveal that Marmara Region is the highest cement producing (7.9 million tons) and consuming (8.1 million tons) region like in all other sectors in Turkey. It is followed by Central Anatolia, Aegean and Mediterranean regions with production and consumption values of 3-4 million tons. Production and consumption of cement in the Black Sea Region is 2.4 million tons and 2.4 millions respectively. In 1990, Southeast Anatolia Region produced 1.9 million tons cement and consumed 2.3 million tons. In East Anatolia Region, the production was 0.81 million tons and consumption was 0.82 million tons. Map 2 Cement Production and Consumption According to the Geographical regions in Turkey,1990

Table 7

Cement Production and Consumption – Regional Distribution (1988 – 1992) (1000 tons)

	Marmara Region		Aegean Region		Mediterranean Region		Central Anatolia Region		Black Sea Region		East Anatolia Region		Southeast Anatolia Region	
Years	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption
1988	7355	8447	3435	3049	3663	3157	3491	3899	2268	2258	802	813	1691	2125
1989	7818	8277	3851	2931	4408	3021	3387	3838	2369	2360	784	779	1814	2170
1990	7935	8130	3721	2960	3973	3070	3552	3960	2453	2467	812	821	1970	2391
1991	8773	8299	3983	2904	4110	3209	3625	4398	2761	2564	818	875	2083	2080
1992	9854	8509	4440	3313	4095	3298	4049	4683	3006	2984	964	990	2195	2190

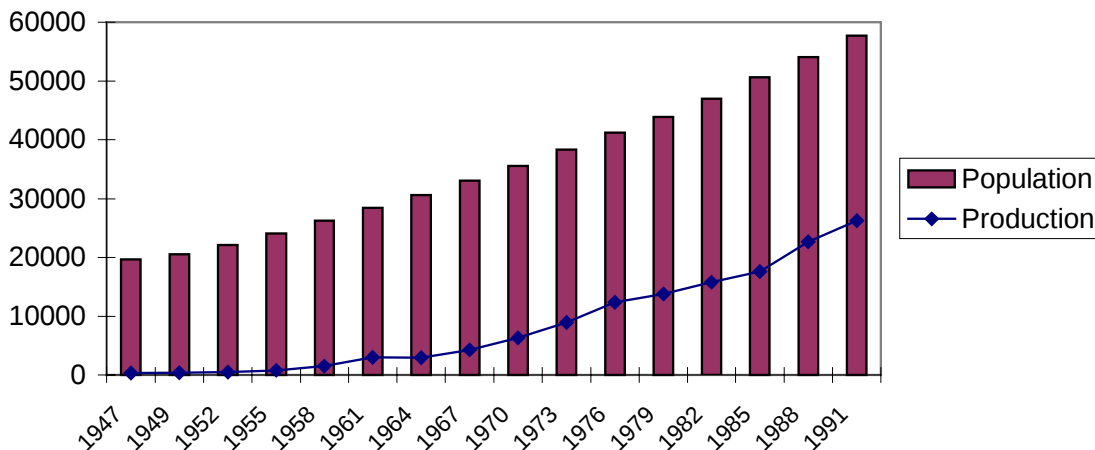
Regional Distribution of cement production and consumption realized in 1990 is indicated in Map 2

REGRESSION ANALYSIS

Fast population growth in developing countries is also experienced in Turkey. With the fast population growth a rapid urbanization movement has started in Turkey after 1950s. Urbanization is not only a movement of population in the demographic sense but it also indicates an inclination towards non-agricultural activities. Urbanization which has started in Turkey after 1950s was also supported by the state with the idea that it would provide industrialization and development; in this direction, the state has applied some policies . In the meantime, the construction industry was developed and took an important place among other industrial branches since it was vital in the establishment of other industries, housing and infrastructure facilities. This has accelerated the development of cement industry after 1950s. An important positive relationship is witnessed between the population growth and cement production and consumption after 1950s. Graphic 5 and 6 show the values related with Turkey's population and cement production and consumption from 1950 to 1990.

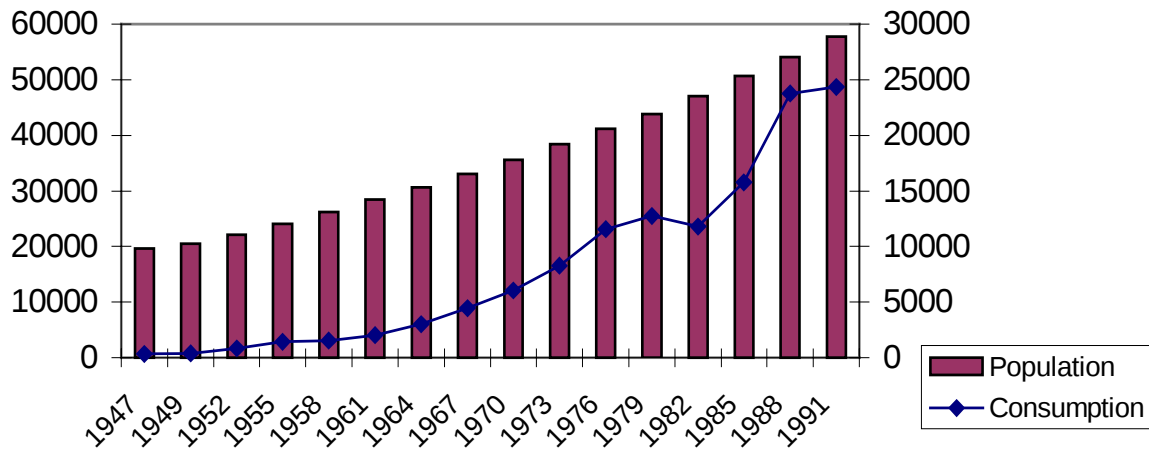
Graphic 5

Relation of Population Growth and Cement Production in Turkey (1950-1990)



Graphic 6

Relation of Population Growth and Cement Consumption in Turkey (1950-1990)



There is a similar relationship between urbanization rate of cities and distribution of by provinces and regions in Turkey. Map 2 shows cement factories are spread over Turkey in a balanced style and there is a balance between the population and production in provinces where both population and urbanization are relatively on the high level. In Map 2 inner circles show the population in subdistricts and villages, outer circles show population living in provinces and boroughs.

National income per capita in provinces with high urbanization and industrial and service sectors shall also be high or there shall be a proportion between production values in that province. Map 3 Comparison of Urbanization and Cement Production.

In order to statistically prove the changes mentioned above, a model is established in this study and a regression analysis is conveyed. In this particular model, production quantity in each province is a dependent variable (Y), population of each province is the first of variables (X_1), national income per capita per province is (X_2) and these have been analyzed stepwise in SPSS for Windows. (10).

A summarized formula of relations in the mentioned model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots \beta_n X_n$$

Data used in regression analysis is indicated in below table.

Table 8 Data used in Regression Analysis (1990)

	PROVINCES	GIV	Prod90	Pop90	Province90
1.	Edirne	7769.00	.00	404599.0	52.01
2.	Kırklareli	11830.00	465.00	309512.0	48.31
3.	Tekirdağ	10076.00	.00	468842.0	55.23
4.	Istanbul	11337.00	3650.00	7309190	92.40
5.	Kocaeli	18420.00	1229.00	936163.0	62.23
6.	Sakarya	5924.00	.00	683061.0	43.59
7.	Bursa	10190.00	938.00	1603137	72.22
8.	Bilecik	9824.00	.00	175526.0	51.49
9.	Balıkesir	7403.00	400.00	973314.0	48.16
10.	Çanakkale	8994.00	1253.00	432263.0	38.99
11.	Izmir	10950.00	2590.00	2694770	79.22
12.	Manisa	8144.00	.00	1154418	51.14
13.	Kütahya	5412.00	.00	578020.0	41.87
14.	Afyon	4337.00	.00	739223.0	41.42
15.	Uşak	4846.00	.00	290283.0	50.57
16.	Denizli	6231.00	472.00	750882.0	44.99
17.	Aydın	7547.00	227.00	824816.0	46.64
18.	Muğla	8818.00	.00	562809.0	33.12
19.	Ankara	9578,00	1275,00	3236626	87,64
20.	Eskişehir	7551,00	506,00	641057,0	74,48
21.	Çankırı	3670,00	,00	279129,0	40,79
22.	Kırıkkale	7096,00	,00	349396,0	69,66
23.	Kırşehir	4391,00	,00	256862,0	49,21
24.	Yozgat	3271,00	658,00	579150,0	35,95
25.	Nevşehir	7429,00	,00	289509,0	39,02
26.	Aksaray	2980,00	,00	326399,0	44,18
27.	Kayseri	4915,00	,00	943484,0	64,03
28.	Sivas	3570,00	236,00	767481,0	49,77
29.	Niğde	6143,00	312,00	305861,0	31,81
30.	Karaman	4269,00	,00	217536,0	48,75
31.	Konya	5568,00	565,00	1750303	55,03
32.	Isparta	4605,00	813,00	434771,0	52,80
33.	Burdur	5599,00	,00	254899,0	50,65
34.	Antalya	7746,00	,00	1132211	53,19
35.	İçel	8828,00	1214,00	1266995	62,14
36.	Adana	7119,00	1376,00	1934907	69,79
37.	Hatay	5894,00	570,00	1109754	47,91
38.	Kahraman- Maras	4131,00	,00	892952,0	45,60
39.	Bolu	6836,00	593,00	536869,0	37,83
40.	Zonguldak	5747,00	,00	867726,0	38,04
41.	Kastamonu	4402,00	,00	423611,0	35,11
42.	Çorum	5129,00	344,00	609863,0	41,62
43.	Sinop	4143,00	,00	265153,0	32,55
44.	Samsun	5225,00	426,00	1158400	45,35

45.	Amasya	5010,00	,00	357191,0	45,51
46.	Tokat	3938,00	,00	719251,0	42,86
47.	Ordu	2879,00	515,00	830105,0	40,58
48.	Giresun	3276,00	,00	499087,0	43,90
49.	Trabzon	4822,00	331,00	795849,0	38,15
50.	Gümüşhane	3030,00	,00	169375,0	34,83
51.	Bayburt	1866,00	,00	107330,0	38,47
52.	Rize	5011,00	,00	348776,0	38,24
53.	Artvin	5668,00	,00	212833,0	31,06
54.	Malatya	4595,00	,00	702055,0	54,01
55.	Erzincan	3959,00	,00	299251,0	48,17
56.	Tunceli	3030,00	,00	133143,0	38,15
57.	Elazığ	5480,00	280,00	498225,0	54,75
58.	Bingöl	1914,00	,00	250966,0	34,53
59.	Erzurum	3036,00	240,00	848201,0	47,20
60.	Muş	1827,00	,00	376543,0	26,86
61.	Ağrı	1572,00	,00	437093,0	36,32
62.	Kars	2118,00	130,00	349437,0	31,63
63.	Van	2561,00	162,00	637433,0	40,63
64.	Bitlis	2033,00	,00	330115,0	43,30
65.	Hakkari	1730,00	,00	172479,0	41,22
66.	Gaziantep	5361,00	383,00	1140594	71,99
67.	Adıyaman	5840,00	363,00	513131,0	42,74
68.	Şanlıurfa	2660,00	285,00	1001455	55,03
69.	Diyarbakır	5027,00	163,00	1094996	54,85
70.	Mardin	2690,00	423,00	557727,0	44,65
71.	Siirt	2998,00	212,00	243435,0	45,24

Data used in the analysis is tried to be calculated on 71 provinces. When production value, that is the value of the dependent variable (y: production 90) is 0, the program automatically excluded and the data dropped to n=34. A summary of data print out enclosed in Exhibit 1. In this study, many data are used to find outwith which independent variables and in which direction of change did the production values on the basis of provinces in 1990 have changed. These are: 1990 urbanization level, population employed in industrial and service sectors, active population rate and logarithm of each data. But in the model which is chosen by computer, above mentioned data were excluded.

So, the model is:

$$Y_{\text{production}} = \beta_0 + \beta_1 X_{\text{pop90}} + \beta_2 X_{\text{giv}}$$

Ideal model is chosen as

$$Y_{\text{production}} = -196.9 + 4.2 X_{\text{pop90}} + 6.56 X_{\text{giv}}$$

Province90, (şehir90) which is used under the data section, that is the urbanization level of cities in 1990, has been excluded from the model. Province90 which is excluded from the model (urbanization level 1990) is enclosed in Exhibit 1.

In this model, R^2 , F and t tests, which are used for measuring the “success” and “sufficiency level” of each parameter in the whole of the model, are applied. But it is not right to use any one of these measures as a criteria of success. Comparison of these measures with other models is a must for the success of econometric application. (7)

Referring to Exhibit-1, R^2 value, which is accepted as the description percentage for the y-variable of two independent variables, is calculated as 81%. So, it can be said that Nüf90 (Population 90 [Pop90]) and Gross Investment Volume [GIV]), are 81% effective and descriptive on the y-production. The remaining 19% is based on other effective variables which are not included in this model. Again referring to Exhibit-1, when β , which is the coefficient of independent variables of the ideal model, is considered, Pop90 has a 42% positive effect on Üretim90 (Production90) and GIV has a 65% positive effect.

For the significance of each of these effects and independent variables on Production90 a “t” test is applied. According to economic theory, since the direction of the relationship is known, a single-sided hypothesis test is applied. According to this:

$$H_0 : \beta_1 = 0$$

$$H_1 : \beta_1 > 0$$

$$t^{\text{calculation}} = 8.767$$

$$t^{\text{table}}_{0.05} = 1.959$$

If $t^{\text{calculation}} > t^{\text{table}}$ then H_0 is Refused and H_1 is accepted.

If same application is made for β_2

$$H_0 : \beta_2 = 0$$

$$H_1 : \beta_2 > 0$$

$$t^{\text{calculation}} = 3.656$$

$$t^{\text{table}}_{0.05} = 1.959$$

If $t^{\text{calculation}} > t^{\text{table}}$ then H_0 is Refused and H_1 is accepted.

According to above table values and calculated values, results for both independent variables are significant and effective for 0.05 .

For the test of this model (except β_0) all parameters have to be tested simultaneously. For this, F test is applied and results of F test are found successful and results did not conflict with that of “t” test.

$$F_{\text{calculation}} = 67.7 \quad H_0 : \beta_1 = \beta_2 = 0$$

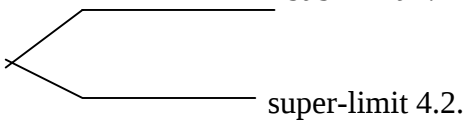
$$t_{0.05}^{\text{table}} = 3.30 \quad H_1 : \beta_1 = \beta_2 \neq 0$$

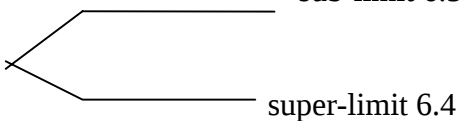
Since $F^{\text{calculation}} > F^{\text{table}}$

H_0 is Refused and H_1 is accepted.

According to these tests, both individual and total parameters have significant results on y-based variable and there is no conflict between the results.

Safety limits for β_1 and β_2 are :

For β_1 :
 $4.2 \pm 1.96 (0.00)$ 

For β_2 :
 $6.5 \pm 1.96 (0.18)$ 

For this model, t and standard error values and model are summarized below:

Production90: - 196.9 + 4.2 Pop90 + 6.56 GIV

t	- 1.661	8.767	3.656
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St. Error	118.590	0.000	0.018
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F= 67.6 $R^2 = 81\%$ and Arranged $R^2 = 80\%$

GENERAL ASSESSMENT AND CONCLUSION

GENERAL ASSESSMENT

From the first census in Turkey in 1927 until today the country's population has 5 times increased. According to temporary unconfirmed results of the recent census, the country's population is around 65 million. Population has not only increased like in other developing countries but its qualities have also changed. Many studies are performed to find out a universal demographic variation theory but the desired result could not be obtained. However, it is still possible to examine the character of Turkish population and conclude that there are demographic transitions. Of these transition periods, the period between 1950s to 1985-1990 was the peak of the urbanization movement. Urbanization is a serious issue in Turkey, which is experienced after 1950s. Before 1950s, only 20-25% of the population used to live in the cities. Between 1980-1985, the situation was balanced and the urban population increased more than rural population. In the meantime, not only number of the people living in cities but also the number of cities have increased. Urban character is not only reflected with migration from rural areas to cities or increase in favor of births rather than deaths. According to many writers, what makes a city a city is its transformation of production style. Non-agricultural activities which are almost not encountered in rural areas are the production style of the cities.

In many studies, urbanization is defined with the existence of non-agricultural (industry and services) activities. Urbanization, which is seen as the result of industrialization in many European countries, has developed in rather different circumstances in Turkey. Although risks of overgrowing cities are well known, in the developing plans urbanization is accepted as a de facto condition of industrialization and this has been supported with developing plans. Distribution of manpower in Turkey faced a change after the urbanization movement after 1950s. While share of agricultural sector has relatively dropped, non-agricultural activities in the cities increased gradually. Though manpower in industrial and service sectors in Turkey is behind that of developed industrial countries, there is still an increase in the number of people working in these sectors. Movement in the industrial and service sectors has also developed the construction sector which is accepted as a sub-industrial branch. Also, cement industry has developed as a result of both urbanization and industrialization. It is not possible to talk about a balanced distribution of

added value which is produced in our country, the location of industrial and service sectors. In the west, Istanbul is especially a spot of attraction and development. Despite the development plans and incentive measures, there is still no established balance between the regions of Turkey. It seems it would take more time to establish a balance although results of the projects such as GAP have started to yield the expected outcomes. It is normal that many industrial and service sectors choose the development centers to maximize their profit and even to survive. It is evident in current distribution of these sectors. But, the cement industry, on the other hand, seems to have been distributed evenly over the country since it was first published by the public sector and then with the reason that its transportation is difficult and expensive due to its heaviness. It is observed that when choosing its location, the industry can be in a positive relation with population, urbanization, urban people's share from the national income. With a regression analysis, relations in choosing location for cement industry are revealed. According to this model, production values, income per capita in a certain city and population of that particular city are highly involved in a positive relation.

CONCLUSION

For development of countries, production share of agricultural sector in total production has to drop and incline through industry and service sectors. This transition seems to have started with the fast population growth and rapid industrialization in 1950s. Although share of industrial and service sectors in total production have not reached to the level of developed countries, they develop gradually and increase the number of employees and share in total production.

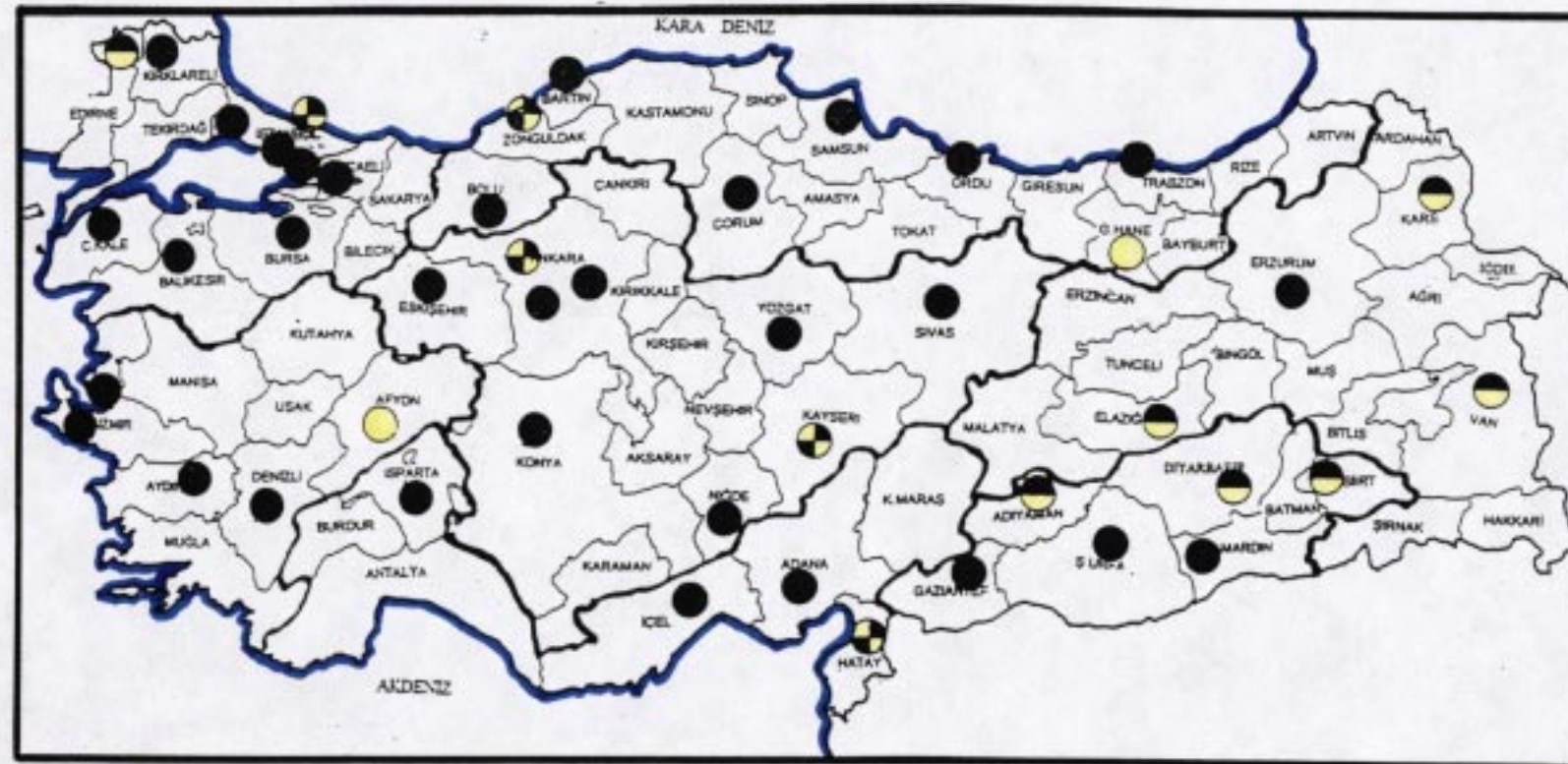
As long as the non-agricultural sectors keep developing, construction sector and cement production shall always keep their special and important places. In contrary to many sectors which are sensitive to market changes, cement – just like basic food products which are not effected from any changes in the market – shall not either be effected or effected less than the other sectors.

When the increased need for housing and infrastructure investments in our country considered, it is evident that cement sector will develop even more. In our country investments made for improvement of imbalance between the regions have not resulted satisfactory. It is a clear fact that cement is one of the sectors which should be supported

and developed by the public aid due to reasons; its raw material is sufficient in our country, its transportation is expensive and therefore related factories have to be built in the nearest location of need, it has almost no technological dependency to foreign sources and also regarding the environment pollution, it decreases pollution almost parallel to production.

Map 1

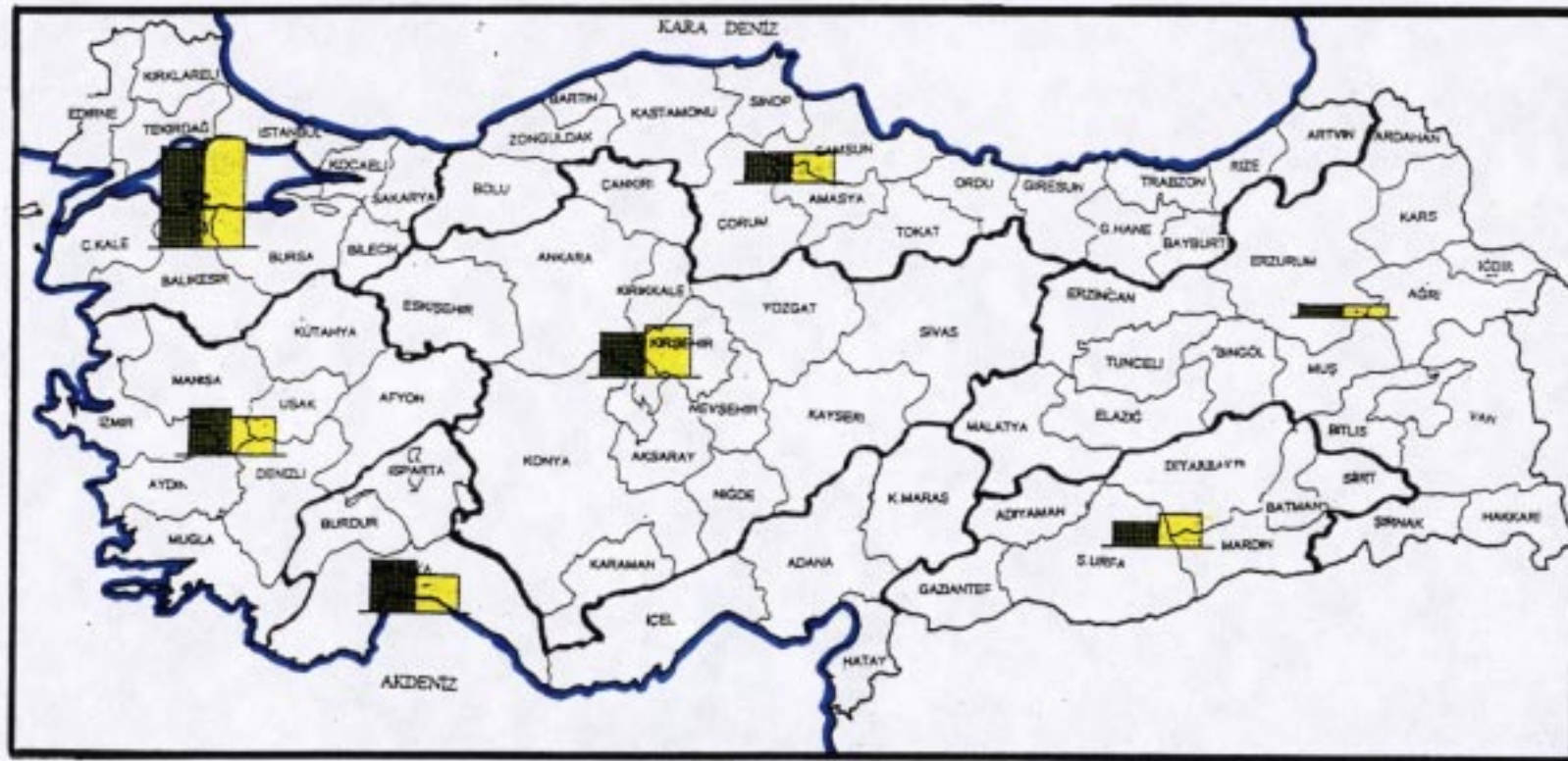
Spatial Distribution of Cement Factories in Turkey



-  Public
-  Public Grid
-  Private
-  Private Grid

Map 2

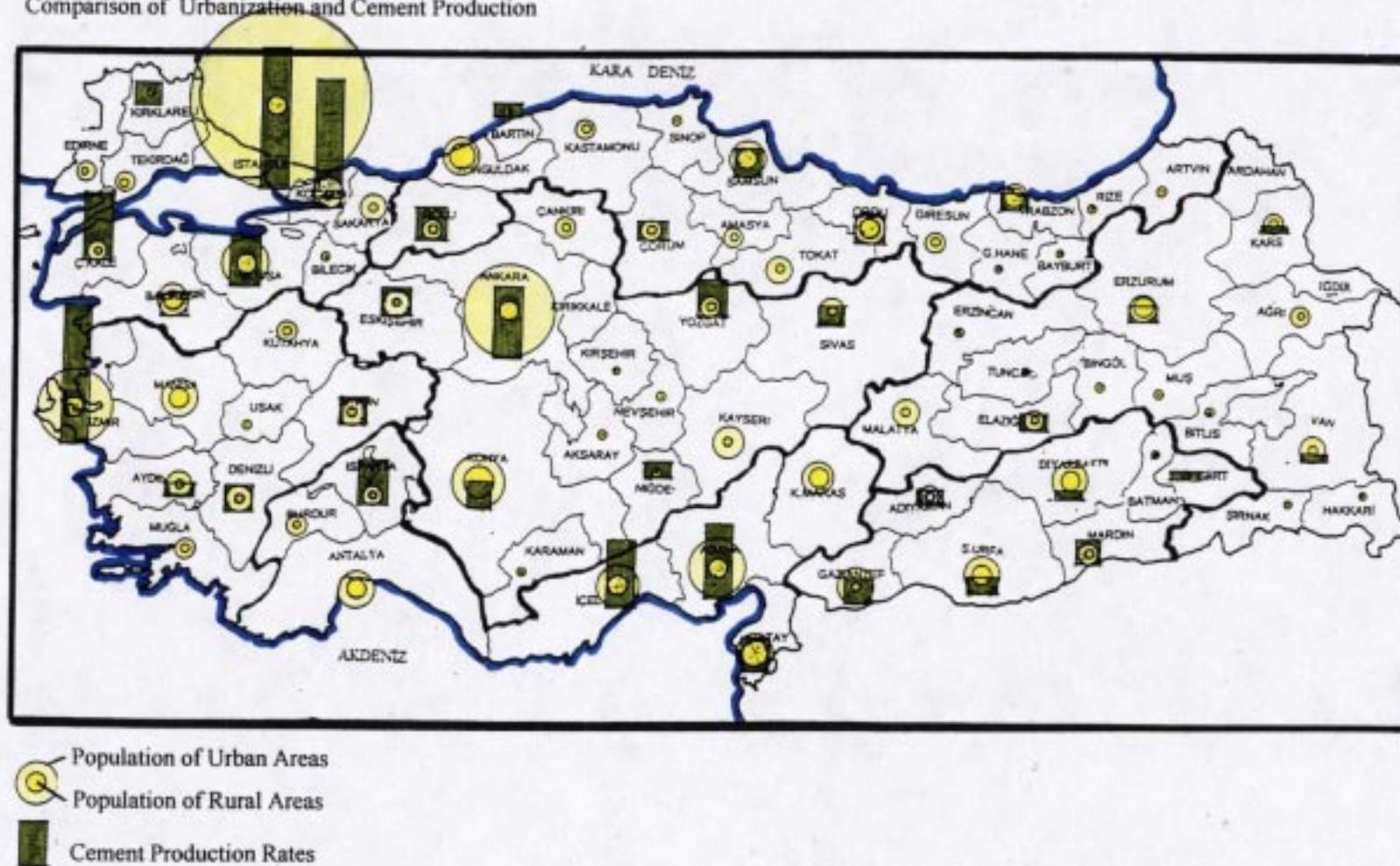
Cement Production and Consumption According to the Geographical Regions in Turkey



■ Production
■ Consumption

Map 3

Comparison of Urbanization and Cement Production



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