

(3) Harmonization of the train control system

The EC member countries have established a committee to develop a standard train control system. PKP needs to comply with the standard once it is established in the future.

(4) Restructuring of railway management

The EC countries have adopted "A Council Directive" on July 29, 1991 which specifies financial independence of railways from the state. The existing relationship between the state and PKP needs to be restructured for the future in accordance with the basic policy of the directive.

(5) Improvement of the information system

Improvement of information system is indispensable for train operations as well as for the introduction of better railway services. The optical fiber network which was installed since 1991 needs to be further extended.

4.2 Road Transport

4.2.1 Road Infrastructure

1) Classification of Roads

The road network in Poland is divided into four classes:

- (1) National Roads (under GDDP)
- (2) Voivodship Roads (under Voivodship)
- (3) Communal/Local Roads (under Commune)
- (4) Industrial Roads (under Commune)

The total road length amounted to 365,365 kilometers at the end of 1991, comprising National Roads of 45,599 kilometers (12.5% of total network), Voivodship Roads of 128,705 kilometers (35.2%), Communal/Local Roads of 172,608 kilometers (47.2%) and Industrial Roads of 18,453 kilometers (5.1%) as shown in Table 4.2.1. The national average of paved road ratio was 63.4% with the highest ratio of national roads at 99.9%, followed by voivodship roads at 85.1%, communal/local roads at 40.9% and industrial roads at 32.7%.

Table 4.2.1 Length of Road by Class at End of 1991

Road Class		Length		Paved Roads		Bridges	
		km	(%)	km	(%)	no.	(%)
Grand Total	total	365,365	(100)	231,678	(100)	30,344	(100)
	rural	313,192		191,915		25,832	
	urban	52,173		39,763		4,512	
National	total	45,599	(13)	45,556	(20)	8,030	(26)
	rural	42,951		42,908		7,358	
	urban	2,648		2,648		672	
Voivodship	total	128,705	(35)	109,559	(47)	12,617	(42)
	rural	114,808		96,372		10,730	
	urban	13,897		13,187		1,887	
Communal/ Local	total	172,608	(47)	70,525	(30)	9,697	(32)
	rural	138,471		47,802		7,744	
	urban	34,137		22,723		1,953	
Industrial	total	18,453	(5)	6,038	(3)	-	
	rural	16,962		4,833		-	
	urban	1,491		1,205		-	

Source: GDDP Statistics

(1) National Roads

National roads are nationally important routes for international traffic and linking the major urban areas. They also provide links both for industrial production and tourism. National roads can be further subdivided into inter-regional and regional roads forming four technical categories as follows:

a) Inter-regional Roads

- Motorways
- Express Roads
- All Purpose Inter Regional Roads

b) All Purpose Regional Roads

The design standard of the national roads is almost compatible with those adopted in the EC countries. Capacity guidelines appropriate for Polish roads, vehicle operations and driver behavior need to be developed. Table 4.2.2 shows an example of hourly capacity ranges based on road type and number of lanes. The actual traffic volume suggests that most parts of the present highway network have a capacity sufficient to accommodate the present volume, although there are bottlenecks in the vicinity of urban areas and on the main bridges.

Table 4.2.2 Designed Capacity by Road Class

Category of road	(1) Normal pcu/hrs	(2) Maximum pcu/hrs	Remarks
Category I: Single 2-lane	900	1,500	both ways
Category II (>2-lane) 3-lane	1,500	2,000	both ways
4-lane	1,500	2,000	one way
for each additional lane	750	1,000	one way
Motorways/Express Roads: with 2 lanes	2,000	3,000	one way
for each additional lane	1,200	1,500	one way

Source: Highway Capacity Manual, 1965, USA and JICA Study Team

There are 4,136 kilometers of roads in Poland constructed to a standard higher than a basic single 2 lane carriageway. These include:

- a) Motorways: 257 km
- b) Dual carriageway express roads: 236 km
- c) Single carriageway express roads: 134 km
- d) Dual carriageway roads: 646 km
- e) Single carriageway roads
with paved shoulders at least 1.5 meters: 2,863 km

It is not uncommon, on the more important routes, for a single carriageway to be widened to dual carriageway as the road enters the outskirts of a city and local suburban traffic is added to the longer distance traffic.

Inter-regional roads in Poland form part of the European network of AGR agreement which carry the appropriate "E". The inter-regional route network is shown in Fig. 4.2.1. The network totals approximately 11,500 kilometers, of which about 4,500 kilometers are international E routes.

Motorways in Poland are generally of dual two-lane standard with a 120 km/hr design speed. Lane widths are 3.75 meters and paved 3.0 meter hard shoulders are provided. The use of motorways is restricted to motor vehicles capable of maintaining speeds of at least 40 km/hr and stopping on the hard shoulders is limited to emergencies only.

Express roads are restricted for use by motorized traffic capable of maintaining speeds of 25 km/hr, but excluding agricultural tractors. They include dual carriageway, generally designed for 120 km/hr but with an alternative standard of 100/80 km/hr and single carriageway with a general design speed of 100 km/hr but with an alternative of 80 km/hr. For the higher design speeds 3.75 m lanes are incorporated and for the lower 3.50 m. In both cases, paved hard shoulders are provided, the width varying between 2.0 m and 2.75 m, depending upon the standard and design speed. Dual carriageway express roads differ only slightly from motorways, the most significant difference being the possibility of at-grade junctions.

In many cases, single carriageway express roads are an interim provision pending construction of a second carriageway when traffic conditions demand. In such circumstances, it is prudent to make provision for the future widening at structures and within land take. Care must be taken to ensure that any interim single carriageway road incorporates full overtaking sight distances. All express roads need feature grade separated rail crossings in the future. Observations of express roads in operation have revealed considerable unauthorized stopping on hard shoulders and the existence of numerous unofficial refreshment sellers. The development of rest/service areas is required to overcome this.

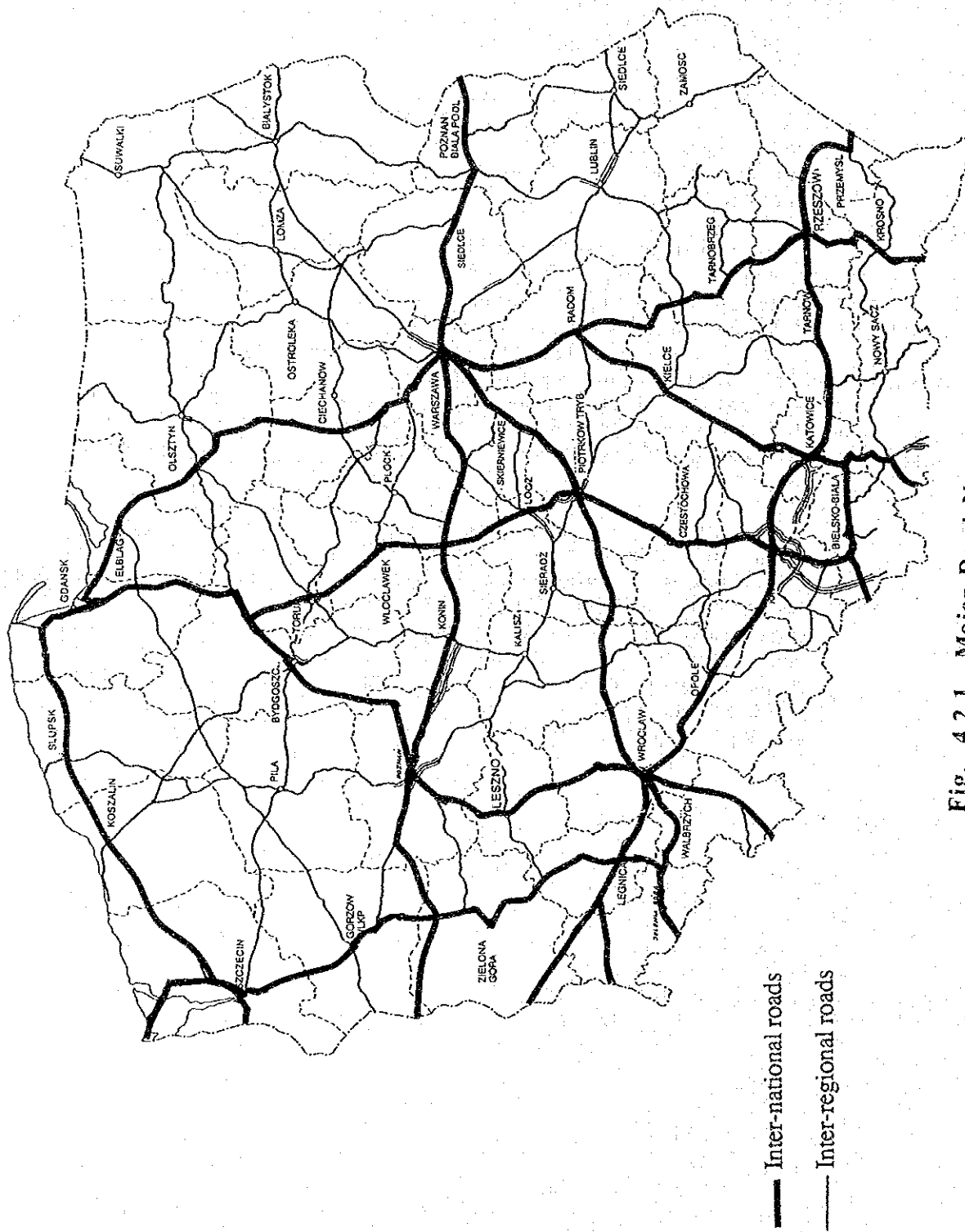


Fig. 4.2.1 Major Road Network

All Purpose Inter Regional Roads also include both dual and single carriageway. Dual carriageway features 3.5 m lanes and paved hard shoulders at least 1.5 m in width. Geometric characteristics are of a slightly lower standard than express roads with a tendency for vertical alignments to be more "rolling", following the natural topography. Single carriageway generally features 7.0 m carriageway and most have paved hard shoulders between 1.5 m and 2.5 m in width. In more hilly terrain, the hard shoulder is often widened to provide a climbing lane. The capacity of a single carriageway with paved hard shoulders is enhanced by the practice of slower vehicles to move over and use the hard shoulder as a running lane, thereby allowing overtaking. Compared with express roads, there are a number of features of all-purpose roads that reduce the level of service and reduce road safety. These include:

- all purpose roads are open to all road users, including pedestrians, cyclists, horse-drawn vehicles and agricultural vehicles;
- provision of by-passes is intermittent and in areas where frontage development exists, this frequently has direct access onto the major route;
- junctions in rural areas are generally at grade and priority is controlled. Crossroads are common and crossing traffic can experience considerable delay, particularly on the more heavily trafficked dual carriageway;
- pedestrian crossings are at grade;
- the use of hard shoulders on single carriageway for overtaking is complicated by their use by slow moving traffic, pedestrians and as bus stops; and
- in certain areas farmers sell produce from the back of the hard shoulder leading to much parking.

Although on dual carriageway all rail crossings are now grade separated, there are still many at-grade railway crossings on single carriageway international roads.

Regional Roads are typically 6.0 meters in width (exceptionally 7.0 meters in some sections) and do not have longitudinal carriageway markings. The edge of the paved carriageway tends to be irregular leading onto a hardened verge of variable width. Overtaking opportunities are very limited because of the road width, and the high proportion of horse drawn and agricultural vehicles results in low journey speeds. The alignment of these roads is typically only compatible with a design speed of 70 or 80 km/hr. Roads lead through the centers of towns and villages, and virtually all rail crossings are at-grade, many of them without any form of control.

A number of general points can be made in relation to the national road network. All roads have a system of marker reference posts dividing the route into 100 meter lengths. Such a system is very important for route inventory and maintenance management purposes. Except in urban areas, where curbs and footways exist, surface water discharges off the carriageway edge into parallel ditches. The lack of a positive drainage system can lead to ponding in periods of heavy rain and pavement strength being influenced by ground water levels.

In general terms the standard of road pavement was found to be good, and well maintained, on rural sections of the higher category roads. However, in urban areas, particularly those outside GDDP control, maintenance is poor. In towns where no by-passes exist, the standard of carriageway provision is generally lower than on rural sections of the route. The provision and maintenance of carriageway markings is generally good although reflecting roadsteads are not used on Polish roads. Bridges, and in particular river bridges, often appear to be in a poor state of repair and frequently require the carriageway to be narrowed or hard shoulders to be suspended. Safety fences and glare screens are not provided in some medians in case the width is lower than 6 meters. The design standards for motorways and express roads in Poland are at least equal to those of Western Europe.

(2) Voivodship and Communal roads

Voivodship Roads provide a secondary network linking towns and villages with one another and with the national road network. They also link railway stations and ports and, within urban areas, link districts of the town and other significant developments.

Commune/Local Roads make up the remainder of the public road network acting as complements to the national and voivodship roads and access roads to residence, farm lands, public facilities, etc. The road density of paved commune roads per 100 square kilometers varies to a great extent from voivodship to voivodship. Krakow had the highest density of 76.4 at the end of 1991, followed by Tarnow with 64.1 and Bielsko with 60.7 while Koszalin had the lowest density of 3.4, followed by Szczecin with 3.5 and Swupsk with 4.6. Most of the voivodship facing to the borders excluding the southern border had a road density of less than 10 km per 100 square kilometers.

2) Length/Density of Road and International Comparison

The total area of the country is 312,683 square kilometers, and the average road network density is 116.8 km/100 square kilometers. Table 4.2.3 compares the average road density of Poland with those of other countries in Europe in 1987.

Poland has a greater road network density than other Eastern European countries and one which compares favorably with many Western European nations. Thus, it can be said that Poland possesses an adequately extensive road network at least in terms of quantity. However, the length of motorways in Poland is rather low even by Eastern European standards. It exceeds only Greece, Ireland, Luxembourg, and Turkey in West Europe. Poland needs quality improvement of the road network.

Table 4.2.3 International Comparison of Road Density, 1987

Country	Road Length km	Country Size km ²	Road Density km/100km ²	
Poland	Total	343,767	312,683	109.9
	Paved	217,994	312,683	69.7
Bulgaria		33,535	110,912	30.2
Hungary		29,701	93,030	31.9
GDR (former)		46,533	108,333	43.0
Czechoslovakia		73,112	127,869	57.2
Rumania		72,816	237,500	30.7
Yugoslavia		120,300	255,804	47.0
Austria		36,500	83,849	43.5
Belgium		14,290	30,513	46.8
Denmark		70,490	43,069	163.7
France		807,600	547,026	147.6
West Germany		493,620	248,577	198.6
Greece		37,950	131,944	28.8
Ireland		92,300	70,283	131.3
Italy		303,350	301,225	100.7
Luxembourg		5,070	2,586	196.1
Netherlands		100,850	40,844	246.9
Norway		86,940	324,219	26.8
Spain		156,490	504,782	31.0
Sweden		203,160	449,964	45.2
Switzerland		71,020	41,288	172.0
Turkey		59,050	780,576	7.6
UK		374,632	244,046	153.5

4.2.2 Road Transport Demand

1) Traffic Volume

The annual average daily traffic (AADT) on Polish roads in 1990 is modest when compared to West European nations. The highest flows fall in the 10,000-15,000 vehicles range on the inter-city sections and 28,000 vehicles range in the vicinity of large urban centers. This was reached at several locations on major transport corridors: Gdansk-Gdynia, Warsaw-Ostrowska, Warsaw-Piotrkow, Tryb-Katowice, Tarnow-Krakow-Katowice-Opole, Konin-Poznan, and Lodz-Piotrkow-Tryb. The average annual traffic by class on the 11,500 kilometer inter-regional road network in 1985 was: 2% motorcycles, 48% passenger cars, 43% trucks, 5% buses, and 2% tractors.

2) Registered Number of Vehicles

Vehicle registrations in Poland continue to increase strongly and exceeded 9.8 million vehicles at the end of 1991. Table 4.2.4 shows the increasing number of registered vehicles from 5,496,000 in 1980 to 9,845,000 in 1991. Passengers cars showed the highest growth rate of 256% in comparison with 1980, followed by tractors of 190% and trucks of 186%. During the period, passenger car ownership per thousand population increased by nearly 2.4 times from 67 in 1980 to 159 in 1991.

Table 4.2.4 Vehicle Registrations 1980 - 1991

Type	unit: 1,000 vehicles				
	1980	1985	1989	1990	1991
Motorcycle	1,723 (100)	1,547 (90)	1,411 (82)	1,357 (79)	1,236 (72)
Sedan	2,383 (100)	3,671 (154)	4,864 (204)	5,261 (221)	6,112 (256)
Bus	66 (100)	83 (126)	91 (138)	92 (139)	87 (132)
Truck	618 (100)	780 (126)	977 (158)	1,045 (169)	1,152 (186)
Tractor	621 (100)	919 (148)	1,175 (189)	1,192 (192)	1,183 (190)
Others	85 (100)	89 (105)	78 (92)	77 (91)	75 (88)
Total	5,496 (100)	7,089 (129)	8,596 (156)	9,024 (164)	9,845 (179)

Source: GUS Statistics

The Polish passenger car ownership rate compares favorably with that of its East European neighbors but is considered modest relative to the nations of West Europe. Passenger car ownership is clearly linked with relative wealth. Thus, as the GDP per capita increases, commensurate growth in the vehicle supply can likewise be expected. Furthermore, as passenger car ownership becomes more common, the probability of more and longer car trips also increases.

The historic elasticities of annual West European passenger car registrations and income (represented by GDP per capita in constant 1985 US\$) suggest that the composite growth in registrations is relatively constant (2-4% per annum) regardless of change in real income. Exceptions were evident during the 1970s when the growth in registrations was more rapid (up to 6% per annum) due to a more modest ownership base.

4.2.3 Road Maintenance

1) Maintenance Budget and System

Maintenance is divided into three categories for which budgetary provision is made. These categories are:

- (1) Major capital maintenance (repairs);
- (2) Current maintenance also referred to as routine or summer maintenance; and
- (3) winter maintenance.

In addition, a separate budget is available for modernization of existing roads. Some maintenance work is undertaken from this budget. In practice, it appears that there is a certain amount of transfer of works between the maintenance and modernization budgets and often the pressure for improvements to be undertaken results in a loss of finance for maintenance. The relative budget levels were decreased from 4,348 billion zloty in 1990 to 3,940 billion zloty in 1991 as shown in Table 4.2.5. In 1991, about 80% of the total budget was allocated to national roads, amounting to 3,189 billion zloty.

Table 4.2.5 Road Budget in 1990 / 1991

	1990			1991		
	National	Voivod	Total	National	Voivod	Total
New construction	487	-	487	542	22	564
Capital Maintenance	886	408	1,294	585	150	735
Routine Maintenance (including Winter Maintenance)	1,849 (177)	718 (46)	2,567 (223)	2,062 (415)	579 (116)	2,641 (531)
Total	3,222	1,126	4,348	3,189	751	3,940

unit: billion zloty

Source: GDDP Statistics

Maintenance of national and voivodship roads, outside the main urban areas, is the responsibility of GDDP, however, the prime agencies in planning and implementing maintenance works are the 17 Regional boards of Public Roads (DODP). The work is actually organized through the District Divisions of Public Road Maintenance and the Sections of Public Road Maintenance.

The 17 Regional Boards are subdivided into 171 District Divisions and 652 site offices which hold route inventory data. The site offices are the first level at which maintenance needs are identified and their proposals are submitted through district offices to the Regional Boards, who are responsible for compiling the maintenance programme. The Regional Boards will seek guidance from GDDP on technical matters and the availability of finance before finalizing the programme.

2) Patrol, Cleaning and Winter Maintenance

Road patrol is practiced daily for the most important nine inter regional highways, twice a week for the remaining inter regional highways, once a week for regional roads and once a month for voivodship roads, all during daytime. Cleaning of national roads is done once or twice a year. Frequencies of patrol and cleaning are considered low and lack of night time patrol might overlook some causes of accidents.

Winter maintenance is confined only to limited sections of national roads, and particular winter maintenance is not undertaken on lower classes of roads. The road network is divided into categories for which different standards of treatment apply. First and second category roads do not precisely coincide with interregional and regional roads.

- (1) Category 1 roads make up a network of about 11,000 km, for which snow clearing and de-icing is undertaken by patrols operating on a 24-hour basis. As these roads are the most important traffic routes, the aim is that they remain constantly open and only very small accumulations of snow are tolerated. De-icing takes place over the total length of the network.
- (2) Category 2 roads make up a further 20,000 km for which treatment times are intended to be of short duration. On these roads de-icing efforts are concentrated on steeper gradients, junctions, bus-stops and areas where braking is likely to take place. On these roads, larger accumulations of compacted snow are tolerated.
- (3) Category 3 roads account for a further 85,000 km and snow and ice clearance on these roads will only be undertaken when vehicles and plant become available from higher category roads.

The remaining roads are not included in any planned snow and ice clearance programme. Any such work that is undertaken is financed by commune/local councils but this would only involve isolated lengths.

Snow clearing plant and equipment is held by the District Divisions of Road Maintenance. A number of heavy duty snow cutters/blowers exists but mainly general trucks would be fitted with ploughs and de-icing equipment during the winter period. De-icing is normally undertaken by sand and rock salt. The use of rock salt is not allowed on major concrete structures and within national parks.

3) Pavement Maintenance

A maintenance manual was prepared by the GDDP, however, actual pavement inspection and maintenance work have not been done regularly mainly due to a lack of equipment for inspection. The maintenance system is planned to be improved by the PMS with support of the World Bank.

Currently, a pavement management system (PMS) exists in some regions but in other regions assessments are essentially visual due to a lack of equipment to undertake network wide assessments. Even where a pavement management system does exist this does not extend to all national and voivodship roads under the control of the Regional Board. Nationally, only 2 bump integrators are available and skid resistance equipment is very limited. Deflection beam equipment (Benkleman Beam) is also available for the assessment of pavement strength/life, however, it is not practicable to use this equipment for a network wide assessment.

In Bialystock region, the pavement management system is based on good geotechnical/existing carriageway construction data obtained by cores taken every 200 to 300 meters throughout the 1100 km system network. Added to this are data on comfort coefficients (derived from the bump integrator), construction category (which is the proportion of the actual pavement thicknesses to that required for the traffic loading), traffic data in terms of equivalent commercial vehicles and visual inspection data, which includes measurements of rut depth/cracking, etc. This system does not, at this stage, provide a network wide assessment of pavement life, as this depends on the acquisition of fall weight deflectometer equipment, which is being financed through the World Bank, as part of the establishment of a centralized pavement management system. Also, whilst the current system is computer-based, it is not compatible with systems containing data on road inventory, accidents and traffic volumes. However, it does allow finance to be better directed than under earlier systems which allocated funding largely based on route length.

National guidance for visual inspections exists and critical values for rut depth have been established as follows:

- | | |
|------------------------|-------|
| - Inter Regional Roads | 6 mm |
| - Regional Roads | 8 mm |
| - Voivodship Roads | 12 mm |

The success of a visual inspection system is highly dependent on consistency of the subsequent inspections by the inspection staff.

Other routine maintenance needs are essentially based on visual inspections which include features such as:

- Drainage;
- Traffic Signs and Road Markings;
- Bridges; and
- Embankments, verges and tree cutting.

Whilst certain schemes will be identified, there will always be a need for money to be set aside for unforeseen repairs.

4) Organization for Maintenance in GDDP

The Maintenance Department of GDDP includes the following three groups:

- | | |
|---------------------------|---|
| (1) Maintenance Team: | Instruction on summer and winter maintenance |
| (2) Road Protection Team: | Travel permission for special vehicles in terms of weight, length, height and width, and approval of access roads from parking and gasoline station to national roads |
| (3) Service Team: | Procurement and supply of equipment and trucks, and establishment of standards for preventing road disasters |

There seems to be substantial functional confusions among departments because the maintenance department is not responsible for preparation of maintenance budget and programs.

4.2.4 Road Development Plans

1) Background

Studies into the development of the road network have taken place since the early 1960's, the UN-UNDP assisted in the development of a plan for the road network. The plan categorized roads as:

- inter regional
- regional; and
- local

The most important roads are the inter-regional roads which are made up of motorways, express roads and all purpose roads. At the end of the 1970's, implementation of this plan was commenced. However, in the early 1980's, due to the unfavorable economic climate in Poland, major highway investment was suspended and new policies were adopted for the maintenance and development of the road network.

2) Highway Development Program 1986 to 1990

The National Socio-Economic development Plan for the period 1986 to 1990 envisaged the following expenditure on roads.

	Billion zlotys (1985 prices)
New Investment in Roads and Bridges	5.0
Upgrading/Modernization of Existing Routes	54.0
Major maintenance/ Repairs	179.0
Routine maintenance	160.0

The budget for upgrading/modernization envisaged the implementation of 96 km of new motorways and 80 km of new express roads, whereas that for major maintenance/repair allowed for works on 15,000 km., including 1,600 km of modernization.

The targeted routes represent a length of 3,770 km or 8.9% of the national road network which carry 25% of the traffic. The routes were selected using the following criteria:

- (1) continuation of the 1984/5 investment in the major international routes E75, E30, E65 and E40;
- (2) investment in Routes 17 and 18 which, although not part of the European network, are important links for the eastern part of Poland;
- (3) investment in Routes 1, 2, 3, 4, 17 and 18 which have the highest volume/capacity ratios and whose capacity is expected to be exceeded in the near future; and
- (4) investment in Routes 6 and 8 which are part of an international agreement on European Routes.

Approximately 71% by length of the program on visages for 1986-90 had been achieved by the end of 1990.

3) Master Plan for Motorways and Express Roads

The General Directorate of Public Roads (GDDP) commissioned a study by the University of Warsaw to review the 1985 Master Plan for Motorways and Express Roads, taking account of land use and economic development in Poland and the political and economic changes taking place in Central and Eastern Europe.

A report of the study was made in May 1991 which recommended a long term network plan toward the year 2015 or 2020, including three new motorways Szczecin to Lubawka (to Prague), Warsaw to Suwalki (to Kowno) and Lodz to Wroclaw to Lubawka. This increased the proposed length of motorway to around 3,200 km. At the same time, the proposed length of express road was reduced to around 2,600 km. Certain lengths of express road had been upgraded to motorways but others were omitted notably:

- Grudziadz to Suwalki (Route 16);
- Bialystock to Rzeszow (Route 19);
- Koszalin to Poznan (Route 11); and
- Szczecin to Gdynia (Route 6).

Subsequently, a slightly modified version of this revised network was recommended to the Council of Ministers. Modifications included the downgrading of the proposed Warsaw to Suwalki (to Kowno) motorway to express road and the reinstatement as a proposed express road of route 6 between Szczecin and Gdynia. This proposed Long Term Road Development Plan is shown in Fig 4.2.2. The proposed network includes an approximate total length of 6,000 km, comprising 2,500 km of motorways and 3,500 km of express road, compared with the 1985 network of 7,000 km.

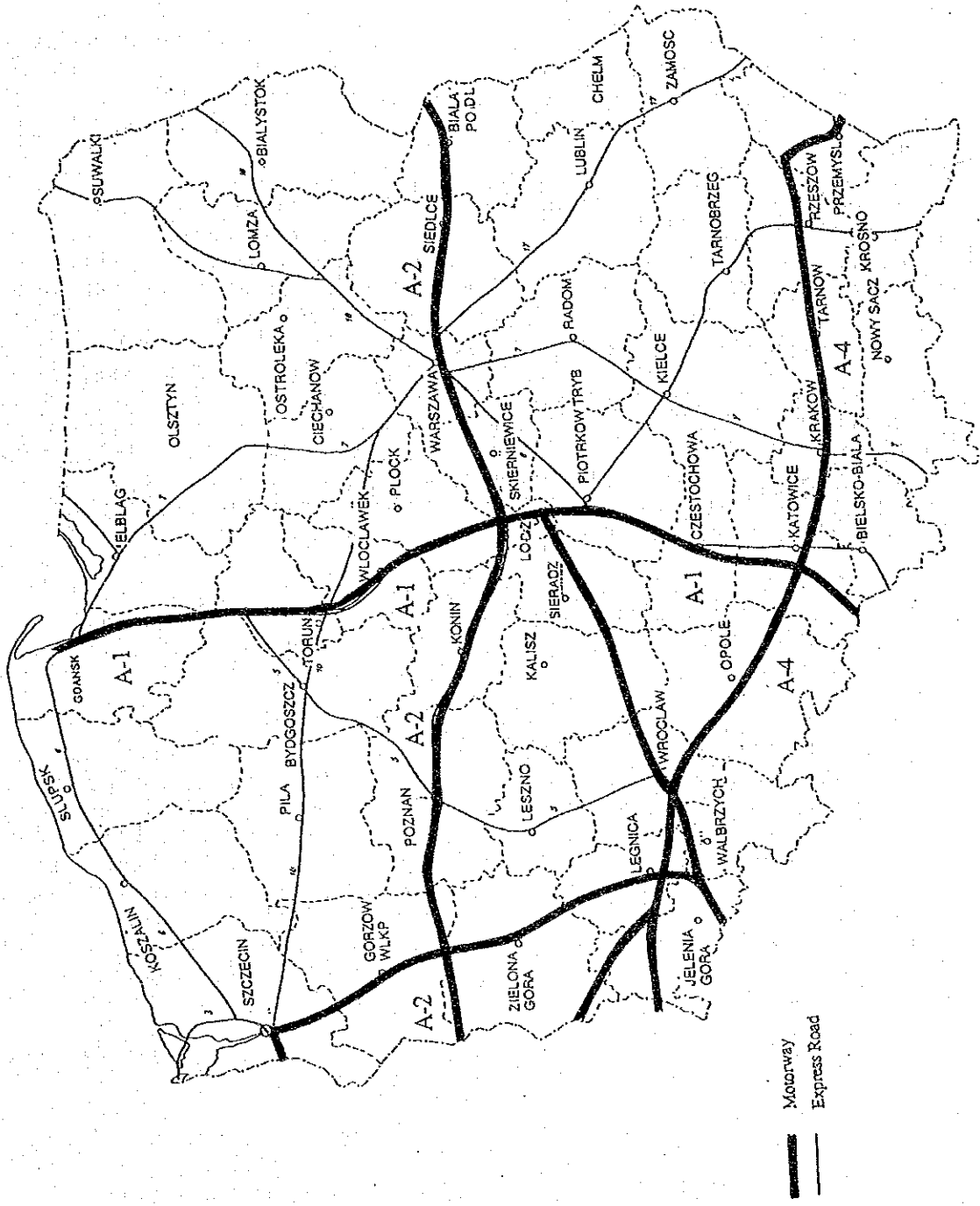


Fig. 4.2.2 Long Term Plan for Motorways and Express Roads (Toward 2015/2020)

4) European Transport System

The AGR agreement on European Main International Traffic Arteries was signed by the Government of Poland in Geneva in 1975. This agreement includes a network comprising major roads and maritime links stretching throughout Europe. The extent of that network in Poland and adjacent countries is shown in Fig. 4.2.3. The network is continuously being revised and within the last year route E371 Radom-Rzeszow-Barwinek within Poland has been added. It is noticeable from Fig.4.2.3 that the extent of the network to the east of Poland is particularly sparse. The latest discussion has been focusing on developing new additional links leading to the Baltic countries in the north east.

The Trans European North-South Motorway (TEM) Project involves ten nations and is supported financially by the United Nations development Program with technical and administrative co-ordination being provided by the United Nations Economic Commission for Europe. The route links the northern part of Europe with southern and south-eastern parts running through Poland, Czechoslovakia, Austria, Italy, Hungary, Rumania, Yugoslavia, Bulgaria, Greece, and Turkey. Work started in 1977, but due to the economic situation in certain of the countries, it is unlikely that the whole of the network will be operational before 2000. This network is shown in Fig.4.2.4. Ultimately, the network will comprise of dual carriageway motorway links with a design speed of 120 km/hr, although in the shorter term it will be made up of upgraded national roads linked to motorway sections. It is considered that the motorway will bring significant economic and social benefits to the region and its importance is likely to further increase when account is taken of:

- political and economic changes in Eastern Europe;
- increased road freight transport between Europe and the Middle East;
- the increased role of the private car in international tourism; and
- the improved access to Western Asia via the Bosphorus Bridge and to North Africa via maritime links.

The total length amounts to 10,970 km of which 764 km are in Poland. The Polish section comprises the proposed route of the A-1 motorway between Gdansk and the Czechoslovakian border at Lubawka together with the existing length of Route 1/Route 15 from Czestochowa via the eastern by-pass of Katowice to the Czechoslovakian border at Cieszyn. The existence of two closely parallel routes leading to two separate border crossings is at the request of the Czechoslovakian government who wish to serve both Czech and Slovak communities.

At the Steering Committee meeting held at Rome in September 1991, certain significant decisions were reached:

- (1) The TEM network was substantially extended. In Poland, proposed motorways of A-1, A-2, A-3, A-4 and A-8 are to be included in the network;
- (2) In the future, the Baltic countries and CIS will be invited to join the project; and
- (3) Albania has joined the committee and Germany attended as an observer.

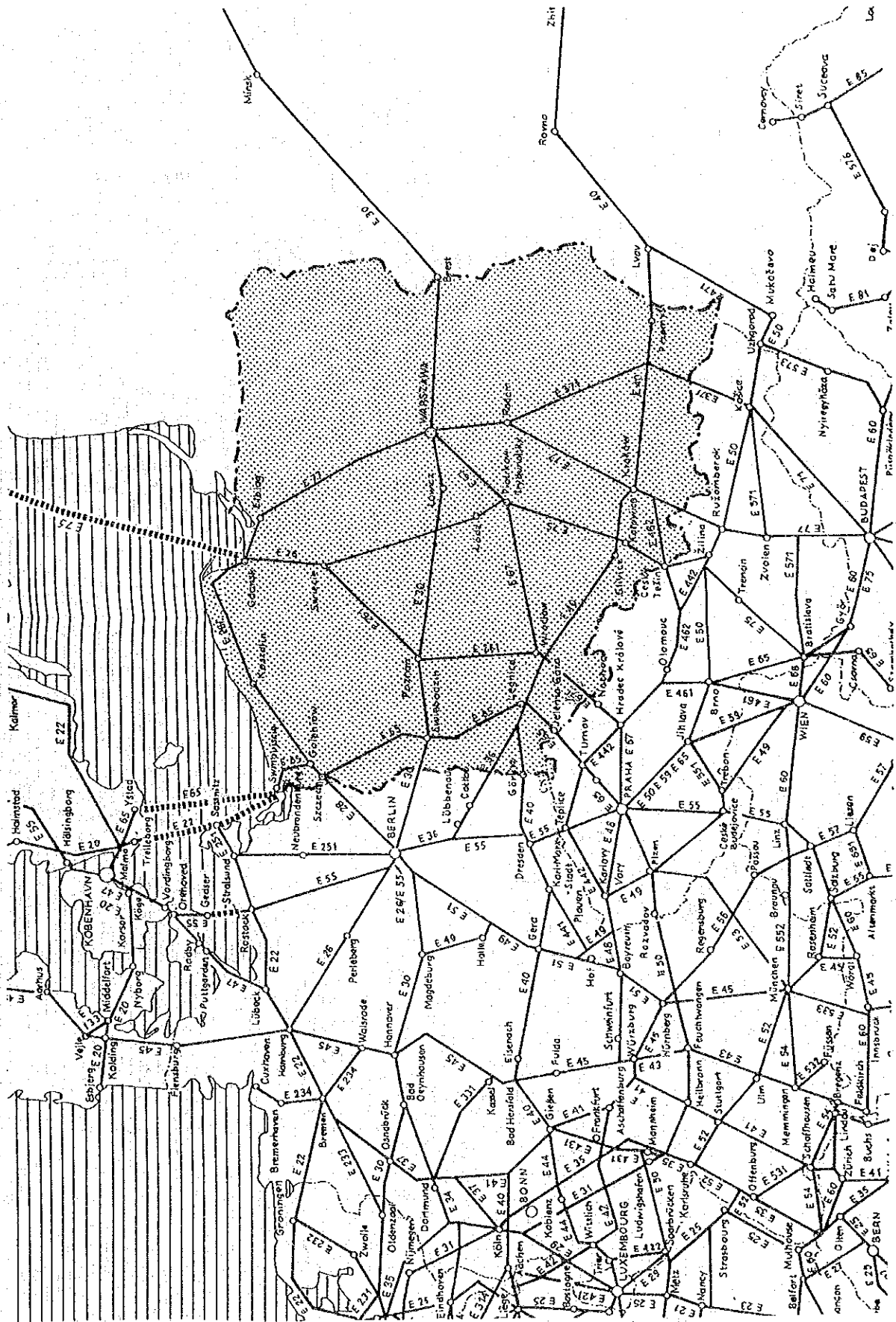
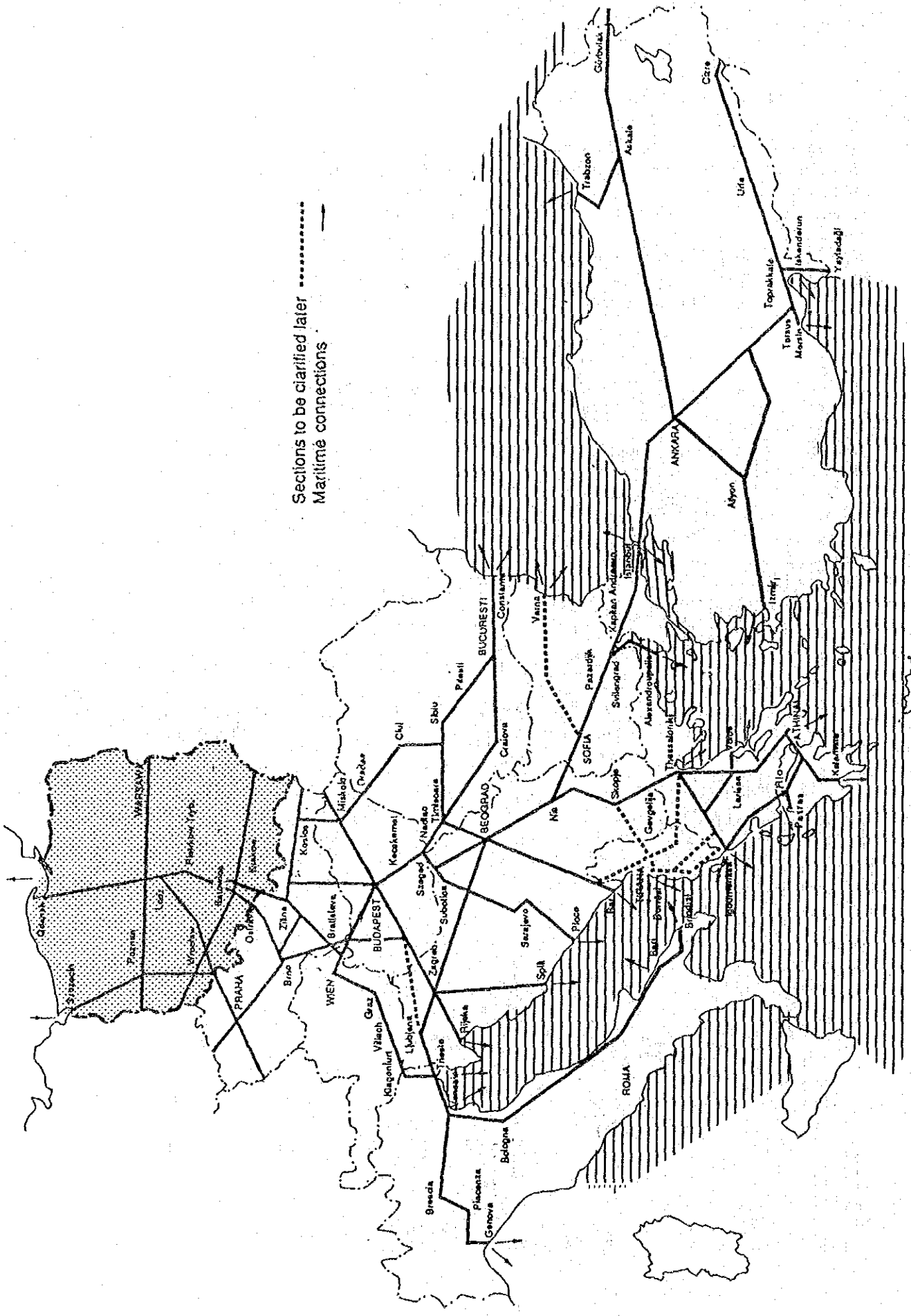


Fig. 4.2.3 International E Road Network



Sections to be clarified later
 Maritime connections

Fig. 4.2.4 TEM Network (1991)

The Project control Office of the TEM project is financed jointly by the United Nations and the individual national governments. Poland, together with Czechoslovakia, has yet to reach a decision on how to finance the construction of motorways, although the introduction of tolls is under serious consideration. Hungary and Romania have already decided to adopt a toll system and are financing construction with the help of the World Bank.

5) Budgetary Requirements for Road Development

The GDDP estimated the total budget required for road improvement and development at 13.4 - 21.2 billion zloty (January 1992 prices) for the next 20 - 25 years. The estimation includes: (1) improvement of bottlenecks such as narrow pavement and bridge width, congested intersections and missing links; (2) upgrading of pavement strength and width, and bridge modernization; and (3) new construction of motorways and reconstruction of urban roads.

A new road financing system needs to be developed to overcome the shortage of funds by way of:

- (1) establishment of special funds earmarked for roads;
- (2) introduction of motorway and bridge tolling;
- (3) encouragement of private participation in road development; and
- (4) external financial assistance.

4.2.5 Project Evaluation System

In the past, the progression of highway schemes has been influenced more by political than by technical reasoning. Due to the lack of intermodal planning and coordination each transport sector has developed independently. The lack of accurate economic principles has led to an uncoordinated approach to highway investment. No attempts to produce inter modal forecasts have been made. Nor does there appear to have been a serious attempt to investigate a range of traffic growth assumptions reflecting different socio-economic assumptions.

Furthermore, the costing contained inaccuracies resulting from previous costs are distorted by centrally controlled pricing and subsidies. Also with the rapidly changing economic situation in Poland, no accurate values of time and vehicle operating costs are available. The lack of any independent land valuation and compensation system in Poland means that no accurate assessment of land costs can be made. An economic assessment of costs and benefits should be undertaken to assess value for money before a scheme can be recommended for inclusion in the program.

4.2.6 Vehicles

1) Composition of Vehicles

Accurate figures which give the age composition of the vehicle stock are not available on a national basis. It is estimated that the average age of the vehicles using Polish roads is about 8 years, however, the distribution of ages is possibly different from many western European countries. In Poland, there are high proportions of comparatively new and very old vehicles. Coupled with the fact that the technological development of Polish vehicles is some years behind western vehicles, the presence of these old vehicles leads to problems, particularly in terms of air pollution.

At the present time, the following types of road vehicles are manufactured in Poland:

Cars:	FSO and FSM;
Trucks:	Jalcz, Nysa, Star, Tarpan and Zuk;
Buses:	Autosan, Jaloz and San;
Tractors:	Ursus.

The vast majority of vehicles on Polish roads is either manufactured in Poland or other CMEA countries. Although import of western vehicles has rapidly increased in recent years, western vehicles still form only a small proportion of the Polish fleet of vehicles. Import controls have been recently introduced to curb the rapid increase of import of old western vehicles, particularly from Germany. There are currently moves by western companies to buy a share of Polish motor manufactures, e.g. Fiat is acquiring an interest in FSM, Volvo are acquiring an interest in Jaloz and Fiat, Citroen, and General Motors are pursuing an interest in FSO. The influence of these companies will lead to assist the technological advancement of Polish vehicle manufacture.

Although international comparison is difficult, limited research would tend to suggest that Polish cars are about 10% less fuel efficient than comparable Western European models. Also, diesel engined Polish cars are very uncommon, there is just one model of FSO Polonez available, whereas diesel engines are the norm for trucks.

2) Vehicle Inspection

The safety and condition of vehicles is governed by regulations relating to the granting of road worthiness certificates. All new vehicles require such a certificate, thereafter they are examined periodically before the certificate is renewed. The following frequencies of inspection are laid down.

Buses (> 15 seats)	after 1 year, and subsequently every six months
Buses (< 15 seats)	- ditto -
Trucks (> 3.5 tonne GVW)	annually
Passenger Trucks (< 3.5 tonne)	- ditto -
Taxis, ambulances, fire engines	- ditto -
Imported or second hand vehicles	- ditto -
Self assembled vehicles	- ditto -
Other vehicles	after 3 years, subsequently after a further 2 years, then annually

The Local Authorities must authorize both the testing station and the personnel undertaking the tests and is empowered to withdraw that authorization if standards are not maintained. Aspects of road worthiness covered by the test include:

- breaking effectiveness;
- wheel alignment;
- steering play;
- alignment and intensity of lights;
- vehicle noise;
- carbon monoxide emissions from petrol engines;
- fume emissions from diesel engines; and
- engine rotation speeds.

There appears to be a problem in the quality of the testing equipment and undertaking of the testing. Consequently, vehicles are receiving road worthiness certificates without necessarily fulfilling the technical requirements. In addition to periodical testing, a vehicle can be referred for a technical examination at any time by Road Traffic Control Services. In general terms, this includes Police and teams under the Environmental Protection inspectors.

3) User Charges

(1) Driver Licensing

Drivers of all motor vehicles used on public roads require a driving license. Subject to having passed the necessary examination, driving licenses are issued for life but there is a requirement for the holder to demonstrate that he can meet certain medical criteria at regular intervals. The fee for driving licenses for all vehicle classes is currently 15,000 zł, and is fixed by the Ministry of Finance.

The minimum driving age and the examination fees, which are set by the Ministry of Transport and Maritime Economy vary dependent upon the vehicle type as shown in Table 4.2.6.

Table 4.2.6 Driving Age and Examination Fees

Vehicle Type	Minimum Age	Average Examination Fee (zł)
A. Motorcycles		
Engine Capacity =< 125cc	16	270,000
> 125cc	17	270,000
Cars and Goods Vehicles		
B. < 3.5 ton GVW	17	360,000
C. > 3.5 ton GVW	18	420,000
D. Buses	21	410,000
E. B/C/D + trailer over 750 kg	-	430,000
M. Slow Moving Machinery	17	300,000
T. Agricultural Tractors and Trailers	16	300,000

Source: MTME

(2) Vehicle Registration

All vehicles must be registered with the voivodship authority and there is a stamp duty payable for this registration as follows:

- a) Initial registration of vehicles, agricultural tractors, trailers or motorcycles 16,000 zloty
- b) Permanent registration or re-registration of vehicles, agricultural tractors, trailers or motorcycles 21,000 zloty

- c) Temporary registration:
 - (a) if vehicle is to be permanently exported 21,000 zloty
 - (b) Other cases:
 - up to 7 days 21,000 zloty
 - over 7 days 44,000 zloty

(3) Road Traffic Related Taxes

Vehicle tax applies to all road motor vehicles, yachts, ferries and motor boats. The liability for this tax lies with the owner of the vehicle, the only general exemptions being foreign diplomats and certain disabled persons. The tax is paid to the local commune council and is paid annually in two installments on February 15th and September 15th. The maximum annual tax rates for the particular vehicle type are as shown in Table 4.2.7.

Table 4.2.7 Road Traffic Related Taxes

Vehicle Type	Annual Taxes
a) Motorcycles	
(a) up to 50 cc	60,000 zloty
(b) 50 - 350 cc	102,000
(c) over 350 cc	492,000
b) Passenger Cars	
(a) up to 900 cc	150,000
(b) 900 - 1,300 cc	276,000
(c) 1,300 - 1,500 cc	348,000
(d) 1,500 - 1,600 cc	540,000
(e) 1,600 - 1,800 cc	852,000
(f) 1,800 - 2,000 cc	1,440,000
(g) 2,000 - 2,500 cc	
(except "Warsaw")	2,220,000
"Warsaw"	348,000
(h) over 2,500 cc	3,000,000
c) Passenger Cars	
(a) without engine	702,000
(b) electric powered	150,000
d) Buses (including driver)	
(a) up to 15 seats	540,000
(b) 15 - 30 seats	996,000
(c) over 30 seats	2,220,000
e) Trucks (gross weight)	
(a) up to 2 tons	348,000
(b) over 2 tons	540,000
f) Trucks-Trailers (loading capacity or pressure on fifth wheel coupling)	
(a) up to 0.5 ton	348,000
(b) 0.5 - 1 ton	540,000
(c) 1 - 2 tons	648,000
(d) 2 - 4 tons	798,000
(e) 4 - 6 tons	1,098,000
(f) 6 - 8 tons	1,302,000

Source: MTME

The cost of vehicle fuel is still comparatively low in Poland compared with Western European countries. Typical fuel prices of the most popular grades are given below together with the rate of taxation. Unleaded petroleum is still fairly uncommon in Poland although it should increase as the number of western vehicles in the country increases.

	<u>Price/Liter</u>	<u>Tax</u>
Gasoline	6,600	57%
Diesel	4,700	40%

Customs duty is payable on vehicles imported into Poland. Rates for this duty were set as recently as June 1991 and can be generally summarized as follows:

Vehicles up to 4 years old:	20% of purchase price subject to a minimum duty equivalent to 800 US Dollars
Vehicles over 4 years old:	40% of purchase price subject to a minimum duty equivalent to 1,300 US Dollars

At the same time a ban was imposed on the import of some vehicles, including certain categories over 10 years old. In addition to import duty, a turnover tax is also paid on imported vehicles. The tax depends on the purchase price as follows:

up to 1600 cc:	20% of purchase price
1600-2000 cc:	25% of purchase price
over 2000 cc:	30% of purchase price

Turnover tax is also charged at 2% of the purchase price on used vehicle transactions within Poland.

Fees are also collected from foreign registered trucks and buses for every trip made through Poland. These fees are collected by either the International Federation of Road Carriers or at the border customs office. After deduction of administrative fees, the revenue used to go to GDDP, but from 1st July 1991 this is received by the Treasury. The fees are quoted in US Dollars but are payable in zlotys according to the exchange rate at the Polish National Bank on the day the fee is calculated. Current fees are given below:

<u>Vehicle Type</u>	<u>Fee in US Dollars</u>
Buses - Seating Capacity	
up to 15	4.5
15 to 30	9.0
31 to 50	15.3
over 50	17.8
Trucks - Load Capacity (inc. trailers)	
up to 10 ton	60.8
10 to 15 ton	91.0
15 to 20 ton	116.5
20 to 25 ton	177.0
over 25 ton	227.8

However, if the vehicle in any way exceeds the maximum dimensions or weights laid down for Polish vehicles then additional fees are payable.

4.2.7 Road Administration

National roads are administered by GDDP under MTME. Voivodship roads are administered by voivodship which is under the jurisdiction of the Council of Ministers. Communes are responsible for commune/local roads including industrial roads (Fig. 4.2.5).

The GDDP has eight departments in the head office as well as seventeen regional offices, 171 district offices and 652 site offices to fully cover all aspects of road administration (Fig. 4.2.6). However, national roads in urban areas are basically administered by the presidential towns (capital cities of 49 voivodships) with some exceptions like urban bypasses.

Contrary to the GDDP, the majority of voivodships (46 voivodships) has insufficient staff for road administration although they are responsible for it. Under the circumstances, GDDP takes a large part of the administration of voivodship roads which are under the authorization of voivodships. Warsaw, Lodz and Krakow are exceptions which fully administer their roads by their own. Communes (2,200 in total) are totally incapable of administering their roads due to lack of staff. Road administration of commune roads is entirely entrusted to Communal Construction and Engineering Enterprises.

The GDDP fulfills the role of national highway authority within the state administration. More specifically, the works undertaken by the GDDP are the programming/development of the road network, establishment of technical standards/guidance, supervision of general technical practices, budget distribution, international cooperation and data collection. The GDDP is responsible mainly for inter-city road networks under the jurisdiction of national and voivodship governments. For ensuring better linkage between inter-city and urban/local roads, there is a need for close cooperation between voivodship and commune authorities.

GDDP's organizational structure is broken down into five main departments related to road administration:

- (1) Department of Planning and Analysis, responsible for traffic surveys, road network planning, establishment of design standards and supervision of the Office for Planning of Road Network Development (BPRSD) which undertakes nationwide network planning, feasibility studies on major highways and development of standards for road design and construction;
- (2) Department of Supervision, responsible for procurement of materials and mechanization, and preparation and supervision of construction works;
- (3) Department of Bridges, responsible for all the matters related to bridges including planning, improvement and construction, and maintenance;

CURRENT ORGANIZATION
CHART OF PUBLIC ROAD ADMINISTRATION

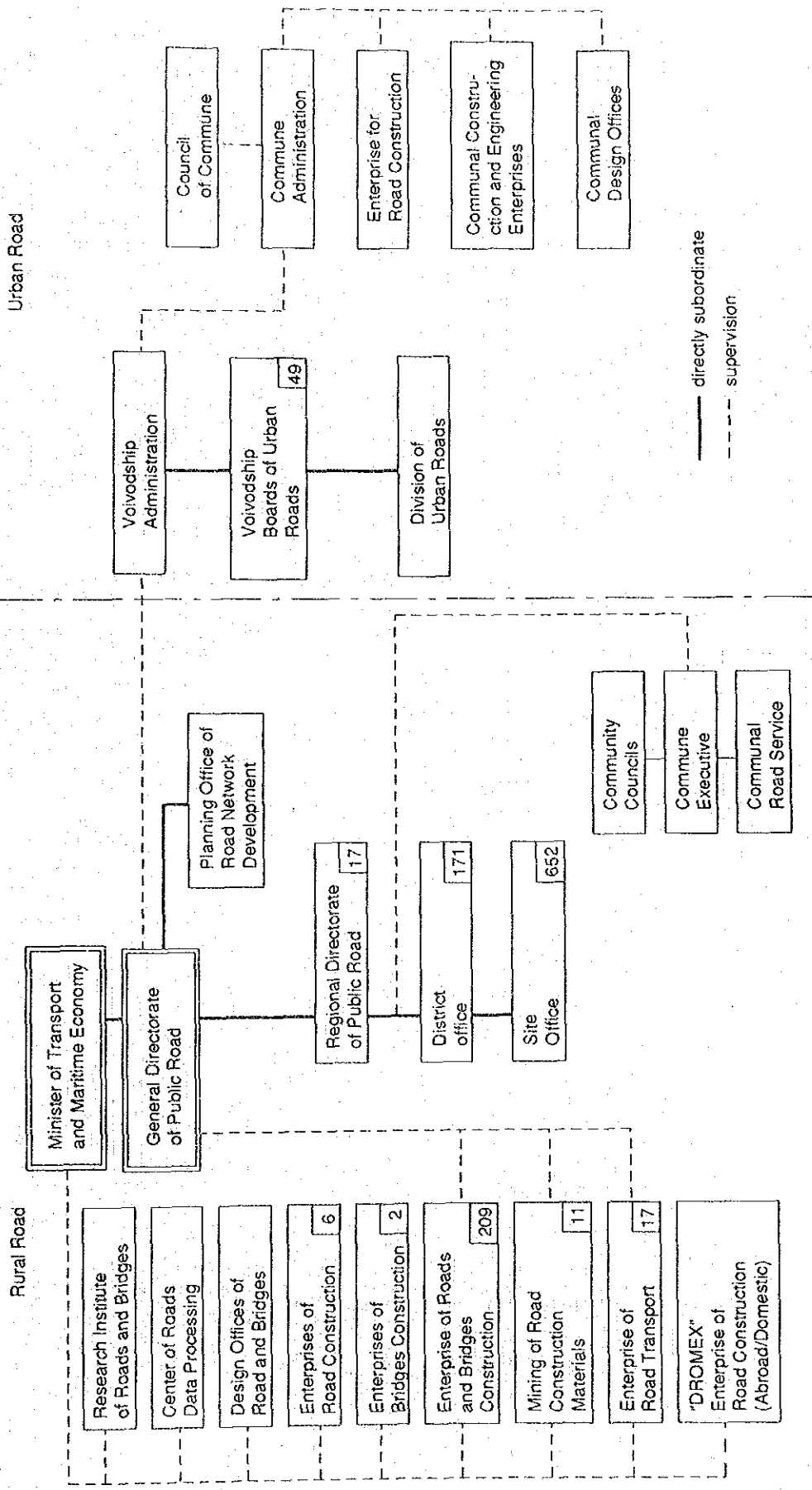


Fig. 4.2.5 Current Organization of Public Road Administration (June, 1992)

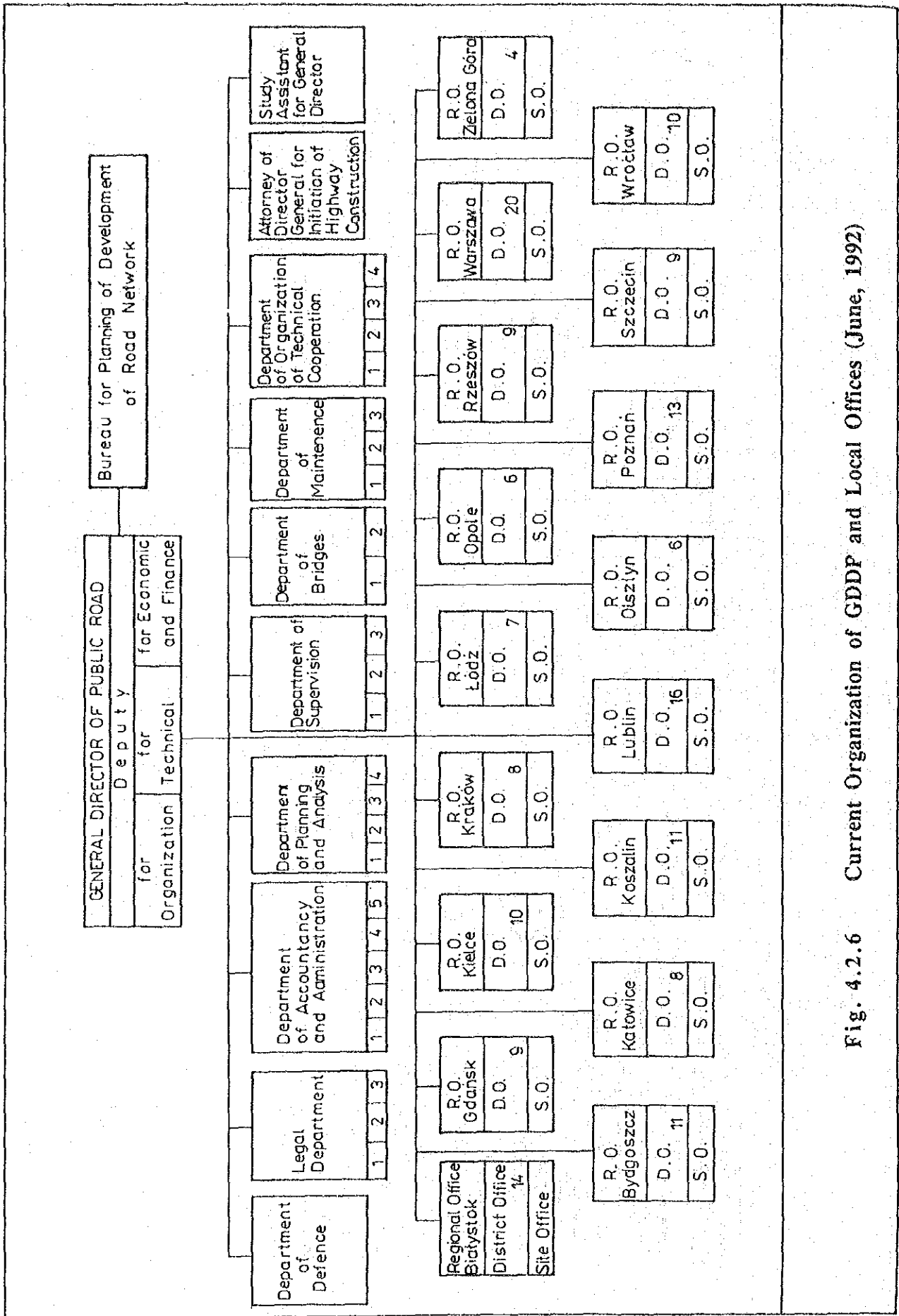


Fig. 4.2.6 Current Organization of GDDP and Local Offices (June, 1992)

- (4) Department of Maintenance, responsible for maintenance planning, development of a pavement management system and inspection, implementation of maintenance, and financial control; and
- (5) Department of Organization of Technical Cooperation, responsible for international cooperation with multilateral and bilateral institutions.

The GDDP is restructuring its organization. The state enterprises for research, design and construction were separated from the GDDP, and now some of the divisions including road and bridge construction, material exploitation and mining of road construction materials are going to be separated. All of these are expected to work as consultants, contractors and suppliers.

Organizational reform of a GDDP headquarter, regional offices, district offices and site offices are underway to comply with the changing requirements for a market economy. The GDDP will retain basic government functions including general administration, international affairs, road safety and environmental protection while contracting to the private sector will be introduced, for example for design, maintenance and construction works. The existing departments need to be combined or abolished depending on the major roles that the GDDP is expected to play.

Road administration is being restructured with a view to reducing the role of the state and encouraging the development of private enterprises. In the process of current reform, care must be taken not to devolve too much authority from the state. Road infrastructure should be viewed as a national asset and the state must retain control over its maintenance and development. In addition, the state must continue to be responsible for setting standards, planning of the nationwide road network, directing research and development, and collection and management of traffic data. The former relationship between the state and the enterprises should be reformed. This should then be followed by the introduction of competitive tendering and the establishment of consultants and contractors. This type of system will contribute to improve the efficiency of road administration as well as to improve competitiveness of Polish consultants and contractors.

4.2.8 Road Transport Industry

1) Restructuring of the Road Transport Sector

Restructuring of the road transport sector was initiated at the turn of 1989/1990 to move from state owned enterprises to private ones. The move was enforced by the Act of December 23, 1989 for economic activities, the Act of March 8, 1990 for territorial self-management and the Act of July 13, 1990 for privatization of state enterprises. The transformations of road cargo transport were dominated by the development of widely operating private carriers. The transformations of road passenger transport were, on the other hand, characterized by the breakdown of large, highly centralized organizations into regional entities.

It can be said that the road transport sector has been under a chaotic situation which might have been caused by the sudden introduction of deregulation without proper mechanisms to monitor and guide the market as well as the sharp decline of transport demand.

2) Road Cargo Transport

Fig. 4.2.7 shows the classification of road cargo transport. Profit oriented transport (61%) covers truckers for hire while non-profit oriented transport (39%) means those for own account. Small truckers employing less than six employees dominate the market in terms of the number of entities.

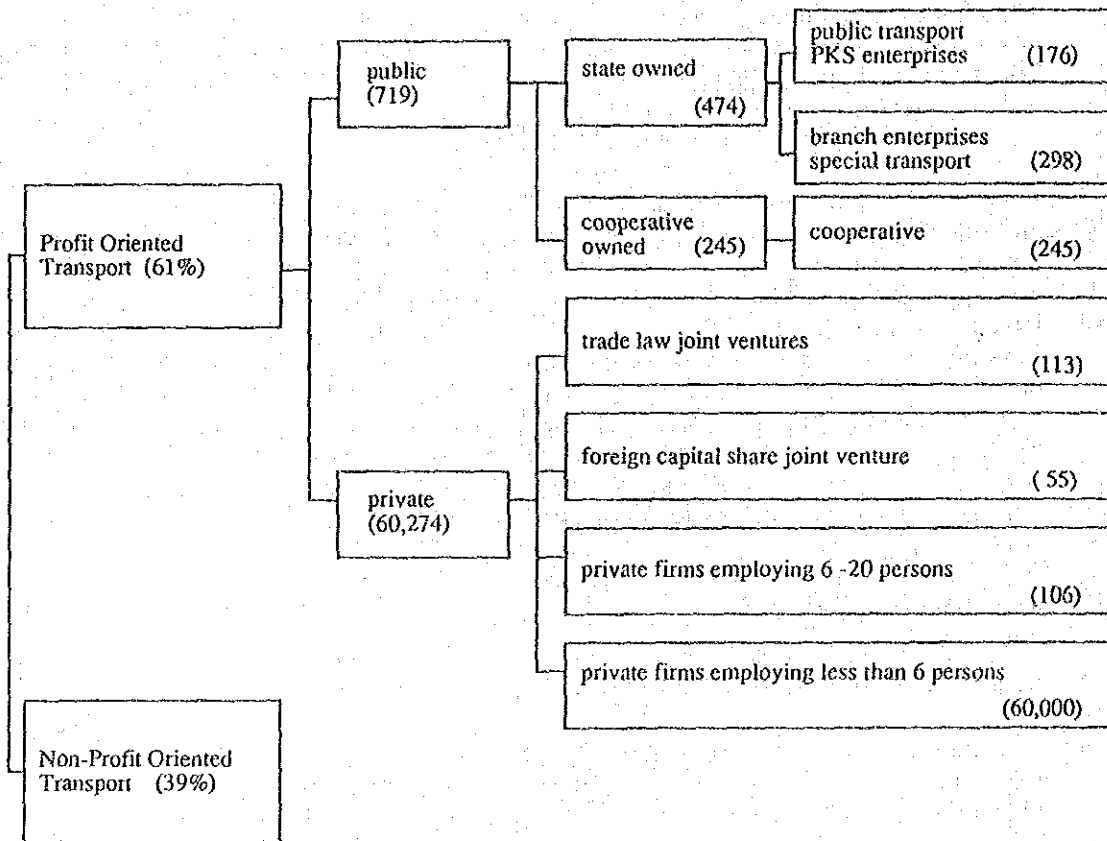


Fig. 4.2.7 Classification of Truckers as of December 31, 1991

Table 4.2.8 shows the changing road cargo transport market from 1990 to 1991. As a total of road cargo transport, there seems to be no particular change during the period in terms of number of trucks, loading capacity, cargo carriage and loading factor. However, there is a conspicuous change of relationship among public, private and own account transport: a sharp decline in public transport, a less significant decline in own account transport, and a rapid increase in private transport. The percentage share of cargo carriage by private transport increased by about 15%, absorbing about 10% from own account transport and 5% from public transport. The calculated loading factors indicate that PKS suffers the lowest factor of 25% while private transport achieved the highest factor of about 70%.

The market share of PKS has been declining from 1.8% in 1990 to 1.1% in terms of number of trucks, from 7.2% to 4.4% in terms of loading capacity and from 2.9% to 1.7% in terms of cargo carriage. This decline was caused by the PKSs' incompetence to compete with private transport in a free market condition mainly due to their heavy cost structures and lack of marketing activities. A number of PKSs are facing bankruptcy.

The road cargo transport market has entirely been liberalized. Competition among truckers will be further intensified in the future, resulting in a screening of truckers to survive or to perish. This will be one of the painful processes for rationalization and modernization of road cargo transport. It allows only the carriers that offer quality services at reasonable cost to stay in the market. Currently, most of the private transport is dominated by household based small owners of 1 to 5 trucks. Measures to improve their business efficiency are also needed.

Table 4.2.9 shows the international road cargo transport during the period 1990 - 1991. It increased by 63% for total, 111% for incoming, 50% for outgoing and 26% for transit transport. International concessions were awarded to 15,000 trucks of which standards are similar to those used in Germany.

Table 4.2.8 Changing Road Cargo Transport, 1990-1991

	1990	(%)	1991	(%)	1991/1990
Number of Trucks:	927,967	(100.0)	926,252	(100.0)	100
Public Transport	64,477	(6.9)	44,602	(4.8)	69
Public PKS	17,075	(1.8)	10,571	(1.1)	62
Specialized	28,260	(3.0)	23,460	(2.5)	83
Cooperative	19,142	(2.1)	11,785	(1.3)	62
Private Transport	538,000	(58.0)	578,500	(62.5)	108
Own Account	325,490	(35.1)	303,150	(32.7)	93
Loading Capacity (ton):	2,272,027	(100.0)	2,161,126	(100.0)	95
Public Transport	521,376	(22.9)	372,082	(17.2)	71
Public PKS	163,026	(7.2)	95,392	(4.4)	59
Specialized	247,038	(10.9)	204,102	(9.4)	83
Cooperative	111,312	(4.9)	72,588	(3.4)	65
Private Transport	627,240	(27.6)	949,200	(43.9)	151
Own Account	1,123,411	(49.4)	839,844	(38.9)	75
Cargo Carriage (ton):	1,399,077	(100.0)	1,395,982	(100.0)	100
Public Transport	250,721	(17.9)	190,210	(13.6)	76
Public PKS	40,837	(2.9)	24,134	(1.7)	59
Specialized	167,784	(12.0)	138,662	(9.9)	83
Cooperative	42,100	(3.0)	27,454	(2.0)	65
Private Transport	453,426	(32.4)	658,310	(47.2)	145
Own Account	694,930	(49.7)	547,462	(39.2)	79
Loading Factor (%):	61.6		64.6		
Public Transport	48.1		51.1		
Public PKS	25.0		25.3		
Specialized	67.9		67.9		
Cooperative	37.8		37.8		
Private Transport	72.3		69.4		
Own Account	61.9		65.2		

Source: MTME

Table 4.2.9 International Road Cargo Transport by Polish Carriers (1990-1991)

	unit: 1,000 tons				
	1990	(%)	1991	(%)	1991/1990
Outgoing	1,182.0	(67.6)	1,773.8	(62.4)	150%
Incoming	417.8	(23.9)	882.2	(31.0)	211
Transit	149.2	(8.5)	188.0	(6.6)	126
Total	1,749.0	(100.0)	2,844.0	(100.0)	163

Source: MTME

3) Road Passenger Transport

A process of deregulation has been undertaken since 1990 leading to decentralization of the state monopoly into a small enterprise system. The number of road passenger companies reportedly grew to 147 companies in 1991 including 25 companies exclusively engaged in passenger transport.

Almost all the road passenger companies are in deficit. Of the 147 companies, 124 companies (84%) had losses amounting to 125,556 million zloty while 23 companies (16%) had profits of 16,323 million zloty. Passenger transport is reportedly unprofitable due to the nature of public services of operating on a time schedule on a fixed route at officially announced fares. This is exacerbated by cream skimming activities of private carriers who abruptly introduce unscheduled bus services a few minutes earlier than the scheduled PKS buses at slightly lower fares.

Deregulation was introduced to enhance the efficiency of passenger transport through encouraging competition. However, the eighteen months experience indicates that this has not happened as yet. Regional PKSs have been receiving subsidies from local governments in compensation for the losses incurred by passenger services. Private participation has been minimal with the exception of unfair cream skimming activities. There has been no legislation and supervision to prevent such activities.

The Government already makes free participation to the passenger market, and maintains a fixed tariff system with considerable amount of subsidy. Bus operators, especially PKS, are in severe competition with private operators. PKS are subject, with similar problems, to trucking companies, such as on assets, bus fleets, workers, management, organization, costing, service, information, etc.

4) Legal Institution Regulating Operators

Various ministries are responsible for laws governing road transport operators. MTME is a central agency responsible for traffic regulation and transport laws, the Ministry of Finance is responsible for laws on taxation, whereas various other agencies are responsible for laws relating to commercial activities, state enterprises, etc.

The Government has regulated the following acts pertaining to road transport operators:

- (1) free participation to passenger/cargo transport markets, but registration is needed at voivodships and MTME.
- (2) no tariff control on cargo transport, but passenger tariffs are regulated by the central government (for intercity service) and by voivodships (for urban service) with time tables.
- (3) subsidy on passenger transport (43.5% of revenue) is provided by the government and voivodships.
- (4) international cargo is regulated by agreements on IRU (Union of International Carrier) and TIR (International Goods Transportation), but trucks need to clear the environmental law (air, noise etc) of west European countries.
- (5) other controls include the inspection of drivers' working hours and vehicle to be made by inspectors of work and security of work operated under the parliament.

According to the financial balance of PKS enterprises over the period of January to May 1991, more than half of the PKS companies were in deficit. Some guidance should be given by MTME to road transport operators, who are struggling under the chaotic transitional circumstances toward privatization.

4.2.9 Integration with the European Community

1) Road Infrastructure

Polish road standards are similar to those adopted in the EC countries at least in terms of national roads. There seems to be no particular problems for integration with the EC. The only issue would be to coordinate the maximum axle load from the existing 10.0 tons to the proposed 11.5 tons in the future when new highways are constructed and large improvement works are done on the existing roads.

However, quality improvement of the present network is indispensable with the assistance of international community particularly for the internationally important roads. East-West links including the A2 and A4 motorways and North-South link including A1 motorways are especially important for the Polish integration with the international market.

The present road financing system needs to be reviewed from a view point of the EC basic policy which envisages equalization of road user charges and encouragement of private participation in road infrastructure development. The existing road financing system which cannot identify the road user burdens needs to be rectified, and the level of charges needs to be gradually harmonized with those adopted in the EC countries. The existing legal institutions also need to be reviewed to encourage private participation.

One of the EC basic policies addresses the importance of environmental protection and traffic safety with an increasing importance on railways and inland waterways, partly due to the reconsideration of over emphasis on roads in the past. In the case of Poland, however, a focus has been placed on railways with less importance on roads. Modernization of the international highway network in Poland should be expedited with due attention to environmental protection and traffic safety.

2) Road Cargo Transport

The market share of truck transport in the twelve EC countries has been quite high (82.7% for domestic and 58.6% for international market in 1989) and has shown a steadily growing trend (6.1% for domestic and 10.5% for the international market) as shown in Tables 4.2.10 and 4.2.11. Improvement of truck transport seems to be very important for Polish internationalization.

A large part of truckers in the EC countries are small size owner operators as shown in Table 4.2.12. Most of them work under contracts with large scale forwarders who have an international and regionwide transport service network. The Polish truck operators need to modernize and establish a collaboration framework among them to supplement the lack of such large scale forwarders in Poland.

This is especially important for the future Polish integration into the EC transport system which is going to be reformed for liberalization of road cargo transport coupled with harmonization of the taxation system, vehicle standards and drivers working conditions.

Table 4.2.10 Market Share of Cargo Transport in Twelve EC Countries by Mode in 1989

Unit: billion ton-kms

	Domestic		International		Total	
		(%)		(%)		(%)
Roads	641.1	(82.7)	156.7	(58.6)	797.8	(76.5)
Railways	108.4	(14.0)	41.3	(15.4)	149.7	(14.4)
Inland Waters	25.7	(3.3)	69.6	(26.0)	95.3	(9.1)
Total	775.2	(100.0)	267.6	(100.0)	1,042.8	(100.0)

Source: EC, Verkehrsmarkt Europe

Table 4.2.11 Growth Rates of Truck Transport in the Twelve EC Countries for 1986-1989

Unit: billion ton-kms

	Domestic		International		Total	
		(%)		(%)		(%)
1986	537.5	(82.2)	116.2	(17.8)	653.7	(100.0)
1987	569.9	(81.5)	129.5	(18.5)	699.4	(100.0)
1988	615.2	(81.0)	143.9	(19.0)	759.1	(100.0)
1989	641.1	(80.4)	156.7	(19.6)	797.8	(100.0)
Growth (%)	6.1		10.5		6.9	

Source: EC, Verkehrsmarkt Europe

Table 4.2.12 Truck Operators in the EC Countries

unit: numbers

	Operators	Emp/Operator
West Germany	44,600	4.3
France	34,500	7.7
United Kingdom	38,400	6.8
Italy	238,000	1.2
Spain	165,000	1.3
Greece	43,000	

Source: Ministère de l'Équipement, de Logement, des Transports de l'Espace

4.3 Water Transport

4.3.1 Sea Transport Network

The commercial port system in Poland consists of the Port of Gdansk, the Port of Gdynia, and the Port of Szczecin-Swinoujscie. The location of the Polish ports is shown in Fig. 4.3.1. All Polish ports are sheltered by peninsula which gives the Polish ports mild wave conditions. There is practically no tide and there are no earthquakes. Its sandy soil is suitable for construction of port infrastructure and facilities. Although Baltic ports suffer from icing problems, Polish ports can provide year-round operation without substantial icing problems.

The ports of Gdansk and Gdynia are located on Gdansk Bay and are only 32 kilometers apart. The port of Gdansk, located at the mouth of the Wisla River, was developed in the medieval time and had enjoyed a prosperous history as a leading Hanseatic port. The port of Gdynia, in contrast, was excavated during the period between the first and the second World Wars.

The port of Szczecin-Swinoujscie is located at the mouth of the Odra River and is very close to the German border. The port of Szczecin has a development history similar to that of the port of Gdansk. The port of Swinoujscie was developed in the mid-eighteenth century as an outer port for Szczecin.

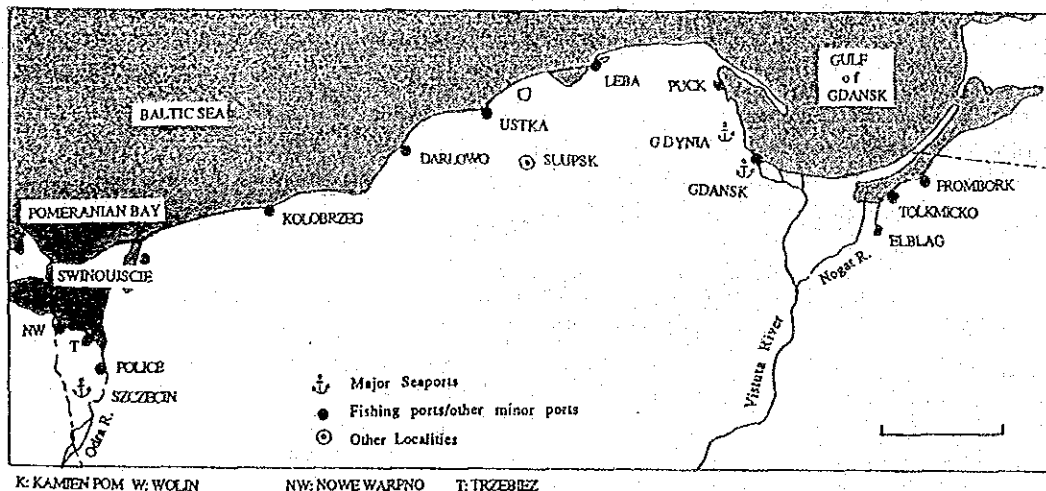


Fig. 4.3.1 Location of Polish Seaports

Polish ports are currently ranked at Class-IV (cargo handling volume of 10-25 million tons) in European ports as shown in Fig. 4.3.2. In the past, Polish ports have been busy serving the extensive international ocean routes. Due to their locational disadvantage, many of these international ocean routes were abandoned, relying much on such West European ports as Rotterdam and Hamburg. In the context of the Baltic Sea, however, Polish ports still predominate over other ports. The Polish ports handled one-third of Poland's total foreign trade, and about 6 million tons of transit cargo to and from Czechoslovakia, the former Soviet Union and other countries.

4.3.2 Sea Transport Demand

1) Cargo Transport

Table 4.3.1 shows the trade structure of Poland. In 1989, sea transport carried about one-third of the total volume of foreign trade, accounting for one-fourth of all imports and two-fifths of exports. In import, more than 90% of grain was imported by sea mainly from the U.S. By contrast, little more than 20% of ore was carried by sea, primarily from Brazil. The remainder was imported by land. About 90% of oil was imported by pipeline from the former USSR. A marginal 10% was carried by sea. Less than 60% of fertilizer was imported by sea from the Mediterranean countries, Indonesia, and the U.S. Of exports, half of all coal was exported by sea, mainly to the Baltic countries and to Western Europe. Around 60% of sulphur exported to Brazil, Great Britain, France, and Finland was carried by sea.

The table shows that the contribution of the seaports to Poland's international trade has remained limited. This is mainly because Poland is situated in Central Europe which is conducive to land transport to the rest of the Continent and to the former Soviet Union. Import and export routes of Poland could have two alternatives of maritime and land transport, selection of the alternatives being dependent on the quality of services in terms of cost, time and reliability.

Table 4.3.1 Total Turnover of Foreign Trade by All Modes and by Sea in 1989

Commodity	unit: 1,000 tons, (%)					
	Total		Import		Export	
	all	sea	all	sea	all	sea
Total*	129,126	40,095	81,625	14,513	67,301	25,582
		(31.0)		(23.5)		(38.0)
Coal & Coke	32,965	15,307	950	-	32,016	15,307
		(46.4)				(47.8)
Ore*	18,066	4,202	17,927	4,091	130	111
		(23.3)		(22.8)		(76.9)
Grain	4,926	4,627	4,138	3,869	788	758
		(93.9)		(93.5)		(96.2)
Oil	19,488	2,662	18,253	2,063	1,235	599
		(13.7)		(11.3)		(48.5)
Fertilizer*	6,120	3,573	5,814	3,365	306	208
		(58.4)		(57.9)		(68.0)
Sulphur	3,636	2,077	-	-	3,636	2,077
		(57.1)				(57.1)

Source: Maritime Economy, Statistical Year Book of 1990:
Maritime Institute

Note: * data in 1988

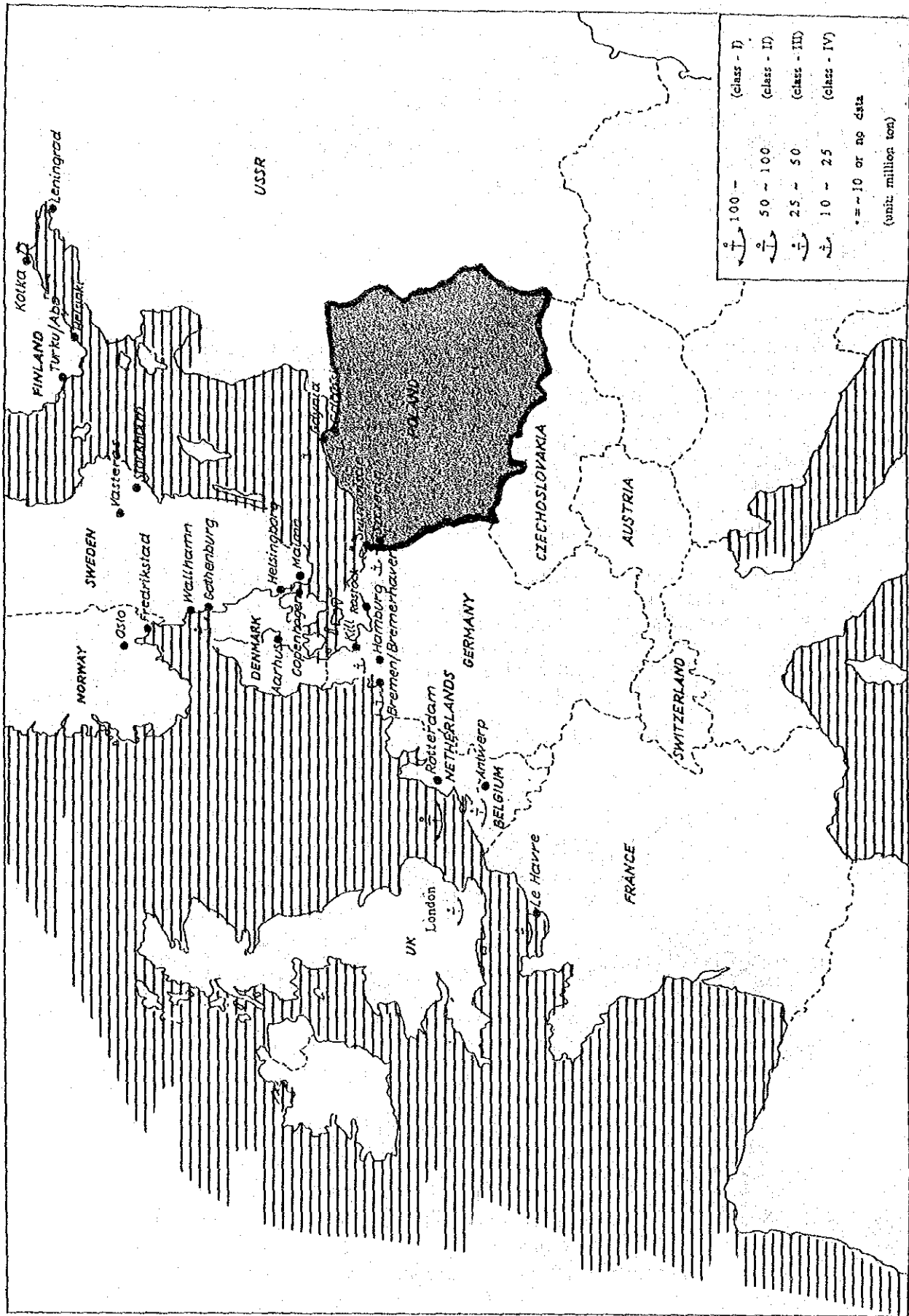


Fig. 4.3.2 Major European Ports by Cargo Volume

However, Polish ports have a huge hinterland in the land-locked countries of Czechoslovakia and Hungary. The same is true of northeastern Germany and the western CIS. Moreover, the international trade pattern of the East European countries will be dramatically changed by their economic restructuring toward a market economy. For example, the former Soviet Union has already linked its oil prices to the international market and decided to settle the account with hard currency. In connection with this, Poland is likely to diversify its oil suppliers other than the former USSR.

The changing situation of surrounding countries will greatly affect the port development program in Poland. For example, while the oil terminal at the port of Gdansk, North Port, had a capacity of 8.5 million tons a year, expansion of the existing terminal has already been initiated. This enables Poland to broaden oil suppliers through sea transportation.

2) Passenger Transport

Table 4.3.2 shows passenger traffic in commercial sea ports. Passenger traffic has sharply increased since 1989 mainly due to the simplified passport procedures at border crossings. This trend is likely to continue for the future because Polish ports provide the best access between to Eastern and Central Europe from Scandinavian countries and vice versa. More than 90% of the total maritime passenger traffic passed through the port of Szczecin-Swinoujscie. Although the ports of Gdansk and Gdynia shared 40% of the total passenger traffic in 1980, their share dropped to 10% in recent years. Sea passenger traffic is expected to gradually increase to and from the Baltic countries. The possibility of introducing a ferry service to these countries needs to be studied.

Table 4.3.2 Passenger Traffic in Commercial Sea Ports

	unit: 1,000 persons				
	1980	1986	1989	1990	1991
Arrivals:					
Total	151.9	146.0	274.5	248.0	270.2
Gdansk	54.1	21.4	19.6	21.9	
Gdynia	6.0	3.0	1.7	4.0	
Szczecin	91.8	121.6	253.2	222.1	
Departures:					
Total	150.2	138.9	274.8	236.7	255.5
Gdansk	54.1	20.8	18.3	20.5	
Gdynia	4.2	2.3	1.7	2.1	
Szczecin	91.9	115.7	254.8	214.1	

Source: Maritime Economy, Statistical Year Book, Maritime Institute

4.3.3 Sea Ports

1) Port Infrastructure

Table 4.3.3 shows the quay length in Gdansk, Gdynia and Szczecin-Swinoujscie ports. Gdynia port has the highest utilization rate of quays of 96%, followed by Szczecin-Swinoujscie port of 88% and Gdansk port of 75%. To cope with the changing demand as well as intensifying competition with land transport, a detailed

study is needed for redevelopment or rehabilitation of these quays to make them suitable for modern and efficient cargo handling practices adopted in the western countries.

Table 4.3.3 Quays owned by Each Port Authority in 1991

	unit: meter, (%)			
	total		deep quays*	
	total	in use	total	in use
Gdansk	16,780 (100)	12,572 (75)	2,384 (14)	2,384 (14)
Gdynia	10,519 (100)	10,096 (96)	8,411 (80)	8,411 (80)
Szczecin- Swinoujscie	17,061 (100)	15,092 (88)	1,214 (7)	1,214 (7)

Note: * quay deeper than 9.6 meters

Source: Maritime Economy, Statistical Year Book, Maritime Institute

Table 4.3.4 shows the rate of container handling at each port. The rate of container usage is 1.4% at the port of Gdansk, 28.1% at the port of Gdynia and 4.1% at the port of Szczecin-Swinoujscie. The volume of container cargo and the number of containers have gradually been increasing. However, judging from the experiences of the western countries, the rate of container usage in Poland remains extremely low as shown in Table 4.3.5.

Table 4.3.4 General Cargo in Containers

		1985	1986	1989	1990	1991
Total	number	73,326	72,080	127,612	-	-
	1000 tons	831	795	1,157	1,199	1,120
	(%)	(100)	(96)	(140)	(144)	(135)
Gdansk	number	1,050	1,737	3,382	-	-
	1000 tons	16	20	30	30	15
	(%)	(100)	(188)	(188)	(94)	-
Gdynia	number	59,875	56,685	108,280	-	-
	1000 tons	719	659	1,009	1,027	999
	(%)	(100)	(92)	(141)	(143)	(139)
Szczecin	number	12,401	13,658	15,950	-	-
	1000 tons	96	116	128	142	106
	(%)	(100)	(121)	(133)	(153)	(110)

Source: Maritime Economy, Statistical Year Book: Maritime Institute

Table 4.3.5 Comparison of Number of Containers per 1,000 Population

	Containers (1000 TEU)	Population (1000 Pop)	No. of TEU (per 1000 Pop)
Poland	148	37,850	3.9
Japan	6,879	123,120	55.9
USA	13,543	248,760	54.4
GBR	3,682	57,200	64.4
W. Germany	2,816	61,990	45.4
Italy	1,632	57,520	27.9
France	1,436	56,160	25.6
Greece	361	10,020	36.0
Spain	1,725	38,810	44.4
Thailand	795	55,450	14.3
Singapore	3,375	2,680	1,259.3

Source: modified from "Containerization International Year Book 1990: National Magazine Co., Ltd, London"

Issues of port infrastructure can be enumerated as follows:

- (1) Insufficient container handling facilities at most of the ports;
- (2) Limited availability of specialized container trains of which the frequency is extremely limited; and
- (3) Inappropriate road connections between ports and highways. For example, in Gdynia, road bridge construction works are suspended because of shortage of financial resources, in Gdansk and Gdynia, port related traffics is forced to pass through the center of the cities due to lack of bypassing routes, and in Szczecin, the road connection between port and highway is poor.

2) Port Administration, Organization and Operation

The port authority, having the same title as seen in Western countries, used to have port operation monopoly in Poland. The entire sea area including the port was under the authority of the state. The power was entrusted to the Maritime Offices at Gdynia, Slupsk and Szczecin. In the port area, however, various activities take place including shipbuilding and fisheries which are not under the jurisdiction of the port authority. In addition, the Polish Baltic Shipping Company operates the ferry terminal at the port of Swinoujscie.

The port authorities are now under reorganization. The organizational transformation consists of:

- (1) commercialization to a state owned stock company, except for the port of Gdynia, followed by a next step toward privatization; and
- (2) demonopolization of port operation such as cargo handling, stevedoring and pilotage.

The transformation aims to introduce the principle of competition and financial self-independence. In the past, port authorities have never been held accountable for profitability of the port. Therefore, development of financial management experience must be ranked as a first priority for the port operation and management.

It is not easy to evaluate port efficiency. There are a lot of factors which constitute port operation. When we take an efficiency of conventional cargo handling and assume, very roughly, the efficiency at Japanese ports, we can get Table 4.3.6. From the table, it is noticed that the cargo handling efficiency of the Polish port is considerably lower as compared with Japanese ports.

Table 4.3.6 Handling Efficiency of General Cargo in 1989

Ports 1/	Average Time
Average	31.5
Gdansk	35.8
Gdynia	31.3
Szczecin-Swinoujscie	29.4
Japanese Ports 2/	16.6 - 20.0

Note: 1/ average hours of handling 1,000 tons of cargo

2/ volume of conventional general cargo handled per gang and per hour (25-30 tons/gang/hour) is assumed to be equivalent with two gangs work on 1,000 tons of cargo.

- container and ro-ro ships are possibly included in data for Polish ports.

Source: Estimate by the JICA Study Team

3) Port Development Planning

Port authorities were hardly involved in the port planning process in the centrally planned system. The central government decided capacities of new facilities and the port authorities were instructed to construct and build these facilities as designed by a design office. The port authorities were not in a position to evaluate and/or comment on any port projects although financial performance of Polish ports was excellent mainly due to the factors of foreign exchange rates until 1989.

In a market economy, however, port authorities are fully responsible for port operation and development planning. They are completely exposed to a free market to compete with other ports as well as the other modes of transport for securing customers. Polish port authorities are required to develop marketing activities for seeking cargoes including transit cargoes via their own ports. Port sales activities need to be strengthened. At the same time, they should make an effort to invite more ship calls to their ports by improving their services such as shorter turnaround time, competitive pricing and security/safety of cargoes.

Every port should have its own master plan for future port development in harmonization with national economic development plans, regional development plans and development plans of other transport sectors. Issues in this respect are:

- (1) shortage of experience and know-how to define hinterland and forecast demand for port; and
- (2) lack of systems to intermediate interests of various port activities and weave them into a port development plan.

It should be reminded that the national government plays a catalyst role in preventing over-heated competition among the Polish ports so as to avoid duplicate over-investment in the port sector as a whole.

Port investment has remained low since 1980 mainly due to the stagnant economy and the deficit in the state budget. The only major work financed by the state budget was dredging work in the channel between the ports of Szczecin and Swinoujscie. The other on-going projects are:

- (1) construction of a container terminal with a capacity of 50,000 TEU at the port of Gdansk;
- (2) redevelopment of Zbozowe Quay at the port of Szczecin for general cargo, partly financed by a Belgian company; and
- (3) construction of five ferry terminals at the port of Swinoujscie.

4) Maritime Environment

Table 4.3.7 shows the survey results on the concentration of rare metals dissolved and suspended in the water. Firstly, it should be mentioned that the precise locations of the surveys and the methods of analysis are not identified, therefore the accuracy of the data is questionable. Even so, there is a possibility of severe contamination of the water. Main sources of pollution are fertilizers, urban sewage and industrial waste water in the Wisla river basin. A systematic and comprehensive study with an accurate analysis of international standards is needed. The table implies that the degree of contamination is even higher in the bottom sediment. Special care is required, therefore, for dredging work in the Bay.

Table 4.3.7 Concentration of Rare Metals in the Bay of Gdansk

Element	unit: mg/l															
	Gdansk Bay						Coastal Zone of Gdansk	Unpolluted Sea Water								
	1982-84		1973-75		1975-78		1984-85									
Cd.d	0.2	-	0.80	0.15	-	0.48	0.31	0.60	-	3.75	0.01	-	0.1			
.s	0.05	-	0.15		-		0.06		-	2.14		-				
Pb.d	0.0	-	1.1	0.0	-	0.8	1.03	0.50	-	6.50	0.02	-	1.5			
.s	0.0	-	0.8	0.0	-	0.8	0.22		-	2.47		-				
Ni.d	0.6	-	2.15	0.2	-	1.9	0.60	-	1.50			1	-	2		
.s	1.0	-	2.2	0.2	-	0.6	0.10	-	0.47				-			
Zn.d				6.1	-	82.5	14	-	113	5.0	3.5	-	28.2	1.5	-	10
.s				0.6	-	6.5	0.8	-	5.8	2.2	11.47					
Mn.d	1.75	-	19.9				0.5	-	86					0.1	-	8.0
.s	4.7	-	149.0				0.17	-	5.52							
Hg.d										0.63				0.01	-	0.2
.s										0.27						
Cu.d				0.30	-	3.10	0.3	-	8.3	2.4	0.50	-	6.25	0.5	-	3.5
.s				0.15	-	0.90	0.2	-	0.8	0.9	2.95					

Note: "d" stands for dissolved
"s" stands for suspended

Source: Maritime Institute

4.3.4 Ocean Going Shipping Services

1) Fleet

Poland had 234 ocean going ships with a total dead weight of 4,049 thousand tons in 1991. The total number of ships decreased by 29% and total dead weight by 10% during the period of 1980 - 1991 as shown in Table 4.3.8. The types of ship which increased during the period are bulk carriers, container ships and ferry boats.

Table 4.3.9 shows the age composition of the fleet. During the period of 1980 - 1991, the percentage share of ships of more than 16 years increased from 11% in 1980 to 38% in 1991. Replacement of aged ships should be addressed, coupled with an introduction of ships equipped with new technologies to save energy, seafarers, loading space, etc.

Table 4.3.8 Sea Transport Fleet under Polish Flag

Type of Ships		unit: number, 1,000 dwt				
		1980	1986	1989	1990	1991
Total	no.	331	261	249	247	234
	dwt	4,524	4,231	4,051	4,065	4,049
General Cargo Ships	no.	332	252	240	238	224
	dwt	4,505	4,212	4,043	4,047	4,030
Bulk Carriers	no.	78	86	89	91	93
	dwt	2,026	2,408	2,546	2,580	2,725
Container	no.	28	39	45	46	42
	dwt	254	468	535	549	496
Tankers	no.	13	9	8	8	6
	dwt	981	538	248	248	186
Ferry Boats	no.	8	8	9	9	10
	dwt	12	12	18	18	19
Passenger Ships	no.	1	1	-	-	-
	dwt	7	7	-	-	-

Note: "no." stands for "number of vessels"
 "dwt" stands for "dead weight ton"

Source: Maritime Economy, Statistical Year Book, Maritime Institute

Table 4.3.9 Age Composition of the Fleet

		unit: number, 1,000 dwt						
		Total	Years					
			0-5	6-10	11-15	16-20	21-25	26-
1980	no.	331	72	92	84	55	26	2
	dwt	4,524	1,361	1,911	760	338	145	9
	(%)	(100)	(30)	(42)	(17)	(8)	(3)	(0)
1986	no.	261	34	60	77	66	19	5
	dwt	4,231	963	903	1,677	563	113	12
	(%)	(100)	(23)	(21)	(40)	(13)	(3)	(0)
1990	no.	247	41	37	54	78	37	4
	dwt	4,065	951	579	945	1,294	274	22
	(%)	(100)	(23)	(14)	(23)	(32)	(7)	(1)
1991	no.	234	40	23	60	65	43	3
	dwt	4,049	975	654	870	1,177	353	20
	(%)	(100)	(24)	(16)	(22)	(29)	(8)	(1)

Source: Maritime Economy, Statistical Year Book, Maritime Institute

2) Shipment of Cargo

The cargo volume transported by the Polish fleet decreased from 39.6 million tons in 1980 to 27.6 million tons in 1991 as shown in Table 4.3.10. Despite the decline in total volume, liner transport increased from 5.5 million tons in 1980 to 7.1 million tons in 1991. The percentage share of liner transport in total, therefore, increased from 13.8% in 1980 to 25.7% in 1991.

Table 4.3.10 Cargo Transport by Liners and Trampers

	unit: 1,000 tons					
	1980	1986	1988	1989	1990	1991
Total	39,572	28,766	30,827	28,299	28,477	27,563
Liner	5,464	5,467	6,202	6,488	6,795	7,089
(share %)	(13.8)	(19.0)	(20.1)	(22.9)	(23.9)	(25.7)
Tramper	34,108	23,299	24,625	21,811	21,682	20,474

Source: Maritime Economy, Statistical Year Book, Maritime Institute

Table 4.3.11 shows Polish and foreign cargoes transported by the Polish fleet. Foreign cargo transported by the Polish fleet increased greatly from 8.4 million tons (21.3% of total cargo) in 1980 to 18.9 million tons (68.7%) in 1991 while Polish cargo steadily declined from 31.1 million tons in 1980 to 8.6 million tons (27.7% of that in 1980) in 1991. The fact infers that due to the decrease of domestic cargo, the Polish fleet was forced to seek cargoes in the international shipping market, resulting in a substantial success there. Poland seems to have a strong competitiveness in the international shipping community, in the west European shipping community in particular, based on the low cost of seafarer though there might have been a partial effect of over evaluation of zloty in the past. More efforts should be made to further improve the competitiveness so as to make the shipping sector one of the leading foreign exchange earners.

Table 4.3.11 Polish and Foreign Cargoes Transported by the Polish Fleet

	unit: 1,000 tons					
	1980	1986	1988	1989	1990	1991
Total	39,572	28,766	30,827	28,299	28,477	27,563
(%)	(100)	(100)	(100)	(100)	(100)	(100)
Polish Cargoes	31,136	17,929	18,414	13,658	11,472	8,629
(%)	(79)	(62)	(60)	(48)	(40)	(31)
Foreign Cargoes	8,436	10,837	12,413	14,641	17,005	18,934
(%)	(21)	(38)	(40)	(52)	(60)	(69)
Transit	1,460	1,967	2,024	1,682	1,638	1,421
Foreign Ports	6,976	8,870	10,389	12,959	15,367	17,253

Source: Maritime Economy, Statistical Year Book, Maritime Institute

3) Shipping Companies

Poland has three shipping companies: (1) Polish Ocean Lines for liner services; (2) Polish Steamship Company for tramp services; and (3) Polish Baltic Shipping Company for passenger and ferry services as well as short range tramp services. Outlines of the shipping companies are summarized in Table 4.3.12.

Polish Ocean Lines (POL) operates a fleet of 93 vessels with a total of 888,000 dead weight tons. POL operates 14 liner services to ports all over the world including North America, the U.S., the Gulf states, South America, Asia, the Far East, Africa, the South Pacific, Australia and the Mediterranean. POL provides five ro-ro services to the Scandinavian countries and the U.K.

For the North American Con-Ro service, POL provides weekly service by operating comparatively new Con-Ro ships built in 1981. For the Far East Asia route, POL provides services jointly with a French shipping company. Two new Polish full container ships, built in 1988, and eight French ships are assigned to these services on an every eight day basis. The fleet of these major service lines calls at major European ports but not at any port in Poland. For Ro-Ro services to the Scandinavian countries and the U.K., comparatively new rail/car ferry boats built in 1977-1988 are assigned to the rail/car ferry line Swinoujscie-Ystad.

Table 4.3.12 Vessel Fleet by Shipping Companies

		1988	1989	1990
Total	no.	250	240	234
	1,000 dwt	3,944	3,858	3,858
POL	no.	108	97	93
	1,000 dwt	985	914	888
PSC	no.	126	126	126
	1,000 dwt	2,935	2,922	2,949
PBSC	no.	16	15	15
	1,000 dwt	22	20	20

Note: POL - Polish Ocean Lines
PSC - Polish Steamship Company
PBSC - Polish Baltic Shipping Company
Source: Maritime Economy, Statistical Year Book, Maritime Institute

The Polish Steamship Company (PSC) operates a fleet of 126 vessels with a total of 2.9 million dead weight tons. The PSC carried 21.6 million tons of cargo in 1989 which accounted for 76.5% of the total cargo carried by the Polish fleet.

The Polish Baltic Shipping Company (PBSC) runs passenger/car ferry services and short-range tramp services in the Baltic Sea and North Sea. The PBSC provides four regular passenger/car ferry services and some seasonal services from Swinoujscie and Gdansk to the Scandinavian countries. The PBSC has ferry terminal facilities in Swinoujscie and provides twice a day ferry services to Ystad and daily ferry services to Copenhagen from Swinoujscie. To cope with the increasing number of passengers in recent years, the PBSC is now constructing new ferry wharves in Swinoujscie.

As discussed in the above, shipping services provided by the three shipping companies have been in different shipping market. The government has already withdrawn every intervention in the market to introduce competition among shipping companies. At present, however, it seems that the intended competition has never occurred among these shipping companies because of the market segmentation inherited from the past.

4) Financial Situation of Shipping Companies

Financial statements of each shipping company has not been obtained, so this topic is to be discussed briefly based on the aggregated financial report of the shipping industry as a whole. Table 4.3.13 shows an outline of income and cost structure of the industry.

Table 4.3.13 Financial Situation of the Shipping Industry

		unit: billion zloty		
		1987	1988	1989
Total Income		225.7	459.0	1,936.2
	(%)	(100)	(100)	(100)
Total Cost		206.5	415.4	1,457.5
	(%)	(91)	(91)	(75)
Material Cost		184.5	370.4	1,256.8
	(%)	(82)	(81)	(65)
Other Cost		21.9	45.0	200.7
	(%)	(10)	(10)	(10)
Total Profit		19.2	43.6	478.6
	(%)	(9)	(9)	(25)

Source: Maritime Economy, Statistical Year Book, Maritime Institute

During the period of 1987-1989, the total income of the industry increased by about 8.6 times from 225.7 billion zloty in 1987 to 1,936.2 billion zloty in 1989. The total cost, however, showed a lower growth of about 7.1 times from 206.5 billion zloty in 1987 to 1,457.5 billion zloty in 1989. The rates of total profit, therefore, improved significantly from 9% in 1987 and 1988 to as high as 25% in 1989. It can be inferred that these high profit rates were achieved due to the increasing volume of international cargoes and decreasing volume of domestic cargoes which enabled the industry to enjoy foreign exchange merits. During the same period, the percentage share of material cost was considerably high, 81-82% of the total income in 1987 and 1988, and 65% in 1989.

Table 4.3.14 shows investment outlays of the shipping industry. The table indicates that the industry received some part of the investment funds from outside in 1987 and 1988 but had no need for external finance in 1989. Almost all the funds were invested for ship building, machinery and equipment.

Table 4.3.14 Investment Outlays of the Shipping Industry

		unit: billion zloty		
		1987	1988	1989
Total		23.1	72.2	106.2
	(investment/profit %)	(120)	(166)	(22)
Construction Work		0.2	0.6	1.4
Ships, Machinery and Equipment		22.9	71.9	104.8

Source: Maritime Economy, Statistical Year Book, Maritime Institute

4.3.5 International Integration of the Polish Maritime Sector

The maritime sector has, by its nature, an international character. The Polish maritime sector had only limited domestic activities during the period of the centrally controlled system. Almost all of their activities were related to the international market.

For example, Polish shipping companies found their main market in cross trading between third countries, which forced them to fully comply their activities with international maritime practices. There seems to be no big obstacle for Polish shipping companies to join and be competitive in the international market.

Polish port people have been well acquainted with international standards and practices through their daily contacts with foreign ships. An example is that they set their tariff level at 90% of those applied in German ports.

Environmental matters, however, are an exception. It was common during the former regime that environmental protection was not given any serious attention as indicated in Table 4.3.7. Efforts should be made to accord the international conventions ratified by the country.

The rapidly changing international circumstances require the Polish ports to adjust their scope of activities, including their role in the Baltic League Nations as well as in relation with the newly independent CIS.

4.3.6 Inland Water Transport

1) Inland Water Transport Network

The Polish inland waterway system was developed a long time ago. Originally, the Wisla and the Odra rivers were used for transporting agricultural products. To keep pace with coal mining and the industrial development in Silesia, the inland waterway system was expanded by excavation of the channels and the construction of locks. Since the second half of the 1970s, however, investment in inland water transport has been declining, almost to zero.

The inland waterway system in Poland consists of the following parts:

- (1) The Odra River from Kozle to Dabie Lake;
- (2) Gliwicki Channel (41 km) and Keedzierzynski Channel (6 km);
- (3) Inland waterway connecting the Odra River and the Wisla River through Warta, Notec, Bydgoski Channel and Brda (294 km), and the stretch of the Warta River from Lubon near Poznan to Notec mouth to Warta (185 km);
- (4) A short stretch of the Upper Wisla and a stretch of the Lower Wisla from Plock to Wloclawek (50 km) and from the mouth of Brda to the sea (169 km);
- (5) Inland waterway connecting Wisla and Zalew Wislany through Nugat (62 km);
and
- (6) Inland waterway connecting Wisla and Narew through Zeranski Channel and Zalew Zegrzynski (55 km).

Navigable sections are fragmented in each inland water system mainly due to the neglected channel maintenance as well as the reduction of river water flow. The system has two main international links from the River Odra, both to Germany through the Hawela and Sprewa canals.

According to the document which appeared in the PIANC Bulletin, the total length of inland waterways is about 3,700 kilometers as shown in Table 4.3.15 and Fig. 4.3.3. Inland waterways of the River Wisla amount to about 940 kilometers and the River Odra to about 680 kilometers.

Table 4.3.15 Classification of Inland Waterways in Poland

		Total	Class				
			1	2	3	4	5
Odra	km	684	-	-	520	89	75
	(%)	(100)			(76)	(13)	(11)
Wisla	km	941	505	-	354	-	82
	(%)	(100)	(54)		(37)		(9)
Others	km	2,087	821	671	471	81	43
	(%)	(100)	(39)	(32)	(23)	(4)	(2)
Total	km	3,712	1,326	671	1,345	170	200
	(%)	(100)	(36)	(18)	(36)	(5)	(5)

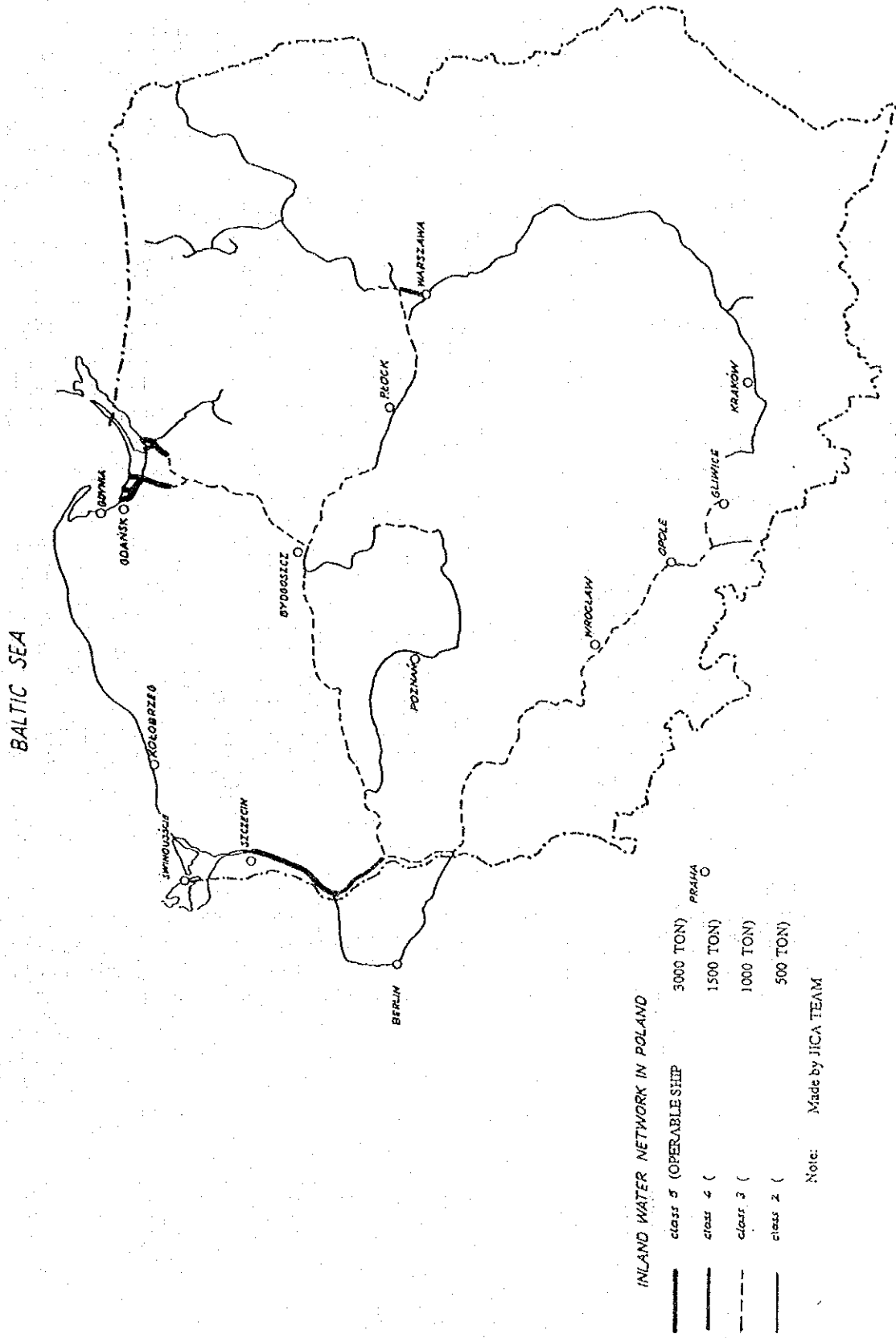
Source: Modified from "Modernization of the River Odra for navigation purposes by Prof. Stanislaw Orlewicz and Dr. Jacek Kurnatowski, PIANC Bulletin No. 60"

The navigable stretch of the rivers does not extend to the whole river; the Odra River is navigable downstream and in some parts of the upper stream excluding most of the middle stream. The remaining rivers are navigable only near cities along the rivers. Under the present situation, therefore, the inland waterways are effective only in the down stream area of the Odra River. A huge amount of investment would be required to restore the rivers to be navigable as they were in the former times.

The water level in the Polish rivers varies seasonally in a range of 1-2 meters. Polish rivers also have problems of icing during the winter. Icing lasts for a minimum of two to three weeks and a maximum of two to three months, which makes the rivers impassable during that time.

2) Inland Water Transport Demand

Table 4.3.16 shows the cargo handled by inland water transport. The total volume of cargo handled during the period of 1986-1989 was in the range of 14-15 million tons. This was about two-thirds of that of 1980. This decreasing trend was furthered in 1990 and 1991, with less than 10 million tons in 1990 and less than 8 million tons in 1991. In terms of transport by commodity, sand and gravel had the largest share of 54% in 1991, followed by coal of 16%, iron ore of 14% and fertilizer of 6%. The percentage share of the total of these four commodities accounted for 90% of the total cargo volume. Most of the coal was transported to a power generation plant at Wroclaw.



INLAND WATER NETWORK IN POLAND

—	class 5 (OPERABLE SHIP)	3000 TON	PRAGA ○
—	class 4 (1500 TON)	
- - -	class 3 (1000 TON)	
· · ·	class 2 (500 TON)	

Note: Made by JICA TEAM

Fig. 4.3.3 Inland Water Transport Network

Table 4.3.16 Turnover of Cargo Handled by Inland Water Transport

		unit: 1,000 tons, %				
		1980	1986	1989	1990	1991
Total		22,247	14,879	14,040	9,797	7,665
	(%)	(100)	(100)	(100)	(100)	(100)
Sand & Gravel		13,113	8,288	6,688	4,589	4,121
	(%)	(59)	(56)	(48)	(47)	(54)
Coal		2,187	1,838	1,690	1,355	1,195
	(%)	(10)	(12)	(12)	(14)	(16)
Stones		909	647	1,583	320	16
	(%)	(4)	(4)	(11)	(3)	(0)
Fertilizer		1,504	1,406	1,458	1,143	448
	(%)	(7)	(9)	(10)	(12)	(6)
Iron Ore		1,796	1,354	812	448	1,047
	(%)	(8)	(9)	(6)	(5)	(14)
Metals & Products		265	218	316	444	331
	(%)	(1)	(2)	(2)	(4)	(4)
Wood & Products		159	86	129	76	39
	(%)	(1)	(1)	(1)	(1)	(0)
Others		2,314	1,042	1,364	1,422	468
	(%)	(10)	(7)	(10)	(14)	(6)

Source: Data prepared by the Polish Counterpart

Inland water is primarily used for carrying bulky cargo of low unit value. In the future, it may be possible to transport oil and petroleum products by inland waterways if they arrive by sea from countries other than the former Soviet Union. Another potential lies in the international inland waterways connecting Poland to Berlin through the Odra River and the Odra-Hawela and Odra-Sprewa canals.

3) Floating Stock of the Inland Water Transport

Table 4.3.17 shows the floating stock of Polish inland water transport. During the period of 1986 - 1991, the total number of floating stock showed a constant declining trend from 2,093 vessels in 1980 to 1,759 vessels in 1991. However, the decreasing pace is slow, about 50 vessels annually in these three years. It is likely that the aged floating stock has been getting older and older with no specific replacement program.

Table 4.3.17 Floating Stock of Polish Inland Water Transport

		1980	1986	1989	1990	1991
Total Vessels	no.	2,093	1,956	1,862	1,805	1,759
Tugs	no.	39	27	26	25	23
	power (kw)	6,344	4,509	4,366	4,240	3,800
	ave. power (kw)	163	167	168	170	165
Pushers	no.	386	392	387	386	372
	power (kw)	99,123	102,640	101,994	101,520	98,904
	ave. power (kw)	257	262	264	263	266
Barge:						
Self powered	no.	331	328	325	319	312
	dwt (tons)	154,000	152,000	150,000	147,568	144,584
	ave. dwt (tons)	465	463	462	463	463
Unpowered	no.	1,239	1,124	1,055	1,018	998
	dwt (tons)	535,000	507,000	487,000	470,920	422,977
	ave. dwt (tons)	432	451	462	463	424
Passenger Ships	no.	98	85	69	57	54
	seats	17,330	15,784	12,381	11,167	10,883
	average seats	177	186	179	196	202

Source: Data prepared by Polish Counterpart

In the neighboring countries, the number of inland water ships decreased while the average size of ships became larger. Countries along the Rhein and Donau rivers have large stocks of inland water fleet. The Netherlands has kept the leading position as the largest owner of fleet over the past 20 years. Germany has a big stock as well and the average size of ships of the German fleet is more than twice as large as that of the Polish fleet. The inland water floating stock in Poland is characterized by small size and aged fleet in comparison with other European stocks.

4) Inland Water Ports

Inland water ports are shown in Table 4.3.18 and used to belong to shipping companies. However, they are now under institutional reformation to be under the jurisdiction of local governments although some small ports will remain for the exclusive use of shipping companies.

Table 4.3.18 Inland Water Ports

No.	Port Location	Area		Quays		Stock Yards	Handling Capacity
		total ha	water ha	total m	handling m	1000m ²	1000t
1)	Gilwice Kanal Gliwicki 41km	39.8	17.0	3,490	2,490	52.3	4,500
2)	Kozle-Odra 89km	33.8	11.3	3,760	2,840	5.1	1,000
3)	Opole-Odra 152km	16.8	4.0	1,330	715	2.6	200
4)	Wroclaw city Odra 255km	28.4	4.4	1,905	1,700	6.8	900
5)	Wroclaw-Popowice Odra 266km	13.0	1.5	1,405	851	4.2	1,100
6)	Malczyce Odra 304km	11.6	8.0	895	191	2.3	300
7)	Nowa Sol Odra 429km	4.1	2.9	734	404	0.5	130
8)	Cigacice Odra 471km	8.3	2.4	1,115	544	2.0	40
9)	Kostrzyn Warta 2km	2.9	0.4	740	240	1.1	200
10)	Ujscie Notec 106km	5.5	2.5	1,025	370	4.5	500
11)	Krzyz Notec 187km	5.3	1.8	800	485	1.7	300
12)	Bydgoszcz Brds 5km	16.3	4.5	650	420	3.8	1,050
13)	Sandomierz Wisla 269km	4.3	1.6	450	250	5.5	300
14)	Warszawa-Zeran Kanal Zeranski 1.5km	13.2	2.5	972	372	34.9	1,300
15)	Plock Wisla 633km	17.2	5.8	1,123	832	3.4	600
16)	Malbork Nogat 22km	8.0	5.9	885	340	13.7	150

Source: Information from the Polish counterparts

5) Institutional, Managerial and Operational Aspects

The Ministry of Environment, Natural Resources and Forestry (MOE) administers the inland waterways, including construction and maintenance works. This is because priority is given to the preservation of natural environment, and water quality in particular. The Ministry of Transport and Maritime Economy (MTME) has a lower level of authority over the development and maintenance of inland waterways. Therefore, the rivers have not necessarily been well maintained for transport purposes. This is one of the main issues for maintaining the inland water transport services.

A committee which involves various agencies related to river basin development should be established to discuss and coordinate the river related activities. A policy for developing and maintaining inland waterways need to be determined by the committee by taking account of the wide range of activities involved in river basin management.

The state enterprise of "Zegluga Na Odrze", located at Wroclaw, is the leading company in the Polish inland water transport sector. The company employs 1,600 workers and is going to be reorganized into a private organization. The company did not get any subsidy from the government for the past two years, but has still attained a profit/income ratio of 30%. In order to ensure the profitability as a private organization, it plans to transfer the ownership of small ports to municipalities and divest such unprofitable business as schools, hotels and recreational facilities.

6) International Trend of Inland Water Transport

In terms of international inland water transport, there are various entry restrictions imposed on new comers. Zegluga Na Odrze, however, is entitled to participate in international inland water transport based on its past experiences excluding the Rhine river. This business field is likely profitable to Poland because international freight rates, which are higher than domestic ones, are applied while Poland has an advantage of lower cost of crews and personnel.

The Odra-Donau inland water connection has been discussed among Poland, Czechoslovakia, Austria, Germany and Hungary. Once connected, the Odra river could be an important international inland water route to offer the shortest and cheapest transportation between the Scandinavian countries and the land locked countries on the European Continent. This is likely to be a great potential for the development of Polish inland water transport in the long term perspective.

4.4 Air Transport

4.4.1 Air Transport Network

1) International Air Services

The existing international air routes connecting Poland directly with the outside world by scheduled flights are shown in Fig. 4.4.1 and 4.4.2. As seen in these figures, these routes connect Poland with over 50 cities in 35 nations.

Scheduled international flights are operated by LOT Polish Airlines, the national flag carrier, and other foreign carriers. Warsaw/Okecie Airport handles most of the international flights, however Krakow/Balice, Gdansk/Rebiechowo, and Szczecin/Goleniow airports also handle a small amount of international scheduled flights. As seen Fig. 4.4.1, the number of annual international air passengers handled at Warsaw Airport is still relatively small when compared with other major European airports.

Long haul routes to North America and Southeast Asia (Bangkok and Singapore) served by LOT are ethnic oriented markets for immigrated Polish in Canada, U.S.A. and Australia. In order to develop new markets, LOT desires to introduce scheduled services between Warsaw and Japan. Preliminary consultation meetings regarding the formal aviation agreement between both authorities concerned is said to be held in August 1992.

2) Domestic Air Services

Scheduled domestic air services had been monopolized solely by LOT Polish Airlines in the past. Although a new law was introduced in 1989 which allows private airline companies to offer scheduled services, no company has commenced such services yet as of July 1992.

Fig. 4.4.3 depicts LOT's domestic routes in the summers of 1991 and 1992. As seen in the figures, its service network forms a hub and spoke structure with Warsaw being the hub. Table 4.4.1 shows the frequency of LOT's domestic air services for the said two years. It is worthwhile to note that LOT has sold Soviet made Antonov AN-24 and has introduced newly purchased AEROSPATIALE/AERITALIA ATR 72 (64 seats).

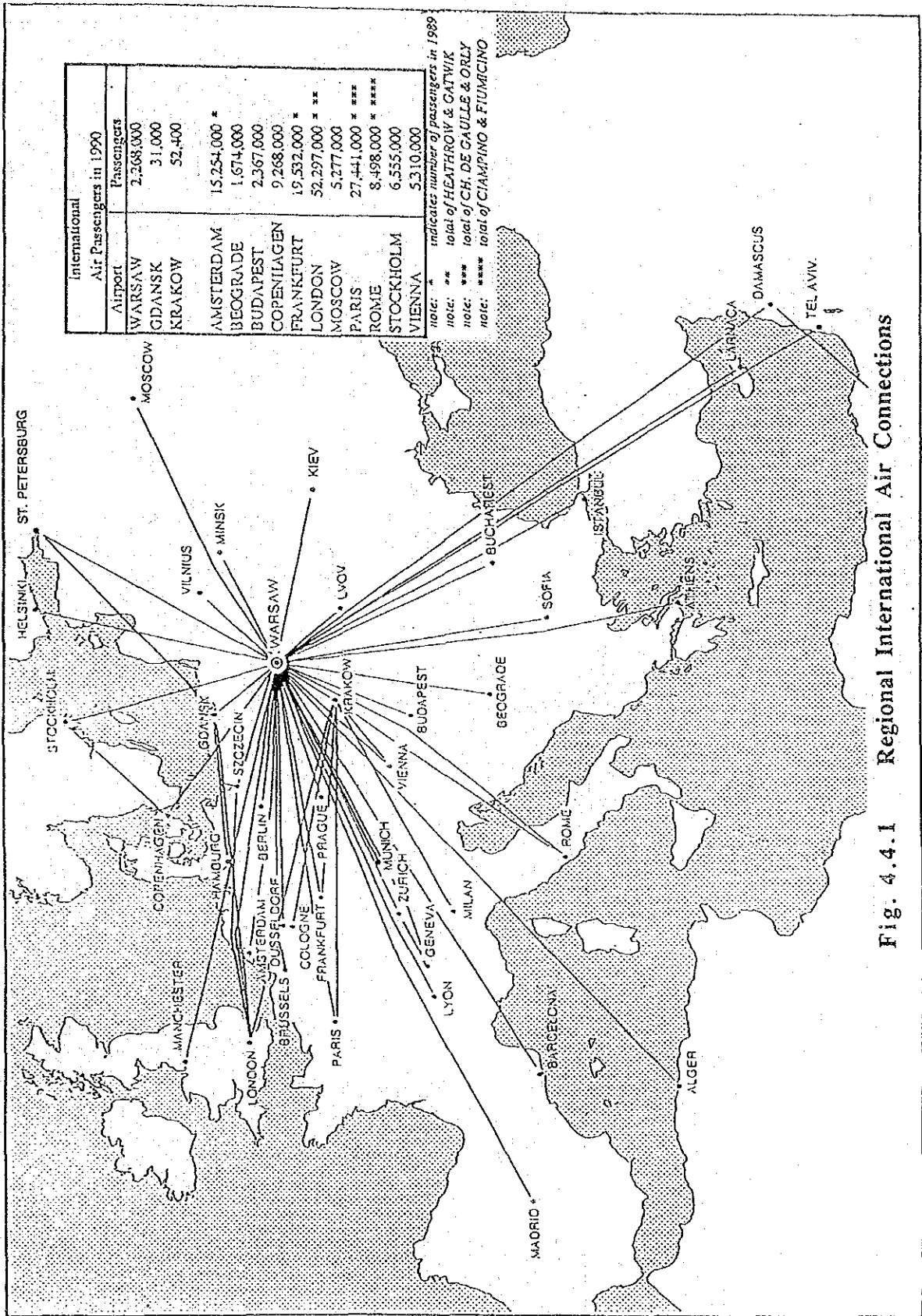


Fig. 4.4.1 Regional International Air Connections

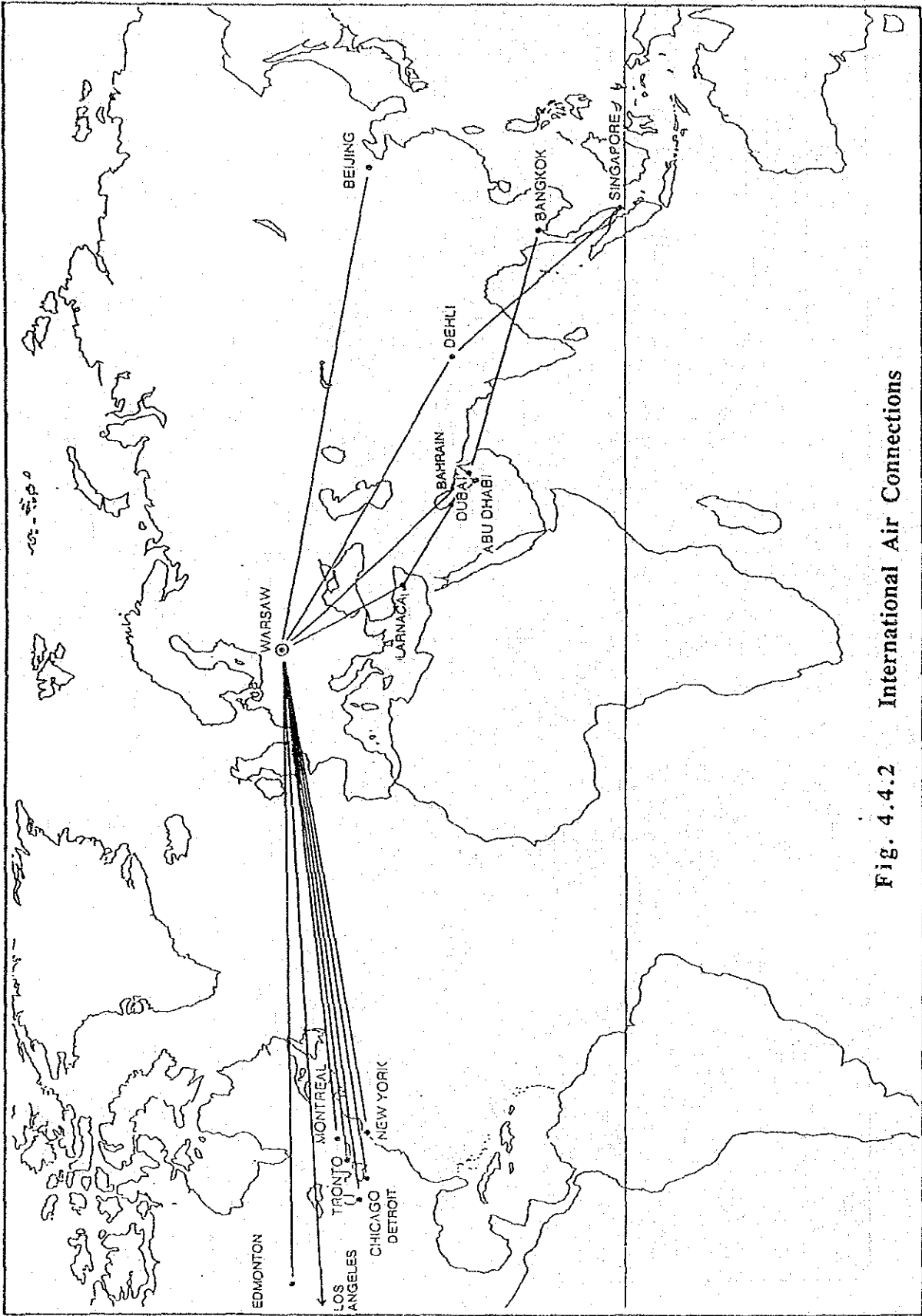


Fig. 4.4.2 International Air Connections

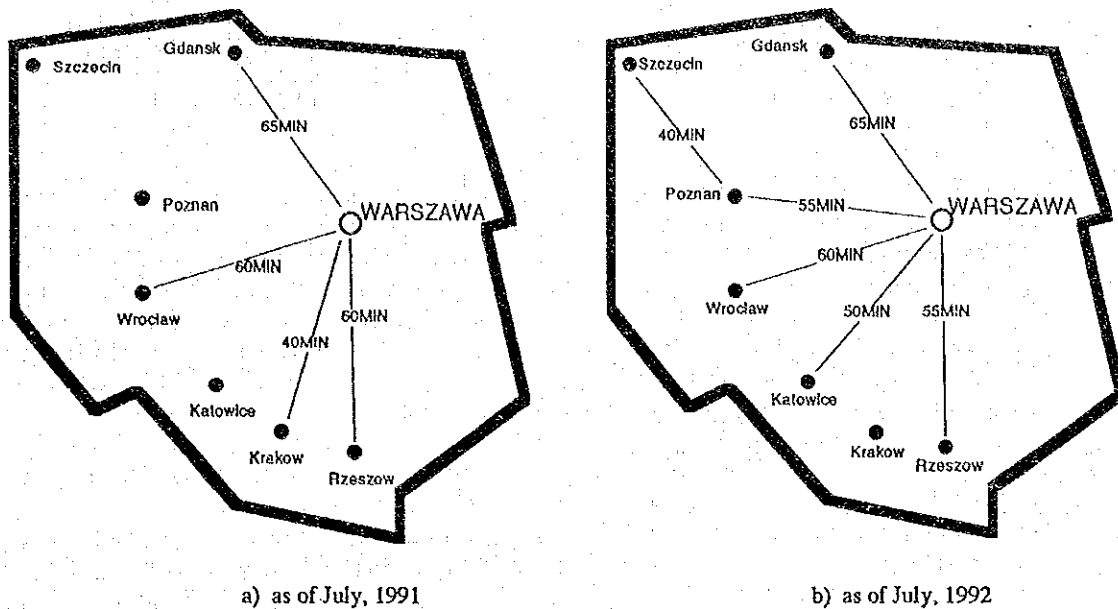


Fig. 4.4.3 Domestic Air Routes

Table 4.4.1 LOT's Domestic Air Services

Route	July 1991		July 1992	
	Aircraft	no./week	Aircraft	no./week
Warsaw/Gdansk	AN-24	19	ATR-72	23
Warsaw/Katowice	-	-	ATR-72	15
Warsaw/Krakow	AN-24	3	ATR-72	-
Warsaw/Poznan	AN-24	(12)*	-	-
Warsaw/Poznan/Szczecin	-	-	ATR-72	5
Warsaw/Rzeszow	AN-24	-	ATR-72	3
Warsaw/Wroclaw	AN-24	-	ATR-72	15

Note: 1) no. of flight/week is for one direction
 2) AN-24 stands for Antonov AN-24
 ATR-72 stands for Aeritalia ATR-72
 * LOT ceased services in late June 1991

Source: LOT

The territory of Poland is roughly a quadrilateral shape. The four sides are some 625 km, 350 km, 625 km and 610 km along the east, west, south and north respectively when measured in a straight line from corner to corner. Thus, distances between Warsaw and other major cities are mostly in the range of 300-400 kilometers.

Judging from the common knowledge that air transport has superb competitiveness with other modes of transport in long haul transport, Polish domestic air transport would continue to suffer severe competition. For example, door to door travel times for air, railway, and bus are almost the same for short routes such as Warsaw-Krakow and Warsaw-Poznan.

Domestic air fares increased ten-fold in 1990 reflecting the adoption of market exchange rates. Conversely, fares of railways and buses have been raised to a lesser extent. As a result, air fares are four to eight times higher than railways or buses on their competing routes.

Low demand on domestic air services due to the economic recession as well as higher air fares will contribute for some years. Nevertheless, LOT seems to try to recover its market share attained in the past which was realized then because of the artificially decided low air fares. LOT has improved its domestic flight schedule, particularly for flight connections between routes. LOT has also introduced various discount systems including weekend fares, family fares, group fares and so on to attract more passengers. However, as of the end of July 1992, the average load factor on domestic routes are reportedly too low to recoup the operation costs.

It is said that the LOT's efforts to improve domestic air services are based on the observation that some nearly one half of LOT's international air passengers originate from provincial cities other than Warsaw. It is assumed that improvement of domestic air services will be effective in increasing LOT's international passengers which are the major sources of profit to LOT. Although it is early to conclude the strategy, it would be advisable for LOT to subcontract some routes of low loading factor to private airlines who operate small aircraft, instead of using its own ATR-72.

3) Capacity of Air Transport

The capacity of air transport can be discussed from three different point of view including airspace, airport and aircraft.

Historically the Polish airspace system had largely been dominated by military requirements which had adopted the former Soviet system. Except newly installed western made equipment, most of the equipment for communication and nav aids are of Eastern European make and outdated due to a lack of investment over many years. A military and civil task force was formed in November 1990 to restructure the airspace control system for civil and military joint use.

At present, there is no significant capacity problem of airspace due to the relatively small volume of air traffic. Nevertheless, it is obvious that the present air traffic control (ATC) system and its sub-systems need to be modernized to comply with the requirements of the European Civil Aviation Conference (ECAC) of which Poland became a member in June 1990.

Airport capacity is determined by airport component including terminal space, air side facilities (runway, taxiway and apron), terminal facilities (passenger, cargo and maintenance) and land side facilities (car park, curb side and access road). It can be said that the capacity of all airports is sufficient enough to handle the present traffic demand since the present air traffic volume at all airports excluding Warsaw are one third or one fourth of the peak volume achieved in 1979. One major issue is that some airports such as Katowice and Wroclaw airports need to develop CIQ (Customs, Inspection and Quarantine) facilities if they wish to operate regional international flights.

The new international passenger terminal at Warsaw International Airport is open to public since July 1992. It is capable of handling 2,000 passengers per hour (BAA's estimate) which is equal to about 6 million passengers per year.

With regard to aircraft, LOT seems to have enough capacity to handle the traffic demand at present as well as in the near future because both the present load factor and the flight hours of aircraft are relatively low and could be improved further.

4.4.2 Airports

1) General

There are over 100 airfields within Poland. Most of them are owned by the military reflecting Poland's geopolitically strategic location and cold war legacy in the past.

According to GICA, there are 40 civilian airfields as of July 1992. Three of them, namely, Gdansk/Rebiechowo, Poznan/Lawica and Warsaw/Okecie, are owned by PPL and operated as commercial airports. There are five military owned airfields which are jointly used with civil aviation and have commercial activities. Fig. 4.4.4 illustrates the location of these major airports as well as two airports with non-scheduled commercial flights. Table 4.4.2 shows main features of these eight commercial airports. Most of the other airports are owned by Polish Aero Club and are mainly of grass fields used for non-commercial purposes.

The ICAO Regional Air Navigation Plan in 1990 for Europe specifies requirements for three airports in Poland which serve international regular scheduled air traffic, i.e., Gdansk/Rebiechowo, Krakow/Balice and Warsaw/Okecie. The plan also requires two airports, Poznan/Lawica and Rzeszow/Jasionka to serve as alternative airports for the above three airports. In addition to the above five airports, PPL classifies Szczecin/Goleniow and Katowice/Pyrzowice airports as international airports and the remaining four airports as domestic ones.

Local governments and the private sector are eager to develop their local airports to boost their economy. It is worth noting as an example that a private airline, "AVTEK", started air services in June 1992 based on Suwalki airfield which is a sway point of airways B20 (to Paris), G9 (to Warsaw), R11 (to Rome) and B20/G9/R11 (to Moscow) with its VOR. Two Antonov AN-2 (12 passengers or 1.5 tons of cargo) have been put into service to Minsk (Belorussia), Kaliningrad (CIS) and Ryga (Latvia) on demand basis for the purpose of avoiding time consuming border crossings by surface transport between Poland and these countries.

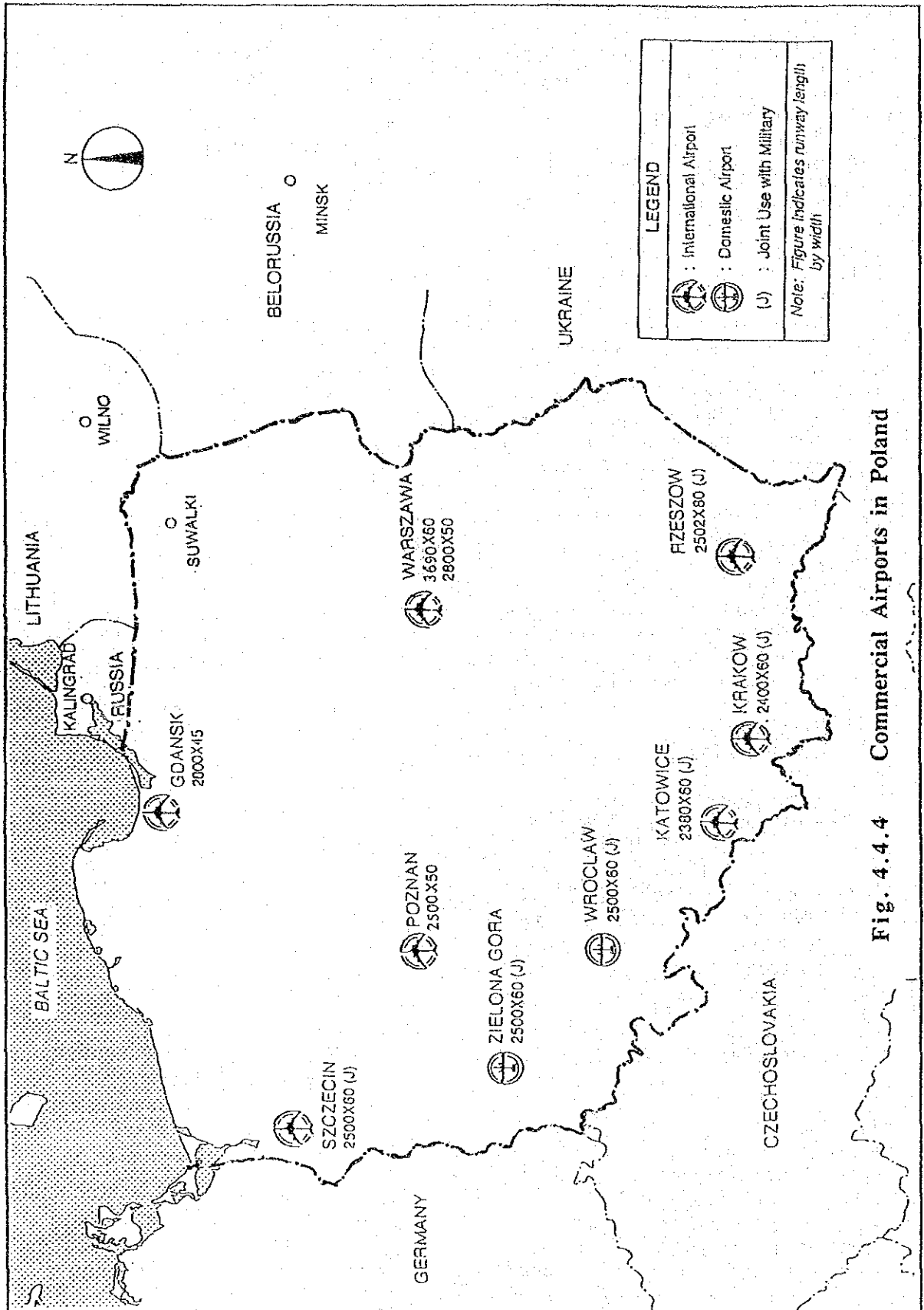


Fig. 4.4.4 Commercial Airports in Poland

Table 4.4.2 Main Features of Eight Major Airports

City	Warsaw Okecie (WAW)	Gdansk Rebiechowo (GDN)	Katowice Pyrzowice (KTW)	Krakow Balice (KRK)	Poznan Lawica (POZ)	Rzeszow Jasionka (RZE)	Szczecin Golenow (SZZ)	Wroclaw Strachowice (WRO)
Airport Name IATA Airport Code								
City Population	2,149,000	1,086,000	3,475,000	848,000	943,000	295,000	734,000	834,000
Total Voivodship Population	2,419,000	1,423,000	3,968,000	1,229,000	1,328,000	717,000	967,000	1,126,000
General								
Airport Owner	PPL	PPL	PPL/Military	PPL/Military	PPL	PPL/Military	PPL/Military	PPL/Military
Airport Area (ha)	550	280	550	220	320	320	270	500
Distance from City (km)	10	12	34	11	5	9	45	10
Air Route Distance from WAW (km)	-	381	318	304	380	360	568	369
Flying Time from WAW (ACFT)	-	1H05M (AN-24)	40M (TU-134)	40M (TU-134)	1H (AN-24)	1H (AN-24)	1H (TU-134)	1H (AN-24)
Air Traffic								
Passenger in 1990	2,268,100	45,650	-	44,830	1,340	-	-	180
Cargo in 1990	222,140	60,050	3,000	28,290	9,000	19,920	17,840	61,790
Aircraft Movements (1990)	40,710	4,674	472	4,157	1,308	844	978	1,968
Airside Facility								
Runway(s) LxW (m)	3,690 x 60 2,800 x 50	2,800 x 45	2,380 x 60	2,400 x 60	2,500 x 50	2,502 x 80	2,500 x 60	2,500 x 60 2,000 x 23*
Runway Strength	PCN62/R/D/X/U PCN45/R/B/X/U	PCN36/R/A/X/D	PCN40/R/C/X/U	PCN22/F/B/X/T	PCN49/F/A/X/T	PCN29/R/B/X/T	PCN38/F/C/X/T	PCN31/F/C/X/T PCN35/F/C/X/T
ILS Availability of Parallel Taxiway	CAT I (RWY33,11) Yes	CAT I (RWY29) No	Yes	CAT I (RWY26) Yes	CAT I (RWY29) No	CAT I (RWY29) No	Yes	(planned by '92) Yes*
Civil Apron Area (m)	27 ACFT stands	90x350 40x150 (Apron 2) 50x180 (Apron 3)	80x230	3,000** 700 ** under construction	100x240	80x130	70x190	56x100 56x100
Passenger Terminal	10,800	400 600	1,000	3,000** 700 ** under construction	(536)** 262	(1,000)**	1,200	700*** *** 700 sq.m planned
Car Parking Area (slots)	1,000 (for Terminal 1)		300					

Source: AIP, LOT Timetable

2) Outline of Major Airports

(1) Warsaw/Okecie International Airport

Warsaw/Okecie International Airport is located some 10 km southwest from the Warsaw city center and is the international gateway of Poland. The airport is linked by scheduled flights with almost 50 cities of over 35 countries in the world. Domestically it is a hub airport connecting several major cities. It handled over 2.4 million international passengers and some 0.2 million domestic passengers in 1990. However, these numbers decreased to 1.9 million and 0.1 million respectively in 1991.

Upon completion of the new international passenger terminal in 1992, most of the problems in the past has been resolved. However, the domestic passenger terminal needs to be improved by renovating the former terminal to a new domestic passenger terminal to accommodate domestic passengers as well as for improving operational efficiency. A new cargo terminal is now operational with an annual cargo handling volume of 50,000 tons.

In all, the airport does not appear to have any significant problem for the years to come except the urgent necessity of overlaying the runways.

(2) Gdansk/Rebiechowo International Airport

Gdansk/Rebiechowo International Airport is located 11 km west from Gdansk city. Except two daily flights during weekends, the airport receives four domestic daily flights from Warsaw as well as several weekly international flights to and from Hamburg, London and St. Petersburg as of July 1992.

The existing runway is 2,800m x 45m of asphaltic concrete with PCN 38/F/C/X/T. RWY29 is equipped with ILS Cat I. Plenty of volcano shaped pop-up cracks were observed on the pavement near RWY29 end in July 1991. It was said that these spot pop-up may be caused by moisture beneath the overlaid layer and occur during summer but become flat again in winter. It is strongly recommended to take immediate remedy action since rain water can seep through from these cracks and destroy sub-grades. Although the height of those heaped areas are not significant they could cause adverse effects on aircraft wheels and spilled material could damage aircraft engines by ingestion.

The existing passenger terminal apron which can accommodate four AN-24s, three IL-62s and two TU-154s simultaneously is considered large enough for the current traffic volume. The existing domestic (600 sq.m) and international (400 sq.m) passenger terminal buildings are also considered adequate in terms of area size. The modern terminal building constructed by Elgaz for its private operation may be converted into a new international passenger terminal if required.

(3) Katowice/Pyrzowice International Airport

Katowice/Pyrozowice International Airport is situated some 34 km north of the Ozarowice and Mieroecice parishes of Katowice City. The airport is jointly used with the military. LOT once ceased its scheduled flights but reopened them in the beginning half of 1992.

The existing non-precision runway is of 2,380m x 60m concrete. The reported PCN number of the runway is PCN40/R/C/X/U. It has a complete parallel taxiway. Although its width is reported to be 23 m in the AIP, it was told to vary from 15m to 23m by a portion of the taxiway. The existing apron can accommodate two AN-24s, one TU-134 and one IL-18. The existing domestic passenger terminal has a total floor area of some 1,000 square meters.

The voivodship of Katowice, who was eager to maintain its own airport, established an airport development committee in March 1991. By the end of the year, it succeeded to fund 1.5 billion zloty and formed an airport company named "Gornoslaskie Towarzystwo Lotnicze (GTL)" with PPL. Considering the fact that Katowice is the center of surface transport and that about one quarter of air cargo handled at Warsaw is either originated or destined to and from Katowice, GTL believes that the 24 hour operational Katowice airport has a great potential to develop air cargo business. Lufthansa Airlines is said to be interested in using the airport for its freighter services.

In addition to cargo business, Katowice voivodship is also eager to have direct scheduled flight connections to European cities. Since the military has started withdrawing its requirements from the airport, it could have a wider range of freedom for civilian use. However, more attention needs to be placed on the viability of the possible expansion of the airport which incurs substantial amount of investment.

(4) Krakow/Balice International Airport

Krakow/Balice International Airport is located 11 km west from Krakow city which has 840,000 inhabitants. As a south air gate to Poland, the airport receives such foreign carriers as Balkan Bulgarian Airlines, Malev Hungarian Airlines and Aeroflot in addition to LOT's international flights. It also frequently receives international general aviation traffic from neighboring European countries.

Under the present hub and spoke air network structure of LOT, domestic air service between Krakow and Warsaw is quite difficult to compete with railways or roads which can travel this section within 3 hours. The low frequency domestic air service, which existed for this section, has been ceased since the latter half of 1991. Since some of LOT's international flights from Warsaw to Frankfurt, London, Paris and Rome stopover at this airport, it is recommended that the Ministry of Interior allow LOT to carry mixed (domestic and international) passengers on these international flights. It is apparent that a simple change of the rules would benefit LOT as well as potential passengers.

The airport is co-used with the military, and has a runway of 2,400m x 60m with a complete parallel taxiway and several exit taxiway. The strength of the runway pavement is reported to be PCN22/F/B/X/T. The runway end RWY26 is equipped with ILS Cat I. The desired 600 m runway extension toward the west (RWY08 end) to reach a total runway length of 3,000m is possible by relocating some houses at Morawica village. However, it has not been realized so far mainly due to lack of fund.

Because of recent political changes, talks are underway for the military to withdraw from the airport. A new passenger terminal of 3,000 square meters to house international passenger facilities was supposed to be completed by August 1991. However, PPL suspended the project due to lack of fund.

It could all depend on the future prospect of the airport and possible withdrawal of the military, however, it is apparent that the existing civil apron area is not ideally located from the viewpoint of airport operation and expansion. It is also obvious that the branch taxiway will become a bottleneck once traffic increases. It is recommended to prepare an airport master plan taking into consideration the above-mentioned factors as well as long-term prosperity of Krakow.

(5) Poznan/Lawica International Airport

Poznan/Lawica International Airport is located 5 km west of Poznan city, which has a population of 943,000. The airport accepts international general aviation flights from neighboring countries excluding scheduled flights.

Because of the short distance (about 300 kilometers) to Warsaw and well developed railways and roads, air services between these cities face tough competition. In May and June 1991, the seat occupancy rate dropped to less than 35%, which forced LOT to cease its scheduled flights in July 1991. However, LOT introduced new scheduled flights between Warsaw and Szczecin via Poznan in 1992.

The existing runway is 2,500m x 50m and equipped with ILS Cat I. The runway can be extended to the west by 300 m if so desired. The pavement strength is reportedly PCN49/F/A/X/T. The only available taxiway is a stub taxiway at the RWY29 end which connects the runway and apron. The existing civil apron can accommodate five AN-24s, two IL-18s and one IL-62.

The existing passenger terminal has a 260 square meter floor area. A new passenger terminal (536 sq.m) is almost complete, however, the exact completion date will depend on the availability of funds, from PPL (60%), Voivodship (20%) and the City (20%).

(6) Rzeszow/Jasionka International Airport

Rzeszow/Jasionka International Airport is 9 km north of Rzeszow which has 295,000 inhabitants and is the capital of Rzeszow Voivodship.

The airport receives LOT domestic services only from Warsaw except occasional international charter flights and general aviation. Air cargo handled at the airport include agricultural products and frozen meat (sent to Libya via Warsaw).

The existing runway is 2,502m x 80m and equipped with ILS Cat I. The runway can be extended to 3,000 m if desired. The pavement strength is reportedly PCN29/R/B/X/T. Transverse cracks were observed at a fair number of slabs along the runway edges.

The existing apron is located on the north side of the runway and connected by a stub taxiway. The apron can accommodate two AN-24s and two IL-62s simultaneously by self-maneuvering configuration. A new passenger terminal with some 1,000 square meter floor area is nearly completed and located at the north side of the apron. The new terminal would solve the inconvenience of the substantial distance which exists between the old terminal and the apron.

(7) Szczecin/Goleniow International Airport

Szczecin/Goleniow International Airport is located 45 km northeast from Szczecin City, which has a population of 734,000. Because of its strategically important location military activities were heavy in the past. In the near future, however, it may become a pure civil airport as talks are underway between the Polish and German governments not to allow any military facilities within a 100 km zone from the national border.

The airport used to handle LOT's international flights, however, as of July 1992, there is no scheduled international flights. It receives daily one flight of LOT which connects Szczecin and Warsaw via Poznan from Monday through Friday.

The existing runway is 2,500m x 60m. Reported pavement strength is 38/F/C/X/T and it used to receive IL-62. The runway has a complete parallel taxiway located on northeast side of the runway with a 350 m center to center separation distance from the runway.

Most of the northeast side along the parallel taxiway, however, is used by the military and the civil apron is located in a strange manner between the runway and the parallel taxiway near the RWY13 end. The rectangular shape apron is 70m x 190m and able to accommodate four AN-24s simultaneously. The southwest edge of the apron, however, is only 130 m from the runway center line. Thus once the runway becomes precision approach runway it is apparent that aircraft on this apron would infringe the transitional surface. The existing passenger terminal has a floor area of 1,200 square meters and was said to be large enough to handle 200 peak-hour passengers.

(8) Wroclaw/Strachowice Airport

Wroclaw/Strachowice Airport is located 10 km west of Wroclaw city, which has population of 834,000. Air services between Wroclaw and Warsaw likely are competitive with surface transport, so LOT has started two daily scheduled flight services since July 1992.

There are no scheduled international flights to the airport. However, Wroclaw voivodship has created an airport company with PPL and a new international terminal is planned to be completed shortly because of the following reasons:

- (a) Wroclaw has a strong business tie with Austria and Germany;
- (b) Wroclaw voivodship and Lufthansa are interested in regional international flights and air cargo business; and
- (c) Residents in Wroclaw have strong ethnic ties with Germany and Lwow in Uklaina.

There are two parallel runways: one with 2,500m x 60m (PCN 31/F/C/X/T); and another 2,000m x 23m (PCN 35/F/C/X/T). ILS is planned to be installed. The existing apron (56m x 100m) is located at the end of the extended taxiway which connects runway ends RWY30L and RWY30R.

The existing passenger terminal has a floor area of 700 square meters. The new passenger terminal building will provide an additional 700 square meters to house CIQ facilities for international traffic.

4.4.3 Air Traffic Volumes

1) International Air Passengers

Warsaw International Airport is the most important international airport in Poland, handling over 95% of the total international air passengers annually. Table 4.4.3 shows the past record of annual international air passenger traffic at Warsaw International Airport.

After a slowdown in 1982, the air traffic picked up and grew to 2.6 million passengers in 1989 at an average annual growth rate of 20.8%. Air passengers carried by western airlines maintained a high growth rate from 1989 to 1990, while those by LOT and eastern bloc airlines dropped significantly in 1990. As a result, the total international air passengers showed minus growth from 1989 to 1990 and this trend continued into the year 1991. The depression of LOT traffic was caused mainly by an air fare rise of about 10 times. The drop in traffic of the eastern bloc airlines was likely caused by their domestic economic depression as well as declining economic ties between these nations and Poland.

In 1990, the number of passengers at Warsaw International Airport amounted to 2.27 million persons. LOT carried 62% of total passengers which equals 1.41 million persons, followed by airlines of western countries with 0.51 million persons (23%) and eastern countries with 0.33 million persons (15%).

Table 4.4.4 shows the international air passenger traffic at other airports including Gdansk, Krakow, Poznan and Szczecin. The total number of passengers amounted only to 92,350 persons in 1990.

2) Domestic Air Passengers

The annual number of domestic air passengers during the period 1979 to 1991 at eleven airports is shown in Table 4.4.5. As seen in the table, domestic air passenger movements were quite active in 1979 showing that four airports of Warsaw, Gdansk, Krakow and Wroclaw handled more than 100,000 persons. Since then, however, the number of domestic air passengers at all airports decreased gradually. The total number of passengers in 1984 almost recovered to the 1979 level, but after 1985 it started declining again to drop half the number of passengers of 1979 in the year of 1989.

In 1990 and 1991, the total number of domestic air passengers further decreased consecutively to less than 30% and about 12% of 1979 levels for 1990 and 1991 respectively. The drastic decrease in these two years can be attributable to the air fare rise of about 10 times in 1990 as well as the striking abandonment of domestic air flights by LOT. Warsaw Airport handled one half of the total domestic passengers, reflecting the hub and spoke network structure with Warsaw being the hub.