



A Brief Overview of Demographic, Geographic, and Energy Characteristics of the German Democratic Republic, Rhone-Alpes, and Wisconsin

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A BRIEF OVERVIEW OF DEMOGRAPHIC, GEOGRAPHIC,
AND ENERGY CHARACTERISTICS OF THE GERMAN
DEMOCRATIC REPUBLIC, RHÔNE-ALPES, AND
WISCONSIN

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W.K. Foell

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WP-75-65

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distribution outside of IIASA, and
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mation purposes. The views expressed
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necessarily reflect those of IIASA.

This paper is one of a series describing a multidisciplinary IIASA research program on Integrated Energy System Modelling and Policy Analysis. The initial phase of this research program is focused on the energy systems of three regions: the State of Wisconsin in the U.S.A.; the German Democratic Republic; and the Rhône-Alpes Region in France. The primary purposes of the study are at least three-fold:

- (1) To identify existing patterns of regional energy use and supply at appropriate levels of disaggregation.
- (2) To compare alternative methodologies for regional energy forecasting, planning, and policy development.
- (3) To use the above methodologies to examine alternate energy policy strategies for each of the regions, to explore their implications from various perspectives using sets of indicators related to environmental impacts, energy use efficiency, etc., and to evaluate the adequacy of the alternative methodologies as policy tools.

Out of these above three items should evolve improved methodologies for energy systems research and policy analysis. The comparative method, intersecting the different disciplines and nations which would be involved in this project, should serve as a powerful tool to the mutual benefit to the participating nations as well as to other countries facing similar energy problems. It could also serve as a prototype for similar studies on other resources such as materials, water, air, i.e. as a vehicle for development of an approach for improved resource management.

Papers in the series describing this research program are:

- (1) Foell, W.K. "Integrated Energy System Modelling and Policy Analysis: A Description of an IIASA Research Program" IIASA Working Paper WP-75-38, April 1975.
- (2) Dennis, R.L. and Ito, K. "An Initial Framework for Describing Regional Pollution Emissions in the IIASA Integrated Energy System Research Program" IIASA Working Paper WP-75-61, June 1975.
- (3) Weingart, Jerome, "Preliminary Data Requirements for a Feasibility Study of the Solar Option in the Rhône-Alpes Region of France" IIASA Working Paper, June 1975.
- (4) Hölzl, A. and Foell, W.K. "A Brief Overview of Demographic, Geographic, and Energy Characteristics of the German Democratic Republic, Rhône-Alpes, and Wisconsin" IIASA Working Paper, June 1975.

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I. Introduction

One of the primary objectives of the Integrated Energy System Modelling and Policy Analysis Research Program at IIASA is to identify usage and supply patterns in each of the three regions under study. This paper is a first step in that direction. It provides an initial overview of some of the important demographic, geographic and energy characteristics of the German Democratic Republic, the Rhône-Alpes region of France, and The State of Wisconsin in the U.S.A. The data are meant to reveal some similarities and differences among the three regions as well as to provide a foundation for assessing modelling techniques which will be used in this research program and to formulate the policy questions which will form a cornerstone of the comparative approach.

The data listed here represent only a small fraction of that available from the region. The disaggregation of the data presented here is not meant to imply that it will be used directly in the models or information systems under development for this project. Rather it gives an indication of the overall characteristics of the energy systems in each of the three regions and to a lesser degree gives the reader an idea of the types of data readily available.

Most of the data given in this paper is presented in graphical or tabular form with only a minimum of explanation. In general the data are presented according to each of the respective regions and then in some cases, compared across the regions. The data were collected from several primary sources

for each of the regions. The most important of these sources were:

GDR - Statistisches Jahrbuch 1974 der DDR

Rhône-Alpes - Annuaire Rhône-Alpes 1974

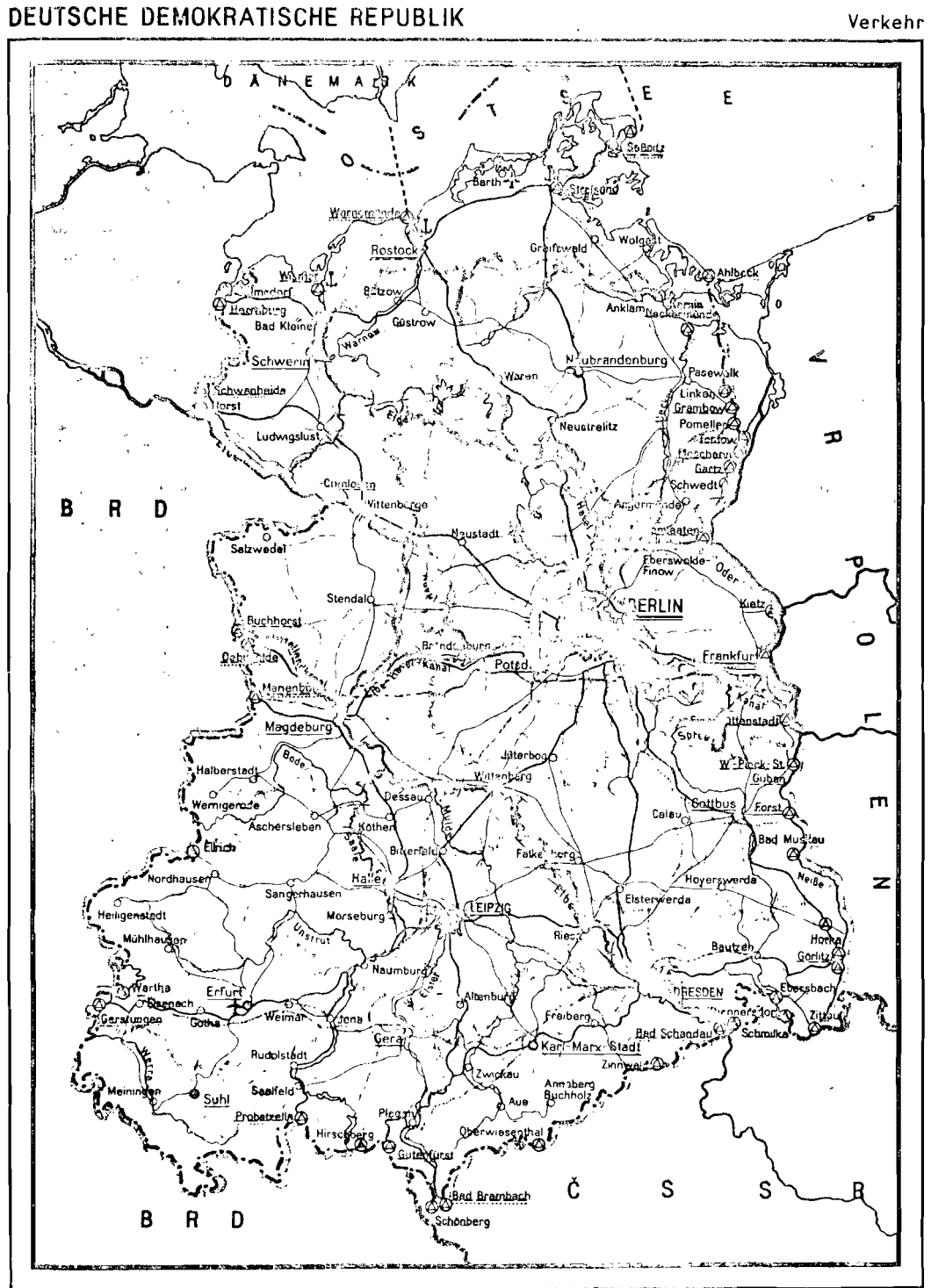
Wisconsin - 1974 Survey of Energy Use in Wisconsin

The data given in this paper have not been checked nor verified by scientists from each of the respective regions, and therefore may contain some errors. They are presented here as a starting point for further discussion and comparison, and as the focus of the research project continues to evolve and sharpen, it is expected that this report will be considerably supplemented. A second paper is under preparation which contains considerably more detail on transportation use and industrial use of energy.

II. Some Demographic and Geographic Characteristics

A. German Democratic Republic (GDR)

1. Geographic Location - Map of GDR

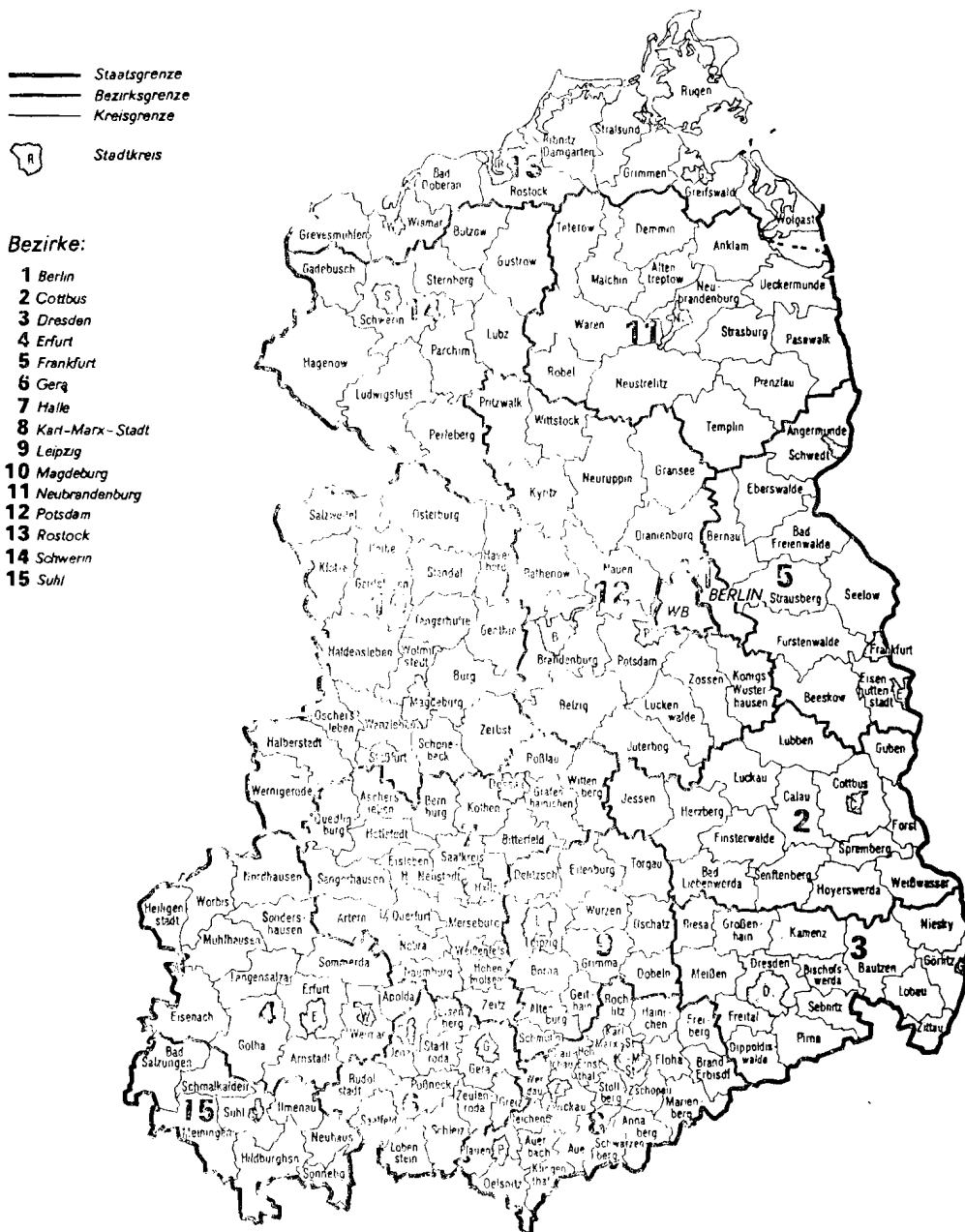


<p>— Eisenbahnstrecke mit internationalem Personenverkehr</p> <p>— Schnell- u. Eilzugverkehr</p> <p>--- Fahrlinie</p> <p>— Autobahn</p> <p>— Fernverkehrsstraße</p> <p>— Transitstraße</p>	<p>✈ internationale Fluglinie</p> <p>✈ Inlandfluglinie</p> <p>✈ Flughafen</p> <p>— Kanal</p> <p>— schiffbare Flußstrecke</p> <p>— Seehafen</p> <p>⊕ Grenzübergangspunkt</p>	<p>⊕ Grenzübergangspunkt mit Verkehrsbeschränkung entsprechend den gesetzlichen Bestimmungen der DDR</p> <p>— Grenzübergang im Eisenbahnpersonenverkehr</p> <p>— Grenzübergang im Eilbahngüterverkehr</p> <p>— Grenzübergang im Straßenverkehr</p> <p>— Grenzübergang im Schiffsverkehr</p>	<p>0 20 40 60 km</p> <p>— Staatsgrenze</p> <p>--- Bezirksgrenze</p> <p>— Erfurt Bezirkshauptstadt</p>
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2. The Administrative Regions of the GDR

Bezirke und Kreise der Deutschen Demokratischen Republik

Stand 1 Januar 1974

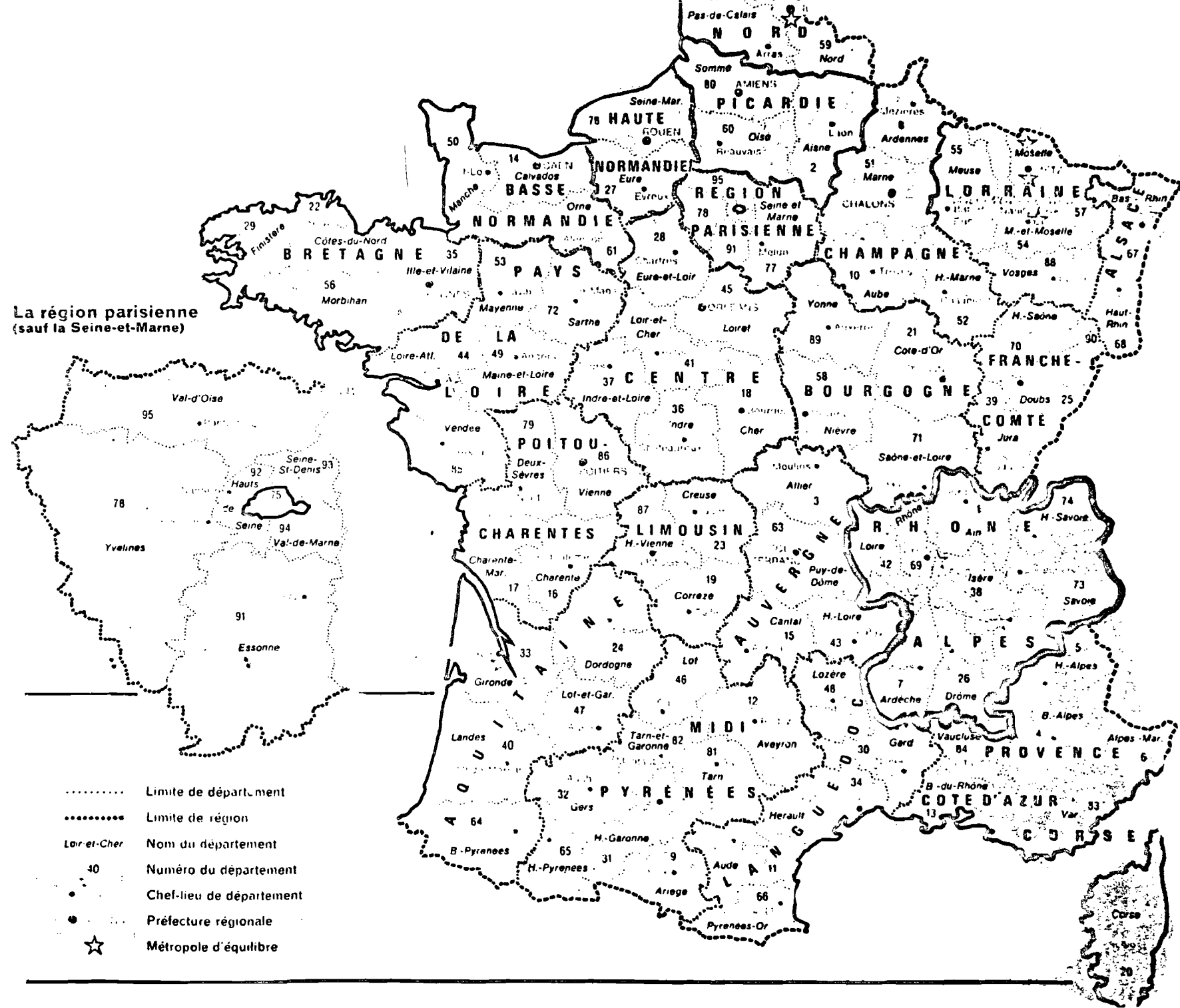


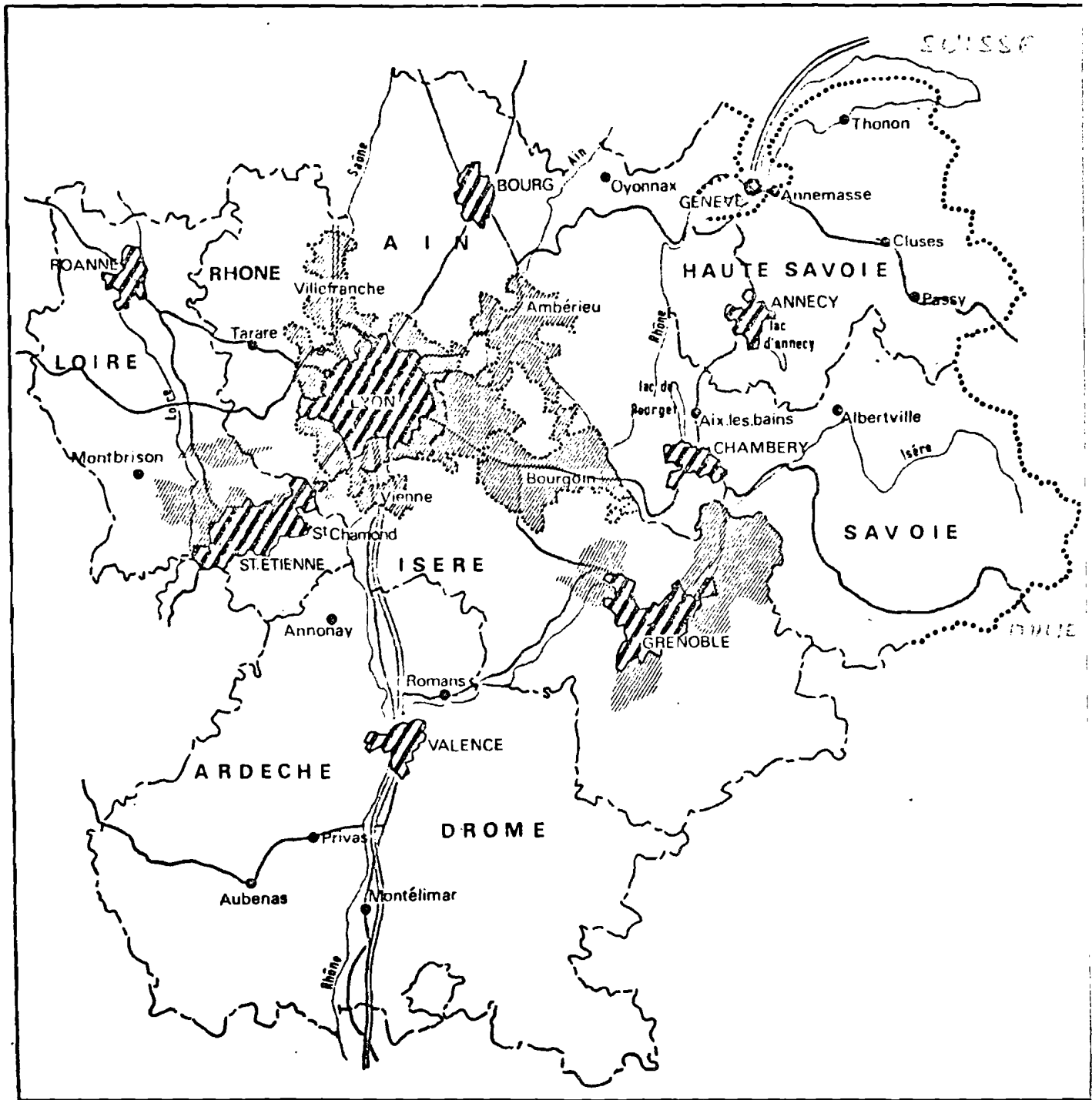
1:3 000 000









3. GDR Regional Population Density

"Bezirk"	Area (km ²)	1973 Population (persons)	Density (persons/km ²)
Berlin	403	1,088,827	2,702
Cottbus	8,262	870,748	105
Dresden	6,738	1,859,255	275
Erfurt	7,349	1,252,285	170
Frankfurt	7,185	687,771	96
Gera	4,004	7,404,470	185
Halle	8,771	1,908,143	217
Karl-Marx-Stadt	6,009	2,016,422	334
Leipzig	4,966	1,471,818	295
Magdeburg	11,525	1,308,165	113
Neubrandenburg	10,792	632,903	59
Potsdam	12,572	1,129,753	90
Rostock	7,074	865,831	122
Schwerin	8,672	595,062	69
	<hr/> 108,178	<hr/> 16,979,620	<hr/> 151

Source: Statistisches Jahrbuch 1974 der DDR, Staatsverlag der Deutschen Demokratischen Republik, Berlin 1974.





-  Autoroutes
-  Routes
-  Limites départementales
-  Limites nationales
-  Agglomérations définition 68 INSEE
-  Régions urbaines de la métropole
-  Privas
-  Villes de plus de 10 000 habitants hors des agglomérations et régions urbaines

2. Departments of Rhône-Alpes with Urban Regions

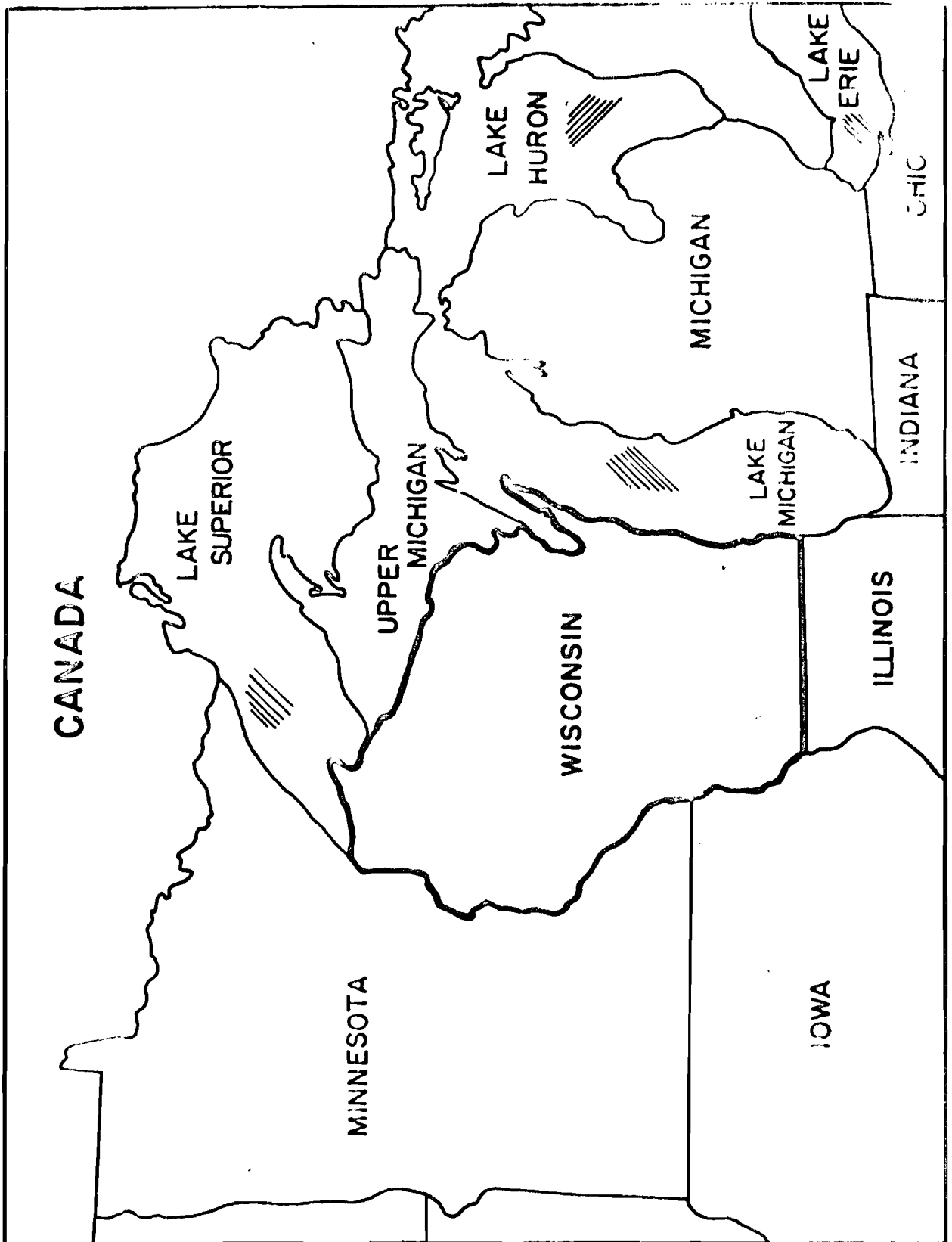
3. Regional Population Density of Rhône-Alpes

Département	Area (km ²)	1973 Population (persons)	Density (persons/km ²)
Ain	5,785	360,000	62
Ardeche	5,565	265,000	48
Drome	6,560	368,000	56
Iserre	7,882	840,000	107
Loire	6,807	750,000	110
Rhone	1,259	1,451,000	1,153
Savoie	6,270	320,000	51
Haute Savoie	4,839	450,000	93
	<hr/> 44,967	<hr/> 4,804,000	<hr/> 106

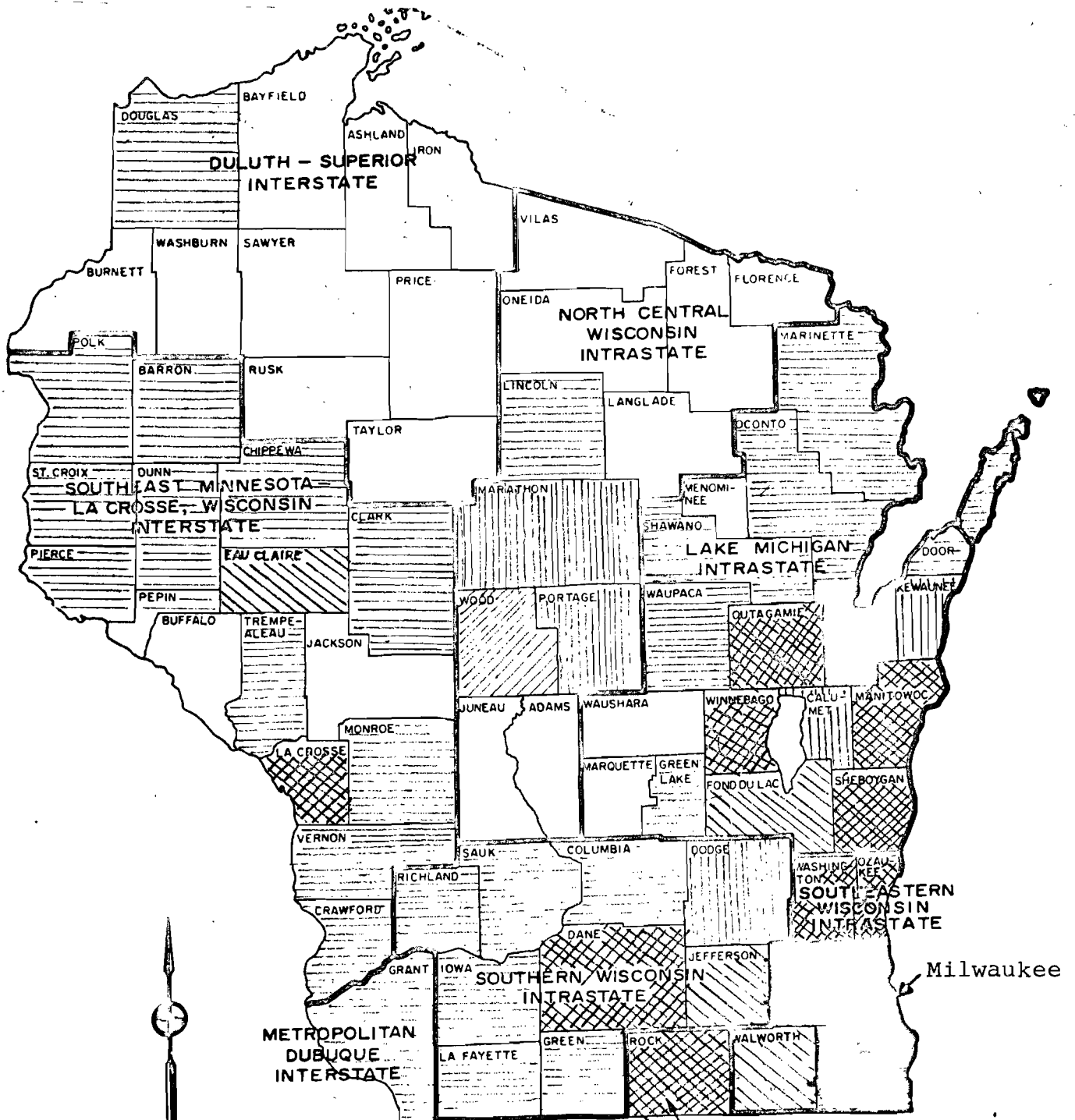
Source: Annuaire Rhône-Alpes 1974, Principaux Resultats
Statistiques en 1973, Supplément de no. 9 de la revue
"Points d'Appui pour l'Economic Rhône-Alpes"

C. Wisconsin

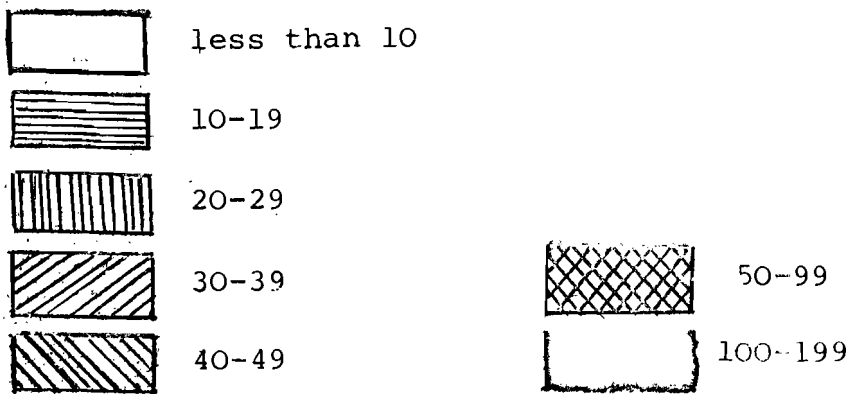
1. Wisconsin and Surrounding States



2. Map of Wisconsin Counties and Population Densities



Population density (p/km²)



ROCKFORD, ILLINOIS—
JANESVILLE, БЕЛОIT,
WISCONSIN INTERSTATE

Milwaukee:
1703 p/km²

3. Wisconsin Regional Population Density

(The aggregation of counties corresponds roughly to the Air Quality Control Regions defined by the Southeastern Wisconsin Regional Planning Commission - see map)

Region	Area (km ²)	1970 Population (persons)	Density (persons/km ²)
Duluth-Superior Interstate	28,454	154,879	5
North Central Wisconsin Intrastate	26,641	327,142	12
Southeast Minnesota- La Grosse Wisconsin Interstate 1)	35,456	556,094	16
Lake Michigan Intrastate	28,011	912,814	33
Southern Wisconsin Intrastate 2)	19,906	711,068	36
Southeastern Wisconsin Intrastate	6,961	1,756,086	252
	<hr/>	<hr/>	<hr/>
	145,429	4,418,083	30

1) Grant is included here

2) Rock is included here

Sources:

The State of Wisconsin 1973 Blue Book

"Regional Air Quality Maintenance Planning Program Prospectus", Southeastern Wisconsin Regional Planning Commission, Waukesha, Wisconsin, 1974.

III. Selected Comparison of GDR, Rhône-Alpes, Wisconsin

A. Demography

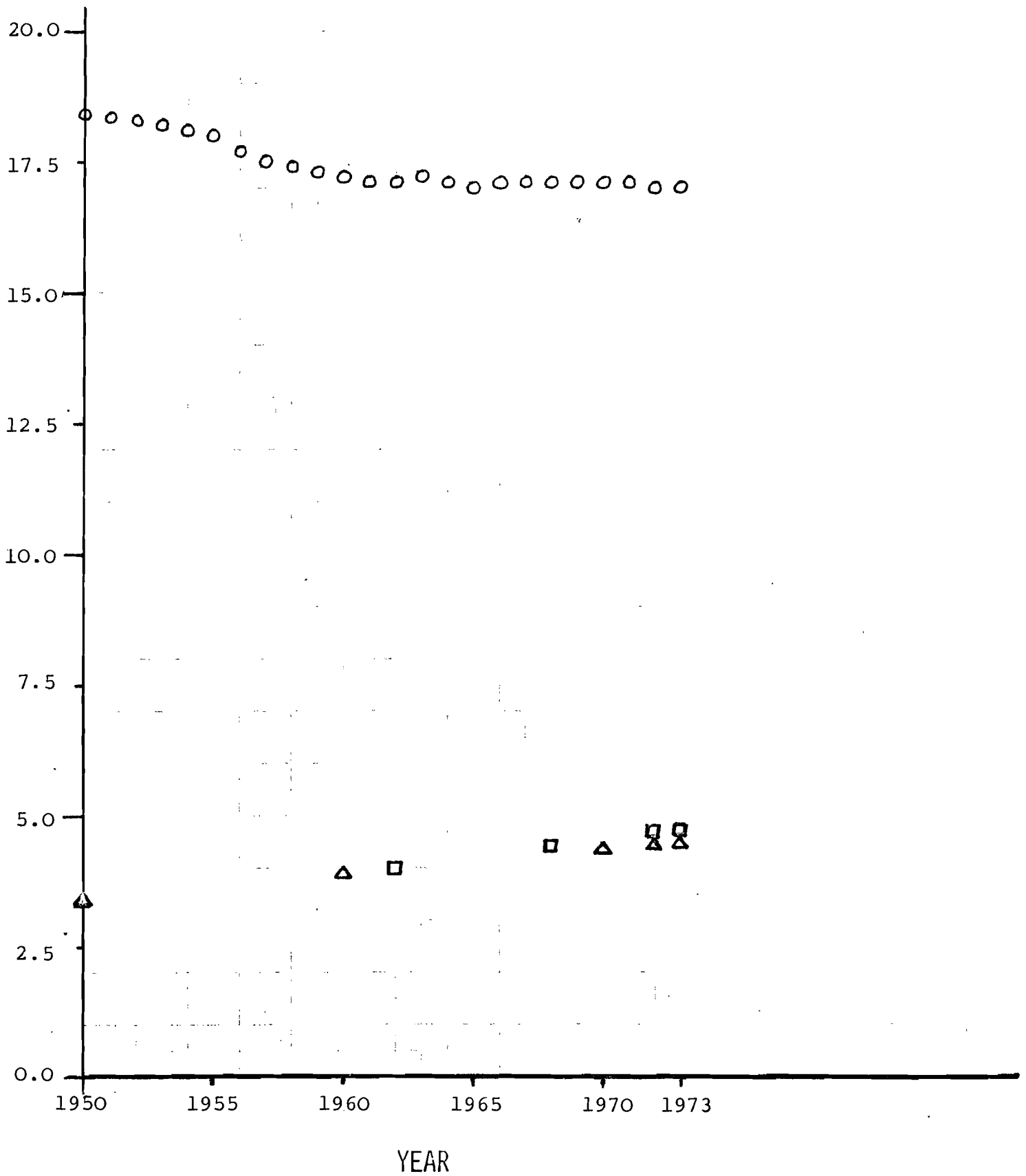
1. Land Area and Population

	<u>GDR</u>	<u>Rhône-Alpes</u>	<u>Wisconsin</u>
Gross Area (km ²)	108,178	44,967	145,320
Population (1973)	16,980,000	4,804,000	4,565,000
Density (p/km ²)	157	107	31

2. Population Growth

	<u>Year</u>	<u>Population</u>	<u>Average Annual Change (%)</u>
GDR:	1950	18,388,000	
	1960	17,298,000	- 0.6%
	1965	17,020,000	- 0.3%
	1970	17,058,000	0.0%
	1973	16,980,000	- 0.2%
Rhône-Alpes:	1962	4,019,000	
	1968	4,423,000	1.6%
	1974	4,884,000	1.7%
Wisconsin:	1950	3,435,000	
	1960	3,953,000	1.4%
	1970	4,418,000	1.1%

3. Graph of Population Growth



- GERMAN DEMOCRATIC REPUBLIC
- RHONE-ALPES/FRANCE
- △ WISCONSIN

4. Cities and Towns by Population Categories

Size	1) GDR		2) Rhône-Alpes		3) Wisconsin	
	Number of Municipalities	% of Total Population	Number of Municipalities	% of Total Population	Number of Municipalities	% of Total Population
1,000,000 or more	1	6.4%	1	24.3%	-	----
500,000 to 999,999	2	6.4%	-	---	1	16.2%
100,000 to 499,999	10	10.5%	2	15.0%	1	3.9%
50,000 to 99,999	18	7.1%	5	9.1%	8	12.5%
20,000 to 49,999	82	15.1%	15	10.8%	17	12.6%
10,000 to 19,999	107	8.9%		40.8%	28	8.7%
Less than 10,000		45.6%			565	46.0%
		100.0%		100.0%		100.0%

1) Data from 1973

Source: Statistisches Jahrbuch der DDR 1974, Staatsverlag der Deutschen Demokratischen Republik, Berlin 1974.

2) Data from 1968

Source: Annuaire Rhône-Alpes 1974, Principaux Résultats Statistiques en 1973, Supplément de no 9 de la revue, "Points d'Appui pour l'Economie Rhône-Alpes"

3) Data from 1970

Source: The State of Wisconsin 1973 Blue Book

B. Transportation Systems

1. Railway, Road and Waterway "Mileage" (1972) Unit: km

	DDR	Rhône-Alpes	Wisconsin
Roads:			
State Truck	12,364	6,844	19,182
County Truck	33,208	22,353	31,544
Municipal	<u>80,764</u>	<u>42,584</u>	<u>114,123</u>
Total	126,336	71,781	164,849
Rail	14,384	3,518*	14,314
Waterways			
River	1,144		
Ship canal	<u>358</u>		
Total	1,502	454	

* Estimated as 10% of the figure given for the total of France

Sources:

- (1) Statistisches Jahrbuch 1974 der DDR, Staatsverlag der Deutschen Demokratischen Republik, Berlin 1974.
- (2) Annuaire Statistique de la France 1974
Résultats de 1972
Institut National de la Statistique
et des Etudes Economiques (INSEE)
- (3) The State of Wisconsin 1973 Blue Book

2. Motor Vehicles Registration

	DDR		Rhône-Alpes		Wisconsin	
	1970	1972	1969	1972	1970	1972
Autos	1,159,778	1,400,390	1,150,000**	1,340,000**	1,858,428***	1,969,430***
Buses	16,686	17,774	6,941	8,818	7,932	9,522
Motorcycles	1,374,006*	1,372,901*	550,000**	502,000**	54,306	69,878
Trucks	228,885	255,478	267,872	328,047	361,450	375,865
Tractors	194,024	202,713	6,000**	10,580		
Trailers	491,278	579,112	32,447	13,567	68,308	76,545

* Small motorcycles: (1970) 1,538,022 - (1972) 1,698,818

** Estimated as 10% of the total of France

*** Private and municipally owned

Sources:

- (1) "Statistisches Jahrbuch 1974 der DDR, Staatsverlag der Deutschen Demokratischen Republik, Berlin, 1974.
- (2) Annuaire Statistiques de la France 1974, Résultats de 1972, Institut National de la Statistique et des Etudes Economiques (INESS).
- (3) Energy Systems and Policy Research Report No.3, 1974 Survey of Energy Use In Wisconsin, Institute for Environmental Studies, Univ. of Wisconsin-Madison.

3. Freight and Mass Transport

GDR Freight Transport

Unit: 1000t

Mode	1960	1965	1970	1971	1972	% of Total 1972
Rail	237,789	260,430	262,901	268,473	274,448	32.8
Truck	270,346	345,821	463,567	497,082	518,302	61.9
Ship	14,008	18,372	22,171	23,045	23,550	2.8
Other ⁽¹⁾	5	3,837	15,376	17,614	20,872	2.5
Total	522,148	628,460	764,015	806,214	837,172	100.0

GDR Mass Transit

Unit: 10⁶ passengers

Mode	1960	1965	1970	1971	1972	% of Total 1972
Rail	943	684	626	630	641	17.8
Bus	688	941	1,137	1,177	1,223	33.9
Urban Bus, Tram	1,967	1,888	1,714	1,727	1,738	48.1
Other ⁽²⁾	9	9	7	9	9	0.2
Total	3,607	3,522	3,486	3,543	3,611	100.0

(1) Air: 19,049t (1972)

(2) Air: 925,900 passengers (1972)

Source: Statistisches Jahrbuch 1974 der DDR. Staatsverlag der Deutschen Demokratischen Republik, Berlin 1974

GDR Freight Transport

Unit: 10^6 ton-km.

Mode	1960	1965	1970	1971	1972	% of Total 1972
Rail	32,860	38,868	41,513	44,033	44,710	33.3
Truck	5,002	7,213	12,233	12,993	13,647	10.2
Ship	12,772	32,400	73,079	74,269	72,940	54.3
Other ⁽¹⁾	3	116	1,183	2,552	3,118	2.3
Total	50,637	78,597	128,008	133,847	134,415	100.0

GDR Mass Transit

Unit: 10^6 pass.-km

Mode	1960	1965	1970	1971	1972	% of Total 1972
Rail	21,888	17,446	17,611	18,407	19,932	42.6
Bus	9,935	13,507	17,284	18,184	18,964	40.6
Urban Bus, Tram	7,365	6,972	6,304	6,347	6,463	13.8
Other ⁽²⁾		686	1,326	1,350	1,382	3.0
Total	39,004 [*]	38,611	42,525	44,288	46,741	100.0

(1) Air: 29,229 ton-km (1972)
 Pipeline: $3,089 \times 10^6$ ton-km (1972)

(2) Air: 1,098.5 pass.-km (1972)

* Double counting with bus - urban bus

IV. Energy Use

A. 1972 Total Energy Use by Sector

[^]
RHONE-ALPES

	1000 tEC	10 ¹² kcal	% of region total
<u>Residential, Commercial</u>			
Coal	685.9	4.7392	
Natural Gas	478.0	3.3027	
Petroleum	5,986.2	41.3614	
Electricity	1,639.1	11.3253	
Total	8,789.2	60.7286	40.1%
<u>Industrial</u>			
Coal	662.8	4.5796	
Natural Gas	815.4	5.6340	
Petroleum	2,927.4	20.2267	
Electricity	5,531.2	38.2176	
Total	9,936.8	68.6579	45.4%
<u>Transportation</u>			
Coal	4.1	0.0283	
Petroleum	2,959.6	20.4492	
Electricity	213.7	1.4766	
Total	3,177.4	21.9541	14.5%
TOTAL ENERGY USE	21,903.4	151.3406	100.0%

Conversion:

1 tEC $\hat{=}$ 27,295,000 BTU)
 1 BTU $\hat{=}$ 0.25314kcal)
 1 tEC $\hat{=}$ 6,909,456.3 kcal

WISCONSIN

	10 ¹² BTU	10 ¹² kcal	% of region total
<u>Residential</u>			
Coal	18.62	4.713	
Natural Gas	125.42	31.749	
Petroleum	109.31	27.671	
Electricity	114.65	29.023	
Total	368.00	93.156	28.8%
<u>Commercial</u>			
Natural Gas	54.93	13.905	
Petroleum	46.85	11.860	
Electricity	87.40	22.134	
Total	189.13	47.869	14.8%
<u>Industrial</u>			
Coal	78.59	19.894	
Natural Gas	183.88	46.547	
Petroleum	14.92	3.777	
Electricity	87.40	22.124	
Total	364.79	92.343	28.6%
<u>Transportation</u>			
Petroleum			
Motor vehicles	289.75	73.347	
Other modes	27.95	7.075	
Total	317.70	80.423	24.7%
<u>Others</u>			
Natural Gas	19.74	4.997	
Petroleum	7.61	1.926	
Electricity	9.25	2.342	
Total	36.60	9.265	2.9%
TOTAL USE	1,276.27	323.075	100.0%

Conversion: 1 BTU $\hat{=}$ 0.25314 kcal

Source: Energy Systems and Policy Research Report No. 3.
 "1974 Survey of Energy Use in Wisconsin" Institute for
 Environmental Studies. University of Wisconsin, Madison.

B. 1972 Total Energy Use by Source

<u>GDR</u>	1000 tEC	10 ¹² kcal	% of state total
<u>Coal, Lignite</u>			
Electric Gen.	60,626.5	418.8962	
Oven coke	7,664.0	52.9541	
Transportation, Retail	12,184.5	84.1883	
Total	80,475.0	556.0386	77.4%
<u>Natural Gas</u> *	1,052.7	7.2736	1.0%
<u>Petroleum</u>			
Transportation	7,377.0	50.9711	
Motor vehicles			
Other modes			
Nontransportation	14,910.0	103.0200	
Total	22,287.0	153,9911	21.4%
<u>Hydro</u>			
Electric Gen.	153.0	1.0571	0.1%
<u>Nuclear</u>			
Electric Gen.	---	---	---
TOTAL ENERGY	103,967.7	718.3604	99.9%

* Figure given for the import in 1973

Conversion:

	Original unit	tEC
Coal, Coke	1t	1.0
Lignite	1t	0.3333
Briquets	1t	0.6667
Crude oil, liquid fuels	1t	1.5
Natural gas	1000m ³	1.332

{ 1 tEC ≙ 27,295,000 BTU }
 { 1 BTU ≙ 0.25314 kcal }
 1 tEC ≙ 6,909,456.3 kcal

Source:

"Statistisches Jahrbuch der DDR 1974", Staatsverlag der Deutschen Demokratischen Republik. Berlin 1974.

^
RHONE ALPES

	1000 tEC	10 ¹² kcal	% of region total
<u>Solid Fuels</u>			
Electric Gen.			
Oven coke	14.9	4.5050	
Other industry	647.9	0.1030	
Retail	685.9	4.7392	
Total	1,352.8	9.3472	6.2%
<u>Natural Gas</u>			
Residential, Commercial	478.0	3.3027	
Industrial	815.4	5.6340	
Total	1,293.4	8.9367	5.9%
<u>Petroleum</u>			
Transportation	2,959.6	20.4492	
Motor vehicles			
Other modes			
Nontransport	8,914.1	61.5916	
Total	11,873.7	82.0408	54.2%
<u>Hydro</u>			
Electric Gen.	7.384.0	51.0194	33.7%
<u>Nuclear</u>			
Electric Gen.	---	---	---
TOTAL ENERGY USE	21,903.4	151.3440	100.0%

Conversion:

1 tEC $\hat{=}$ 27,295,000 BTU)
 1 BTU $\hat{=}$ 0.25314 kcal)
 1 tEC $\hat{=}$ 6,909,456.3 kcal

Source: Annuaire Rhône-Alpes 1974
 Principaux Résultats Statistiques en 1973
 Supplément de no. 9 de la revue "Points d'Appui pour
 l'Economie Rhône-Alpes"

WISCONSIN

	10 ¹² BTU	10 ¹² kcal	% of region total
<u>Coal</u>			
Electric Gen.	235.24	59.549	
Oven coke	10.26	2.597	
Retail	18.62	4.713	
All others	68.33	17.297	
Total	332.45	84.156	26.2%
<u>Natural Gas</u>			
Residential	125.42	31.749	
Commercial, Industrial	238.81	60.452	
All others	19.74	4.997	
Total	383.97	97.198	30.0%
<u>Petroleum</u>			
Transportation			
Motor vehicles	289.75	73.347	
Other transport	27.95	7.075	
Nontransportation	184.83	46.788	
Total	502.53	127.210	39.4%
<u>Hydro</u>			
Electric Gen.	22.50	5.696	
<u>Nuclear</u>			
Electric Gen.	35.52	8.992	2.8%
TOTAL ENERGY USE	1,276.97	323.252	100.0%

Change 1971/72:

Coal	-1.6
Natural Gas	+10.3
Petroleum	+0.9
Hydro	+10.3
Nuclear	-3.2

Conversion: 1 BTU₃₉ $\hat{=}$ 0.25314 kcal

Source: Energy Systems and Policy Research Report. "1974 Survey of Energy Use in Wisconsin." Institute for Environmental Studies. University of Wisconsin, Madison.

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