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# ARGUMENTA OECONOMICAE

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## **THE LINKAGES BETWEEN TRADE AND ENVIRONMENT. A CASE OF POLAND**

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The authors of the paper try to highlight the most important interlinkages between Poland's foreign trade and the state of the natural environment. They analyse both the influence of international environmental agreements on Polish exports and imports and the bearing of trade upon environmental quality. Special attention has been paid to the ecological aspects of trade relations between Poland and the European Union and, within this analysis, to environmentally disadvantageous changes in the structure of Polish exports to and imports from this international economic organization.

The paper has been mostly based on findings of vast empirical investigations carried out by the authors within their report („The Linkages Between Trade and Environment. A Case of Poland”) prepared for the United Nations Conference on Trade and Development. The authors express their thanks for the permission to use excerpts from this Report.

### **1. TRADE-ENVIRONMENT SUSTAINABLE DEVELOPMENT**

1. The liberalization of foreign trade creates new dangers to the state of natural environment in both post-socialist and developing countries. It is commonly emphasized that international trade leads to the emergence of specific buffers between countries accumulating goods and wealth and those manufacturing them, particularly at early stages of production processes within which an extensive use of natural resources and environmental degradation takes place. This phenomenon has been noticed by the World Commission on Trade and Development that suggests (in the Brundtland Report) new measures of incorporating environmental externalities into trading channels.

2. There occurs a visible tendency in the group of less developed countries, including the economies in transition, to be more and more dependent on the production of „anti-ecological goods”. It is enhanced by the system of

tariffs in OECD countries and the general structure of international commodity trade. This danger may be also imminent for Poland. Some analysts draw a conclusion that developing countries subsidize, in a sense, industry and consumers in OECD countries. As indirect subsidies can regard savings in environmental protection costs, these highly developed economies achieve through imports from developing countries having less stringent environmental technology and products standards or even imposing no such regulations on production of environmentally harmful products. It is estimated that at the beginning of the eighties those relative savings amounted to about USD 6.5 billion yearly. (Czaja, Jakubczyk 1993, pp. 387-398).

## 2. EFFICIENCY-ENERGY ENVIRONMENTAL GAP

3. Besides general circumstances on international markets, this is also the development level and efficiency of Poland's economy, as well as the state of natural environment which influence the international trade competitiveness of the country. The „efficiency-energy environmental gap” was accruing in Poland for many years in the post-war period. Its underlying causes are:

- domination of state-owned enterprises in the Polish economy which under circumstances of soft money-budget constraint had to lead to a high raw material and energy intensity (Kornai 1985),

- accelerated capital accumulation with focus on the development of fuel-energy sector and metallurgy,

- excessive and frequently wasteful exploitation of natural resources,

- strengthening economic links within the CMEA, based on the assumption of raw material/energy self-sufficiency and supply-oriented development strategy of fuel-energy sector,

- rapid urbanization together with the ecologically disadvantageous tendency to locate or to develop towns in the close vicinity of big industrial complexes.

4. The whole economy was subordinated to detailed and obligatory central planning, as well as strictly related to political and ideological factors. All this resulted in the model of central, extensive and environmentally unfriendly pattern of economic development in Poland. Its main features were quickly growing production costs and energy consumption.

5. The growth of energy and raw material consumption was considerably higher than that of national income; particularly in the sixties and 1979-1982. At the end of eighties, the rate of decrease in energy use was, in turn, smaller than that in the national income which meant a still high level of energy intensity of Poland's economy.

There were many factors leading to the high energy and raw material intensity of the Polish economy. These are: raw material and energy pricing system, growing energy costs in particular branches, waste and inefficiency in many technologically and economically outdated mines, low energy supply elasticity and a quite peculiar structure of primary and final energy use. All those factors taken together with the autarky development pattern of fuel-energy sector (finding its expression in the lack of any adequate reaction on experiences of the first and second oil crisis), explain why Poland fell into the vicious circle of energetic-ecological destabilization.

6. When analyzing the structure of production and consumption of energy carriers in Poland, some alarming tendencies may be noticed. Whereas in many countries the structure of energy carriers production is strongly linked to energy resources they possess, the structure of energy consumption reflects not only deliveries of energy carriers from domestic sources but also follows economic tendencies on the world energy market. At the same time, it expresses ecological dangers that are connected with the use of specific fuels and consequences of R&D activities in the domain under consideration. Hence, the energy consumption structure becomes an essential coefficient of technological advancement and energy safety of a given country. When looking from this perspective at Poland's energy production and consumption, the conclusion should be drawn that there prevail, both environmentally and economically, disadvantageous tendencies. Poland belong to a group of very few countries whose economies depend extremely heavily on solid fuels consumption (comparable shares only with China and the Republic of South Africa). Besides that, Poland is characterized by a very stable structure of fuel mix in the last thirty years. Within the same time period, there was a remarkable tendency in most highly developed economies for crude oil, gas and non-conventional energy source to grow (in both absolute and relative terms). The Polish economy was showing a quite opposite trend of almost constant and very high share of solid fuels (hard coal and lignite) in the structure of primary energy carriers.

A high share of solid fuels is not the unique factor underlying the high energy intensity of the Polish economy. Other important reasons bringing it about can also be listed:

- disadvantageous, energy-intensive structure of industry,
- obsolete and energy-intensive industrial technologies,
- inefficient organizational system of the electroenergetic system resulting in the lack of incentives to rationalize energy consumption,
- errors in the common energy policy of the former CMEA,
- low efficiency (in terms of the scope and implementation of environmental standards and regulations) of the state environmental protection policy.

7. An important and still not elucidated problem is the negative bearing of cooperative links within the CMEA upon the economy of its member countries. The most important feature of this integration organization was the strict connection of particular national economies with the Soviet economy. It also meant their dependance on deliveries of crude oil and gas from the former USSR. To this order an extensive system of technical infrastructure (gas and oil pipelines) and financial settlements had been developed. Settlement were based on the so-called transfer rouble (a kind of accounting currency) and excluded national economies of member countries from trends and tendencies in the world market of energy carriers. Owing to that, the energy autarky of individual countries had been toughened. The system concerned resulted also in the minute diversification of energy carrier supply which reduced the energy elasticity of member countries' economies and their energy safety. The consequences of the former CMEA are of a very persistent character. Many years have to pass and big investments in the sphere of technical infrastructure are indispensable to overcome the economically and technologically disadvantageous links that have been created through the energy policy followed over four decades by the CMEA.

### 3. GENERAL FEATURES OF POLISH FOREIGN TRADE

8. At the end of 1989 Poland started the process of transition from a centrally planned to a market economy. This process has comprised all the spheres and sectors of economic life, including the sphere of foreign economic relations. A possibility of system transformation in the field of foreign economic cooperation was and still is negatively influenced by Poland's economic structure. The main features of industrial production are the domination of heavy and war industries, a high monopolization level, obsolete technological equipment and the small innovation propensity. Polish industry was also extremely energy and raw material intensive which, jointly with the high direct pollution intensity, had to lead to its huge ecological arduousness. The sector concerned was also characterized by the bad quality level of most goods produced and, subsequently, their very low competitiveness in international markets. Except for a part of heavy industry that specialized in deliveries to CMEA countries, there were generally lacking export oriented industrial branches. In foreign trade policy exports activities were considered to be not a manner that leads to increased markets and, as a consequence, to achieving economies of scale but merely a way to obtain convertible currencies that were indispensable for securing the most urgent import needs. This approach

towards foreign trade resulted in constant payment difficulties and trials to overcome then through launching so-called anti-import production.

9. The main foundations of the overall transformation of Poland's economic system have been created by the world-famous Balcerowicz program. The most important systematic international cooperation related elements of the program concerned was the introduction of internal convertibility of Polish national currency (on January 1, 1990 at the rate of Zl 9,500 per USD 1, Zl 0.95 per USD 1 after denomination) and passing laws and regulations that meant the practical elimination of most export and import restrictions; the introduction of liberal foreign trade. The cancellation of state monopoly in the sphere of currency turnover gave enterprises a possibility to keep direct economic relations with foreign partners thus creating opportunities to compare domestic and world market prices. In order to achieve price comparability, it was also crucial to cancel subsidies to most goods and services. It has also to be added that Poland's openness to free commodity turnover was accompanied by the removal of barriers hampering the inflow of foreign capital into Poland.

10. As a result of the positive assessment of the above-mentioned changes by the international community, Poland retrieved its ability to apply for and to obtain loans from foreign public sources. The total sum of such loans granted to Poland in the years 1990-1992 amounted to USD 7 billion (measured in terms of credit lines launched). The actual use of credits was, however, significantly lower because most credits have not been granted on preferential conditions and, furthermore, there appeared troubles to absorb them on domestic markets.

11. One advantageous change in the external conditions of the performance of Poland's economy is the gradually more open access to markets of highly developed countries. An event to be particularly worth noting here is the Agreement on Association with European Communities that is aimed at establishing a free trade zone in industrial goods turnover and a partial liberalization of agricultural trade between the signatories before the year 2002. The agreement concerned was also a base for negotiations with EFTA countries that ended in the agreement initialled in November 1992.

12. Apart from those positive changes in external conditions that are basically a consequence of the new political attitude of the international community towards Poland and supporting deep social-economic reforms in our country, there are also phenomena in Poland's external political environment that constraint possibilities of foreign economic cooperation. These are, first of all: the decay of the former USSR, the dissolution of CMEA and the reunification of Germany. All of these events meant to Poland breaking off traditional specialization and trade links of numerous Polish enterprises to

partners from former CMEA countries and, above all, from the former Soviet Union. It also meant an urgent necessity to create a new settlement system and a revised general framework for trade relations between „old” and „new” CEE countries.

13. It is crucial to stress that all the system changes taking place in Poland opened for Polish enterprises a quite new opportunity to buy directly (without the compulsory intermediary of state owned foreign trade enterprises) machines, spare parts or raw materials abroad. Owing to a generally higher quality and technology level of most imported goods, imports became an important factor contributing to the economic and technological modernization of many Polish enterprises.

An important and formerly not existing function of foreign trade was breaking down the hitherto monopolistic position of numerous inland producers. Even if deliveries of imported goods did not contribute sometimes to most desirable goals (e.g. falling price or better quality of domestic products), the very appearance of foreign commodities on Polish inland markets constitutes a factor that influences behaviour patterns of Polish producers.

The next function of foreign trade in the period concerned consists in creating for Polish enterprises possibilities to offset their losses brought about by shrinkage of inland markets due to tough monetary and fiscal policy. In the years 1990-1992 there took place in Poland a dynamic growth of export by the simultaneously decreasing GDP.

14. A liberal approach towards foreign trade (that has been commenced within the Balcerowicz program) found its expression also in the trade policy and, above all, in setting up very low tariff levels. Before starting the system transformation in Poland, the weighted average for tariffs on industrial goods amounted to 18.3 percent, whereas between March 1990 and July 1991 this average fell to the 5.5 percent level (Bartoszewicz 1993). A renewed tariff increase to be observed in the middle of 1991 was caused by the temporary worsening of trade balance and the aim for possessing higher tariffs before concluding negotiations on the Treaty on Association with the European Communities. An additional reason for that were also renegotiations of Poland's status within GATT. Moreover, it is worth emphasizing that the growth of tariffs should be viewed against a background that Poland uses merely to a marginal extent (in comparison to Western highly developed countries) non-tariff trade barriers.

15. The geographical structure of Poland's foreign trade changed principally in the last few years. A continuously declining share of CEE countries was being accompanied by a growing share of Western European countries. As early as in the middle of eighties the share of EC countries was only ca. 23% in exports and ca. 20% in imports. It achieved a level of 47%, and, for

imports, 46% already in 1990. Those figures increased further to 58% and 53% in 1992. The share of CEE countries fell from 21-22% in 1990 to merely 15-16% in 1992. It has been chiefly caused by a substantially decreased scale of foreign trade with former Soviet states. It is also worth noting a still relatively low share of EFTA countries in the Polish foreign trade despite changing its geographical structure (a shift from East to West).

#### 4. ENVIRONMENTAL ASPECTS OF INTERNATIONAL TRADE/COOPERATION AGREEMENTS WITH FOCUS ON ASSOCIATION WITH THE EUROPEAN UNION

16. It is obvious that EU environmental legislation and regulations influence nowadays and will be affecting in the future the volume and structure of Polish exports to and imports from the EU. It is however worth noting here that the harmonization of Polish environmental law with the European environmental law and, in particular, with EU emission, technological and product standards, will essentially influence the competitiveness of the whole Polish foreign trade. The process of harmonization has to be implemented in a very deliberate manner, with the adoption of precise strategy and range of bringing the Polish formal-legal procedures closer to their EU counterparts, as well as with taking into account general economic conditions of the transformation of the Polish economy, particularly by the harmonization of emission and ambient air/water standards, which should result in working out the cost-effective harmonization strategy.

The range of choice within the above mentioned process is relatively large, because the Treaty on Association speaks only of „likening legal procedures”, not defining the scope and rate of bringing Polish environmental legislation nearer to that of the EU. It is connected with the subsidiarity principle that is the most important foundation of the whole joint environmental protection policy of the Community.

17. It is crucial to be fully aware that the harmonization of Polish legal solutions with EU environmental protection legislation and standards and subsequent economic outcomes of this process makes a very important but not the only dimension of ecological relationship between Poland and the European Union. Another and much more important dimension of this relationship is connected with the ecological consequences of establishing the European Single Market. From the Polish perspective, it has to be particularly emphasized the increased transboundary pollution and, subsequently, deposition of air pollutants (mostly SO<sub>2</sub> and NO<sub>x</sub>) that will be (very likely) brought about by

the globally increased consumption of fuels and energy and a significant intensification of international road freight traffic in conjunction with the commonly expected acceleration of economic growth due to the development of the European Single Market.

18. The harmonization of Polish environmental law and standards gives rise to very serious, both direct and indirect, economic consequences. It encompasses the increase in current costs of environmental protection in Poland (direct outcomes) and the bearing upon general conditions of performance of Poland's economy and upon the competitiveness of specific branches, enterprises and products on domestic and foreign markets in particular. As the German Institut für Wirtschaftsordnung estimates, the overall costs that Poland would bear in order to achieve the environmental quality comparable to that corresponding to EU standards would have amount to ca. \$ 30 billion (by the current yearly expenditures of appr. \$ 1 billion). According to estimates that have been carried out by Polish analysts, to achieve in 1998 emission standards for SO<sub>2</sub>, NO<sub>x</sub> and dusts from the 1990 ordinance of MEPNR&F on the fuel combustion in the energy sector, ca. \$ 5-10 billion (depending on the emission abatement scale) would have to be spent (Czaja et al. 1995). It is at the same time obvious that it will result in increased costs and prices of electricity; 10% on average and up to 100 % (for costs) in some thermal power plants. Though the implementation of standards under consideration would make their level comparable to that resulting from the EU directive on big combustion facilities, it could be insufficient in the context of planned total emission plafons to be achieved by particular member countries in 1998 and, subsequently, 2003.

19. The previously mentioned harmonization process of Polish environmental law and standards proceeds parallel to the unification of many kinds of standards and norms within the Community which generally results in introducing more rigid natural environment related technology, product or emission standards. It is very likely that a part of Polish exporters will not be able in the short run to meet those standards and thereby will loose the Community's markets. Hence, the standards concerned may act as non-tariff barriers in the trade relationships between Poland and the EU.

With a view to future full membership in the European Union, Poland has to watch carefully ecological consequences of integration processes within the Union and manners of solving environmental issues as well. It relates, particularly, to such outcomes of creating the Single European Market as: abolition of commodity control on state borders, liquidation of technical trade barriers, establishing the open market for government orders, liberalization of service markets, developing the internal energy market and harmonization of taxes. Anticipating potential ecological problems that may result from all of these

processes, Poland should undertake preventive activities, paying special attention to respective legislative initiatives. The processes concerned require also to undertake investment activities in order to create the technical infrastructure that would enable Poland to enter the European Union in the future.

20. An essential part of Polish export to the Community are low-processed goods whereas Poland's import from this economic zone consist mostly of high-processed merchandise characterized by a big share of value added and low energy intensity. This exchange pattern brings about the generally low efficiency of Poland's export. It is additionally reduced by the high raw materials and energy intensity of the whole inland and export production. One should also emphasize that many Polish export commodities are regarded as „vulnerable” and are subject to various non-tariff trade barriers. They have also confronted the strong competition with export products of other CEE countries.

The raw materials and agricultural specialization of a given country can not be considered to be wrong itself, providing the adequate utilization of its benefits. This is, however, very difficult at the end of this century. Firstly, most unprocessed mineral and agricultural commodities are showing unfavourable price trends on international markets. Secondly, the quantitative level of very important natural resources in Poland seems not to stimulate the long-term development of raw materials production. Thirdly, in the short-to-medium term the ownership and employment structure in Polish agriculture makes it rather impossible to reduce essentially unit production costs which, in turn, will not allow for achieving competitive advantages by Polish food producers vis-a-vis EU farmers.

21. In March 1991 Poland concluded the agreement on reduction of its foreign indebtedness being subject to guarantees by governments belonging to the so-called Paris Club. The agreement concerned relates to the debt of total value of \$ 33.3 billion. The Agreement provides for a possibility to diminish further the Polish debt by 10% through changing a respective debt sum for investment projects in the sphere of the protection of natural environment. The practical implementation of this debt-for-environment-swap however, requires Poland to conclude agreements with the governments of Paris Club member countries. Hitherto, such agreements have been signed by the U.S., France and Switzerland. Respective negotiations with Italy should be finalized soon. The government of Great Britain expressed quite recently (April 1994) its willingness to sign the debt-for-environment-swap agreement with Poland. Denmark and Belgium declared, in turn, their disinterest in concluding an agreement of this kind with our country. Within the Paris Club, the first agreement on partial conversion of Polish debt for environmental protection was concluded with the U.S. Government that took decision on the „eco-con-

version" of \$ 360 million. The agreement obliges the Polish government to transfer the equivalent of that sum in Polish Zloty on the account of „ECO-FUND" that has been established in order to administer programs and activities to be financed within this debt-for-environment-swap operation. Payments are made on the annual basis (up to the year 2009) (cf. unpublished elaboration of the „Eco-Fund").

The „eco-conversion" may serve to use the foreign debt as an incentive of foreign trade development. With respect to the bilateral character of debt-for-environment-swap agreements, directions of investing „eco-converted" money are usually strictly defined. As a rule, it is used for purchase of technologies, machines and equipment in the creditor-country.

22. Another source of promoting international trade through launching undertaking aimed at the protection of natural environment is the direct foreign assistance. The scope of such assistance granted to Poland in 1989-1992 amounted to \$ 250 million. Besides that, Poland received \$ 33.5 million of preferential credits. The biggest creditors were: European Community, the U.S., Sweden, Germany and Denmark (Stodulski 1994). As requested by donors, the assistance concerned is being devoted to the transfer of organizational and engineering knowledge, carrying out general programs, studies and investigations, education and training, as well as purchasing modern measurement equipment and pilot installations of modern control technologies. The latter are to serve as demonstration projects and should contribute to widening the scope of transfer of efficient pollution abatement equipment from donor-countries.

## 5. INTERNATIONAL ENVIRONMENTAL AGREEMENTS AND THEIR CONSEQUENCES TO POLAND

23. An essential component of international cooperation in environmental protection became treaties and conventions that are concluded on a voluntary base but, afterwards, they create the transnational environmental (ecological) law. Poland is a signatory of about 40 such conventions. Considered from the standpoint of their impact on the international trade, the most important of them are:

- Gdansk Convention of September 13, 1973 on the fishery and protection of biotic resources of the Baltic Sea (it came into power in 1974);
- Helsinki Convention of March 22, 1974 on the protection of marine environment of the Baltic Sea area (it has been binding for Poland since 1980

but the 1992 amendment to this Convention from 1992 has not been ratified by Poland yet);

- Geneva Convention of November 13, 1979 on distant transboundary air pollutions (binding for Poland since 1985);

- Washington Convention of March 3, 1973 on international trade with flora and fauna endangered species (binding for Poland since 1990);

- Vienna Convention of March 22, 1985 on the protection of ozone layer, jointly with the Montreal Protocol of September 14-16, 1987 on substances degrading the ozone layer, that is binding for Poland since 1990;

- Basel Convention of March 22, 1989 on controlling the transboundary movement of hazardous waste and their neutralizing (it has been obligatory for Poland since 1992).

Poland signed and will soon ratify the following agreements:

- Espoo Convention of 1991 on the Environmental Impact Assessment in the transboundary context;

- Helsinki Convention of 1992 on transboundary effects of industrial catastrophes;

- Nairobi Convention of 1992 on Preserving Biodiversity;

- United Nations Framework Convention of 1992 on Global Climate Change (Rio de Janeiro);

- Amendments to Montreal Protocol on substances degrading the ozone layer (London 1990 and Copenhagen 1992).

Poland intends to enter the following agreements:

- Bonn Convention on protection of migrating species of wild animals;

- Bern Convention on the protection of European wild-life (1979);

- Sofia Protocol of 1988 to the 1979 Convention on distant transboundary air pollutions. The Protocol concerned relates to the abatement of NO<sub>x</sub> emission and their transboundary translocation;

- 1991 Protocol to the 1979 Convention on distant transboundary air pollutants. This protocol refers to the abatement of emission of airborne organic compounds and their transboundary translocation;

- Second Sulphur Protocol to the 1979 Convention on distant transboundary air pollutions. It relates to the reduction of SO<sub>2</sub> emission;

- Convention on the protection of the Odra River from pollution.

Poland signed (but has not ratified yet) two conventions during the World Conference „Environmental and Development” in June 1992, in Rio de Janeiro. These are:

- Convention on preventing from global climate changes,

- Convention on protecting the biodiversity.

The global Action Programme for XXI Century (AGENDA 21) that has been approved in Rio de Janeiro, outlines the main directions of activities between 1993-2000. The Programme concerned points out, among other things, the need to take into account ecological constraints resulting from the Agenda 21 in the development of world trade.

24. International environmental conventions are generating common activities and actions to prevent from international or even global environmental dangers. Poland's broader participation in international conventions started only after 1990. In the previous period, Poland was taking part in many international bodies working on ecological conventions, protocols etc. but did not usually ratify those of them that imposed specific environmental obligations. Such an attitude was partially determined by political factors. It seems, however, that it had much more to do with a view that Poland was unable to meet requirements resulting from specific international ecological agreements. An active participation of our country in the implementation of numerous of these agreements to be observed since the very beginning of the 1990s, means also to Poland a duty to harmonize its internal law and legislation system with international standards, as well as to facilitate the access of international community to environmental quality related information and data. The process of creating laws and regulations that would fulfil Poland's international ecological obligations is, however, at the very beginning. Therefore, it is hard to indicate examples proving the influence of ecological conventions on Polish foreign trade.

25. From among international ecological agreements Poland has ratified only a few have a direct bearing upon the current performance of Polish foreign trade. These are:

- Basel Convention of March 22, 1989 on controlling the transboundary movement of hazardous waste and their neutralizing,
- Espoo Convention of 1991 on the Environmental Impact Assessment in the transboundary context,
- Vienna Convention of March 22, 1985 on the protection of the ozone layer, jointly with the Montreal Protocol of September 14-16, 1987 on substances degrading the ozone layer,
- Sea Law Convention signed during the 3rd UN Conference on the Sea Law (December 1982), Montego Bay in Jamaica).

The Basel Convention resulted in the amendments to the Polish law on protecting and shaping the natural environment consisting in the total prohibition of bringing from abroad hazardous wastes into Poland. The amendments concerned allow only for importing non-toxic/hazardous wastes to be used, within individual permits and under certain conditions, for strictly defined economic purposes. Branches that have been particularly affected by restric-

tions concerning the waste export and import are the wood-paper and metallurgical industries.

In accordance with the resolutions of the Basel Convention, the transit of hazardous wastes has been covered with Polish legal regulations. In every case this transit requires the permit of the Chief Inspector of Environmental Protection to be obtained. The permit can be issued only when the respective regulatory bodies of a country importing a given hazardous waste agreed to receive it.

26. An example of a domain within which the ratification of international ecological agreements has predominantly negatively influenced the Polish foreign trade is fishery. The introduction of a 200 mile „exclusive economic zone” by most maritime countries resulted for Poland not only in the essential decrease of its exports revenues from selling fish and fish products but also in tremendous costs of reconstruction of its fishing fleet.

## 6. ENVIRONMENTAL CONSEQUENCES OF POLAND'S PARTICIPATION IN FOREIGN TRADE

### 6.1. Extraction/production and Processing of Major Natural Resources and/or Raw Materials Exported by Poland and their Environmental Consequences

27. Not taking into account ecological effects, in their regional or country-wide dimension, there were attempts in the seventies to make Poland the greatest world coal exporter. In the first half of this decade coal exports reached a magnitude of ca. 40 million tons and Poland became the second-biggest hard coal exporting country. In the 1980s, despite a radical change of political elite, a new program of coal extraction development had been elaborated. Both general economic difficulties of that time and the countervailing power of other groups of interests that started emerging in the eighties, including country-wide and regional ecological lobbies, made the implementation of that program impossible.

The hard coal export was falling in the whole period of economic system transformation in Poland. The respective figures in millions of tons a year amounted to: 1989 – 29, 1990 – 19.5, 1992 – 16.4 (*Handel zagraniczny...* 1991). The foreseen (in some development scenarios of hard coal mining) extraction of about 90 million tons in 2000 would enable exports of ca. 15 million tons to such countries as the Czech Republic, Slovakia, Austria and

Germany (in the case of Germany mostly to the new Bundestates). It is simultaneously highly probable that Poland will import a few millions of tons of hard coal yearly as a procurement for power plants and district heat systems situated in northern territories of the country (Gdansk and Szczecin regions).

28. Hard coal belongs to Poland's most important export products. In 1992, ca 15% of domestic coal production has been exported which made 6.8% of the total value of Polish export. Taking into consideration a high ecological burden of hard coal branch to the environment, any change in the coal export level will influence the state of the environment. Ecological and qualitative claims of receivers of Polish hard coal will force the branch concerned to take specific environmental protection activities. This, in turn, will have a positive bearing upon the quality of Polish hard coal, including that being used within the country. On the other hand, an excessive and determined by export needs extraction of coal would lead to the toughening of raw-material oriented and, subsequently to that, ecologically disadvantageous structure of Polish exports. It would also mean reduced opportunities to use foreign trade as the lever of the country's economic development and structural-technological changes. With a view to both the benefits and dangers connected with growing coal export, the decline in its level should be rather recommended.

Speaking of hard coal export possibilities it is crucial to emphasize that already nowadays inland prices for coking coal and fuel coal for thermal power plants are higher than respective world market prices. In the future, the increasing competition of cheap coal being extracted in strip mines in the US, Columbia, Indonesia and other countries has to be taken into account.

29. Another exceptionally important Polish export branch is the non-ferrous metals industry. Over 50% of the copper production is exported; 58.7% in 1992. Partly processed copper, copper products and copper wastes constituted 6.4% of Poland's export (in value terms) in 1992. This share remained constant in spite of disadvantageous price movements on the world copper market in the next year. Also zinc and lead are exported in big quantities. In 1992 46.7% of zinc and 32.9% of lead production had been exported. A respective figure for aluminium amounted to 55.8% in 1992 (*Handel zagraniczny...* 1993). In comparison with copper, the share of zinc, lead and aluminium in the value of Polish export is not significant. Taken as a whole, the non-ferrous metal branch contributes substantially to the deterioration of natural environment in Poland. It is mostly connected with a big accumulation of solid waste (post-flotation sludges and slams, in particular) and big quantities of air pollutants (SO<sub>2</sub>, CS<sub>2</sub> and other) emitted in the first stage of copper processing (copper mills).

30. Another raw material with a high share in Polish exports is sulphur. In the last years over 90% of domestic sulphur production was exported, with a share in export value reaching 1.3%. Development perspectives of sulphur extraction are, however, weak because highly developed countries obtain most sulphur mostly from desulphurization facilities which makes the demand on sulphur on the world market fall. It is a very interesting example of the paradox that certain kinds of environmental protection activities in some countries can contribute to the reduction of mineral resources extraction in other countries.

## 6.2. Industrial Pollution with Relation to Manufactured Exports Goods (Selected Examples)

31. Polish exports consist of goods characterized by different procession level. In each manufacturing industry one can indicate products that are only slightly processed. Quite the contrary, in some industries of raw material character there appear goods that should be numbered among manufactured ones; e.g. rolling steel products in the metallurgy. For some goods there also takes place a strict connection of place and production technology with the location of raw material extraction; for instance in non-ferrous metallurgy. For all of these reasons we should treat the distinction between raw material and manufactured (processed) goods as a rather conventional one.

So far as the manufacturing sector in the approach of official state statistics is concerned, the highest export share show following branches: metallurgy (16.8%), electro engineering industry (24.3%), chemicals (12.1%) and foodstuffs industry (9.8%) (*Handel zagraniczny...* 1991). Within all the above-indicated industries there are no single products whose share in the Polish export is visibly predominant.

32. From among goods produced by the electro engineering branch the 1%-threshold of export share exceed metal goods (5%), means of transportation (8%), energetic machines and facilities (1.6%) and electronic and precise mechanics goods (1.2%). In the context of average energy intensity in Polish economy those goods are characterized by a low energy intensity, ranging from 26 kWh/million ZI of net commodity production (precise mechanics branch) to 56 kWh/million ZI (energetic machines and facilities). The share of real costs (including fuels/energy) is diversified: precise mechanics goods – 34.2%, energetic machines and facilities – 37.8%, metal goods – 46.9%, means of transportation – 53.7% and electronics – 56%. (Authors' own computation based on data from statistical yearbooks and Central Statistical Office.) An unexpectedly high share of real costs in the last branch results

from the extensive contribution of imported materials and semi-products to the value of final goods manufactured by the Polish electronics branch.

In general, products exported by the electronics and other parts of electro-engineering industry show a low energy intensity and use materials/semi products of high procession level. All this means that the exports of branch concerned do not contribute significantly to the deterioration of the environment. The production of electro engineering branch is also characterized by low, compared to other industries, pollution intensity with regard to main air/water pollutants. From among products being manufactured and exported by the electro engineering branch only metal products show a relatively high, but still by two times lower then the average for industry as a whole, pollution intensity.

33. Among the manufactured goods of metallurgical industry, hot rolling products (4.1 %) show a high export share. Their exports amount to ca. 30% of inland production. This production, in turn, is characterized by a high, two times bigger then the average for the whole industry, energy intensity (140 kWh/million Zl of net commodity production), as well as by high actual costs. It is also important that these costs are determined by the consumption of materials and semi products that are also pollution and energy intensive; particularly in terms of electricity and thermal energy use. All this has to lead to the conclusion about the very high indirect pollution intensity of export of rolling products. As for the direct pollution/energy intensity, it differs for particular pollutants and energy carriers: high, in comparison to the average for the Polish industry, gas intensity, moderate dust and solid wastes (with regard to waste generation) intensities whose level was only slightly higher then the average for industry. Generally speaking, due to the high energy, gas and raw material intensity of the rolling products generation, their export is connected with the substantial deterioration of the environment.

34. The chemical industry shows very high values of export-to-production coefficients. These are some examples for the year 1992: polypropylen and co-polymers of ethylene – 18%, chemical fibers – 28%, polyethylene – 41%, synthetic caoutchouc – 60%, vinyl polychloride and vinyl co-polymers – 70%. Organic chemicals yielded 2.9% of revenues of Poland's export in 1992. Respective figures for other product groups of chemical industry in the same year amounted to: fertilizers – 1.3%, plastics – 1.3%, non-organic chemicals – 1.2% (*Handel zagraniczny...* 1993). From among 26 product groups analyzed in the Report, organic chemicals, fertilizers and plastics are the most energy-intensive ones. These products groups are also characterized by the real cost coefficients (including the energy) that are visibly higher then the average for whole industry. In the case of non-organical chemicals this coefficient is close to the average. On the other hand, the direct pollution intensity

of organical chemicals production is extremely high in comparison to other product groups from the set of 26 most important export product groups to which we refer in this section. It particularly relates to the sewage intensity with respect to untreated sewage; pollution intensity by 12 times higher than the average. As for the three above-mentioned product groups of chemical industry, their direct pollution intensity is very high as well; e.g. sewage intensity with respect to purification requiring sewage is by 3 times higher than average for the whole industry.

Without going here into further details concerning the ecological performance of individual product groups of the chemical industry, a conclusion should be drawn that the production and, subsequently to that, export of chemicals contributes strongly to the pollution of the natural environment in Poland.

35. With a view of the share in Poland's total export, the most important products of Polish food industry are fruit products, vegetables and mushrooms (the joint export share of them amounts to ca. 2%), dairy products (ca. 2%) and meat products (ca. 1.5% excluding poultry) (*Handel zagraniczny...* 1991). Only in the case of fruit, vegetable and mushroom preserves one may speak of export specialization, because within this product group the share of export exceeds 1/3 of domestic production value. For the two remaining product groups this share is below the 10% level. The energy intensity of production of all the above-mentioned goods is very low. The raw material intensity is, in turn, high but it is connected mostly with agricultural products whose ecological arduousness is predominantly insignificant. The direct pollution intensity is also low, except the sewage intensity of creamery. Some dairies, and particularly those located in the vicinity of small rivers, may create environmental dangers on the scale of local communities. In general however, the exports of creamery products contribute to a very limited extent, as compared to other export products of Polish industry, to the pollution of the natural environment.

36. The light goods industry yields 8.5% of export revenues. From among its export goods, the following product groups exceed the 1% share in total value of Polish exports: clothing (3.9%), leather products (1.6%), knitting and hosiery products (1.5%) (*Handel zagraniczny...* 1991). The clothing and leather branch is characterized by the lowest (in the whole industry) energy intensity (12 kWh/million of net commodity production). The energy intensity of knitting and hosiery branch is also low, not reaching the 50% level of this coefficient for the industry as a whole. Also the raw material intensity of knitting and hosiery branch is below average for industry. A different situation is to be observed in the clothing and leather branch whose raw material intensity is higher than the level of this coefficient for the whole industry. Since

they, however, use mostly imported raw materials and semi products, their indirect ecological arduousness remains low. The direct pollution intensity of clothing branch is also insignificant and much smaller than the average for industry. With a view to above-mentioned features of ecological performance of particular branches of the light goods industry, the conclusion about small ecological harmfulness of export of this industry can be drawn.

37. The share of wood-paper industry in the Polish export amounts to 7.6% of which the most significant are furniture and joinery products (3%), sawn timber and sawmill products (2%). The export-to-inland production ratio amounts to 43% in the first product group and 32% in the latter one (*Handel zagraniczny...* 1991). The energy intensity level in both groups is relatively low, whereas the raw material intensity is above average for the industry as a whole. It should be emphasized that in almost all the technological processes within the industry concerned, raw materials are used whose production/extraction is connected with the emission of toxic air-and-water-borne substances. It relates, above all, to the production of the following raw materials for the furniture branch: polyurethane foam, joinery boards (e.g. fibreboards), glues and varnishes. It is crucial to emphasize that the production and deliveries of sawn timber and some joinery products (particularly, the so called „Euro-pallets” and wainscot) for foreign receivers contributed within the last two years to the extensive tree cutting in privately owned forests. According to the General Directorate of State Forests, in this time period over 4 thousand ha of private forests have been cut down and more than 15 thousand ha excessively thinned out. The waste intensity of sawn timber and sawmill products manufacturing exceeds the average for the industry as a whole, whereas the sewage intensity is ca. 1/3 lower. Additionally, the production of sawn timber and sawmill products is usually connected with a high noise level. As for the furniture and joinery production, the level of dust emission is close to the mean value in industry, whereas the sewage and gas intensity is lower than in the industry as a whole. When taking into account both direct and indirect influences on the natural environment, the export of furniture, joinery products, sawn timber and sawmill products should be regarded as an activity that contributes essentially to the pollution and deterioration of the natural environment in Poland.

38. The share of mineral industry in Polish exports amounts to ca. 3% of which 1.5% is the contribution of construction materials and 1.2% of glass products. The export-to-production ratio for the first product group is ca. 17% and for the latter one ca. 47%. From among exported construction materials, slightly 50% constitute the cement and clinker (*Handel zagraniczny...* 1992). The production of construction materials is characterized by a high energy intensity (56% bigger than the average for industry). The same

coefficient for glass and glass products caimates the average for industry. The raw material intensity of both products groups under examination is relatively small owing to the fact of using cheap domestic raw materials. The gas, dust, sewage and waste (with regard to sewage generation) intensity of construction material production is much higher than respective intensities for the whole industry. Glass production brings relatively small dangers to the natural environment, except the airborne emission of fluorine by the glass mills which aggravates local air quality. Generally it can be stated that the production and export of construction materials, and cement in particular, is connected with a high environment load, whereas the export of mostly labour-intensive glass products contributes to a relatively small extent to the pollution of environment.

Almost 60% of cement production in Poland is based on the so-called wet technology that is by over three times more energy intensive then the dry one. Within the next ten years a complete technological reconstruction of the branch under consideration will be implemented, thus leading to the overall abandonment of wet technology. It will enable the cement branch to diminish the energy intensity and the cement and clinker related dust emission by 70-80%. Subsequent benefits consist in the decline of fees paid by the emission of airborne pollutants, reduction of production costs and increased export possibilities.

39. So far as the export of field and meadow plants, as well as breeding products, is concerned, lowly processed products prevail. In the group of breeding products (1.8% of total value of Polish exports) a half of export revenues comes from the sale of live horses. From among other products in the group under consideration, the export of geese and lambs (up to 20 kg) is also of key significance. As for field and meadow plants, the most important export products are potatoes and grains. The export of potatoes is relatively stable (ca. 4% of their production), whereas the foreign sale of grains is subject to essential fluctuations. As compared to the Western Europe, the energy intensity of Polish agriculture is low. The consumption of electricity amounts nowadays to ca. 67 kWh/million of agricultural commodity production (below the average for the whole industry). There are missing data about the current pollution intensity of Polish agriculture. According to findings of some examinations, in the 1980's the share of agriculture in the pollution of surface waters was considerable. It was connected, first of all, with the excessive use of fertilizers and their wash-away from the soil into rivers and lakes, as well as with the pollution of surface waters with liquid manure from big pig farms. It seems to be justified a statement, that after the currently observed radical decline of fertilizer consumption, the collapse of breeding in big farms and the equipment most of them with sewage treatment facilities

(and installations for solid waste utilization) the actual sewage intensity of Polish agriculture is relatively low.

A low (as compared to the average for EU countries) consumption of fertilizers and pesticides and, on the other hand, the opulence of relatively cheap manpower in the Polish rural population, create potentially favourable conditions for the development of „ecological (green) agriculture”. The future opportunities of exporting „green” agricultural products to highly developed countries have to be, however, confronted with (1) lacking professional skills that are necessary in this agriculture and (2) rigid regulations concerning the „green” products in most Western countries.

### 6.3. Improved Management of Natural Resources and More Rigid Environmental Regulations vs. the Competitiveness of Polish Exports

**40.** Introducing more rigid domestic ecological standards and regulations and their improved enforcement will inevitably influence conditions of production of many goods being exported by Poland. The same is true of bringing energy and raw material prices closer to world market prices. Sharpening of ecological standards is of particular significance to the electro energetic sector. Power plants will have to install before 1999 flue gas desulphurization facilities. Taking German experiences connected with implementing a similar program as a base of calculation of production cost increment, one can expect the production costs in thermal power plants to increase by 30-40%. In the case of overall technological reconstruction of Polish power plants, leading to both the SO<sub>2</sub> and NO<sub>x</sub> emission abatement, the cost increase would be by no doubt higher. For instance, Poland's third-biggest power plant „Turów” (located in the „Black Triangle” area) needs caimately \$ 1.2 billion to carry out such a modernization program. It would allow for a radical decline in SO<sub>2</sub> and NO<sub>x</sub> emission but, most likely, will result in the triplication of current price of electricity being generated by the power plant under examination. It would, in turn, inevitably lead to the overall collapse of electricity export by the „Turów” power plant (the biggest Polish electricity exporter).

The increase in electricity prices due to more rigid ecological standards will also have to influence production costs and prices of many energy-intensive goods and subsequently, their foreign trade competitiveness. Owing to that, the export of the following products may decrease: fertilizers, plastics, organic chemicals, products and semi-products made of non-alloy steel, rolling products, zinkified plates, lowly processed copper products, cement, some building materials, electricity. The joint current share of the above-enumerated products in Polish exports can be estimated at 15%. It is also very

important that in the case of some of those products there exist substantial free production capacities. These are, for instance: steel and copper metallurgy, cement, electricity. Assuming even that better capacity utilization would result in declined fixed costs, higher costs of electricity generation due to tighter ecological standards and their expected better enforcement will most likely disable the branches concerned to increase their exports.

41. Sharpening emission standards and their improved observance will also influence the export of hard coal and hard coal intensive products. Given the 20% reduction in coal production costs upto 2000, the potential level of hard coal export would amount to 25 million tons. Ecological costs of hard coal are estimated at 8-10% of its extraction cost. The internalization of even a part of those costs would make hard coal export unprofitable. On the other hand, the strict enforcement of ecological standards and regulations would have lead to the limitation (or even closing down) of hard coal extraction in some big and technologically up-to-date mines. If all the currently obligatory and to be introduced environmental standards and regulations were really implemented and enforced, then the export of Polish hard coal would have to fall in the year 2000 from ca. 25 to 7-10 million tons. Subsequently, the total value of Polish exports would decline by ca. 2.5-3.5% (Czaja et al. 1995).

42. Already in the near future, the Polish iron and steel industry will be forced to buy coke at higher prices. It results from a necessity to replace the wet methods of coke quenching with dry ones and from new restrictive regulations concerning the emission of air pollutants. The modernization costs of cokeries will be tremendous but they will bring considerable ecological effects consisting in the reduction of atmospheric air pollution by 80-90% in a few years. Since Polish coking coal still remains cheaper than the imported, it is likely that despite increased prices of Polish coke inland receivers decide to buy it further. The most important consequence of higher inland coke price will be the growth of production costs of pig iron and, subsequently, prices of steel and steel products. Other reasons for potential cost increase in the metallurgical branch belongs also the previously mentioned limitation of import of scrap iron brought about by the prohibition of waste import. The relatively high level of scrap iron export has to lead to the increase in price of this secondary material on the inland market and, ultimately, to the growth of production costs of steel products. The program of technological modernization of Polish metallurgy is to reduce within 10 years a number of plants being in possession of the so called raw material installations (e.g. blast furnaces) from 26 to 8. In 12 steel mills only processing installations will be preserved and 6 plants will be shut down. One of the premises underlying the whole program is a high energy, labour and pollution intensity of Polish metallurgy. The implementation of program under examination should result

in reducing disadvantageous ecological influences by 70-80%. Steel production will be 5 million tons lower than its current level. At the same time, production costs are expected to decrease by \$ 20-25 a ton. It will enable the Polish metallurgy to keep the competitiveness in the international market by the simultaneous reduction of state subsidies.

43. Poland ratified the Vienna Convention on the protection of ozone layer and the Montreal Protocol on substances degrading it. It means the complete abandonment, up to 2000, of the following compounds: freons – CFC11, CFC 12, CFC113, CFC 114 and CFC 115, halons – 1211,1301, 2402. Poland is not producing these compounds but their domestic use amounts to 1% of world consumption. Freons can be relatively easily eliminated from aerosol containers. Their removing from the production of polyurethane foams can bring about the temporary cost increase in the Polish furniture branch aggravating this way, to some extent, the export competitiveness of upholstered furniture. Poland's obligation to cease the use of freons in refrigerators, freezers and freezing counters will bring about, at least in the short run, the reduction of export of these products. This is simply due to the fact that Poland is not in possession of own technologies to eliminate ozone layer impairing gases and the purchase of such technologies abroad will be connected with the increase in production costs in the refrigerating industry. For the same reason the production costs of frozen foodstuffs: fruits, vegetables, meat and creamery products can also increase.

#### 6.4. Economic Transition and Industrial Restructuring Related Changes in Imports and Their Environmental Consequences

44. Looking at Polish imports from the point of view of the national economy's restructuring requirements, the analysis of import according to its economic nature (utilization) seems to be particularly appropriate. Over 50 per cent of Polish imports constitute material procurements, whose share show, simultaneously, a tendency to grow. In 1992, ca. 33% of foreign procurement purchases constituted fuels (chiefly crude oil and gas). The share of other products was as follows: – ca. 20% chemicals (organic and inorganic, pharmaceuticals, fertilizers) – ca. 20%, metals and their products (iron, cast-iron, steel, color metals) – ca 10%, plastics and goods made of them and rubber – ca. 9%, wood pulp, paper and cardboard – ca. 7%, textile materials – ca. 8% (in 1993 ca 17%); over 60% of import in this group constitute refining accessories.

The import of investment goods amounts to ca. 17% of import total value in the last three years. Within this group, a relatively high share had machines

and facilities for the light industry – ca. 15%, energetic machines and facilities – ca. 9%, means of transportation and car assembly lines – ca. 10%, computers and computer hardware – ca. 9%, metal working machines – ca. 8%, machines and facilities for ground, construction and road works – ca. 6%.

As regards the import of consumption goods, a dominating share have food-stuffs – ca. 38%, cars – 10%, pharmaceuticals – ca. 14% (jointly with pharmaceuticals for productive purposes), clothing – ca. 9%, sanitation means and cosmetics, electrical home appliances and glass/ceramic products – ca. 4% (*Handel zagraniczny...* 1993).

A constant upward trend for the share of imported material procurement in the procurement as a whole can be explained by many factors. The most important of them are: better quality standards, including also better compliance with environmental standards and regulations, special requirements of foreign receivers of goods being produced in Poland, advantageous exchange rate of U.S. Dollar to Polish Zloty, lower, in comparison to domestic goods, prices of many imported goods, shortage of some products in the internal market and the higher punctuality of imported deliveries.

45. The biggest share in the structure of procurement import have fuels. One of them is gas whose domestic consumption is based in two thirds on import deliveries. For both economic and ecological reasons, there takes place in highly developed countries a tendency to increase the consumption of this primary energy carrier in the electro-energetic and residential sector. The tendency under consideration is also to be observed in Poland which manifests itself in the 20% increased consumption of gas by households in the years 1989-1992, with the total consumption of gas decreased during the same time period (due to the deep economic recession and, above all, as a result of declining gas consumption in the production of fertilizers and steel) by 20%. Both the economic and ecological policy makers in Poland are fully aware of the necessity to abandon the „coal monoculture” in Poland and switch to increased gas consumption so as to double it before the year 2000. In order to achieve such a goal, both domestic gas extraction and its import deliveries will have to increase by 100%. It seems that a natural factor that can accelerate the process concerned is the gradual aggravation of ecological conditions in hard coal mines and, subsequently, the decrease in hard coal price competitive advantage.

Another example of positive bearing of import upon the environment related behaviour patterns of Polish producers are imports of petrols and engine oils. Imported petrols constitute ca. 1/3 of domestic petrol consumption, with a tendency for this share to grow. Growing competition of ecologically highly valuable imported fuels and more and more stringent environmental regula-

tions induce domestic manufacturers to undertaking aimed at the production of ecologically friendly fuels.

46. Of essential significance from the standpoint of influencing environmental quality is car and truck imports. It can be classified as both the procurement (parts and spare parts, components for car assembly lines), investment (trucks) and direct consumption import (cars and car accessories). The growth of import of Western cars and their assembly in Poland as well (FIAT, Opel, Peugeot) leads to a growing share of vehicles being characterized by up-to-date construction and technology, higher technical reliability, lower fuel consumption and – generally – environmentally more friendly features than cars produced hitherto by Polish manufacturers. Simultaneously, it forces them to undertake activities aimed at the modernization of domestic cars; e.g. installing catalytic converters in „Polonez” cars.

The advantageous influence of imported cars on the state of environment would be still bigger if Poland – following Hungarian and Czech solutions - introduced the prohibition of registration of imported cars not equipped with catalytic converters. The current situation in this domain is a result, among other things, of one of the provision of Poland's Treaty on Association with European Communities that allows for several times higher duty-free import of cars without catalytic converters (in comparison to imported cars having installed this facility).

47. The most important component in Poland's import of consumption goods is food-stuffs. There is a common view that most imported food products could be easily substituted with domestic goods. The process of such substitution is being already observed and finds its expression in falling shares of products under examination in the consumption import as a whole in 1992 and 1993. It can be related to the strong competition of foreign food-stuffs which forced the Polish food producers to improve the quality of their products (particularly dairy products and confectionery) and to amend aesthetic features of packings. In turn, a negative outcome of increased import of food products is the accompanying inflow of package waste that, frequently, is very difficult to recycle or to re-use. Also, a relatively high import of sanitation means and cosmetics (8% of consumption import) leads to many harmful ecological consequences.

48. An essential problem to Poland is bringing from abroad non-recyclable packings and products, as well as installing production lines for goods not fulfilling Western European ecological standards; e.g. plastic and metal packings and wash powders containing phosphorus compounds. The problem concerned relates also to the import of used home appliances: refrigerators and freezers containing CFCs.

## 7. ATTEMPT OF OVERALL ASSESSMENT OF ENVIRONMENTAL EFFECTS OF CHANGES IN EXPORT AND IMPORT STRUCTURE

49. Industrial production is the most important source of environmental pollution in Poland. In consequence of that changes in the industrial foreign trade may essentially influence the state of environment. In the three year time period of 1990-1992 one could observe the shrinkage of total share of pollution intensive branches in Poland's import of industrial goods. Whereas the fuel-energy and metallurgical branch decreased their joint share in the import under consideration by 12%, the joint share of chemicals, wood-paper and minerals increased by only 9,9%. It means that Poland was importing more goods whose inland production would be relatively less harmful to the environment and, respectively, less goods whose manufacturing in the country loads the environment.

50. The structure of industrial import differed from that of industrial production. Based on pollution intensity coefficients for particular industries, the total emission of pollution for exported industrial goods has been estimated. In turn, dividing the estimated pollution through the export value, we have calculated pollution intensity coefficients per Zl 1 million of exports. Thereafter, they have been compared with respective coefficients of industrial inland (for internal uses) production. Except intensity coefficients with respect to wastes (they were rising systematically), export pollution intensity coefficients were falling. Taking into consideration differences in the pollution intensity level, the situation can be regarded as ecologically advantageous when export pollution intensity coefficients are lower than those for the production of particular branches as a whole. As results from our computation, within the whole time period under examination (1990-1992) this is the case for the emission of airborne pollutants. For most other pollution coefficients, this situation took place only in 1990. For a majority of pollution kinds we observe in the years 1990-1992 a growing discrepancy between the pollution intensity of inland and, respectively, export production. It is evident that in the time period under examination there occur ecologically disadvantageous changes in the industrial export structure. Though export related pollution coefficients with respect to most pollution kinds decreased (except waste intensity), pollution coefficients for the production of particular branches fell to a greater extent. It seems to justify a view that the export of industrial goods contributes relatively stronger (than in the past) to the pollution of natural environment.

51. The commodity exchange makes it possible to reduce the production of certain goods and owing to that to make the emission of pollution fall. Speaking very generally, this is a way in which the international exchange may become a source of ecological benefits. Table 36 contains total emission estimates based on (1) pollution coefficients for the unit production in particular branches and (2) the value of export and import in those branches. As regards exports, these are real magnitudes, whereas in the case of imports we have to do with hypothetical quantities. The underlying assumption for calculating them was that in the „no import situation” the inland production would be launched. As results from the comparison, the balance is not usually advantageous for Poland. The positive balance proves that bringing industrial commodities abroad contributes more to the load of environment than the potential inland production of imported goods. Only for the emission of sulphur dioxide, in the whole analyzed time period, and dust, in the year 1992, can one speak of relative ecological benefits that Poland is achieving owing to the foreign trade of industrial goods.

52. Data described in the previous paragraph and included in Table 36 in Report „The Linkages Between Trade and Environment. A Case of Poland” do not precisely reflect the bearing of a changing structure of industrial foreign trade upon the environment (Fiedor 1994). In order to better evaluate tendencies in the range of harmful ecological influence of export, as the base of calculation we took such a volume of industrial export in each year that would equalize the value of import of the same goods.

In 1990, this volume is lower and in the next years higher than the actual export. For in this manner estimated export volumes and structures (the latter ones have been calculated on the base of branch pollution intensity coefficients) the emission of specific pollutants has been computed. As Table 38 shows, for this volume of export that would equalize the import of industrial goods, the emission in 1990 was lower and in the next years higher than the actual export volume related one. Furthermore, for all the pollution kinds the increase in the above-mentioned difference is observed.

53. Previously discussed figures firmly confirm a thesis that there were taking place in the years 1990-1992 ecologically disadvantageous changes in Poland's industrial export and import. The percentage share of pollution intensive goods in the export was increasing. A reason for that was Poland's striving for equalizing the trade balance, as well as looking for export surpluses. The import of industrial goods, however, was growing faster than their export and, simultaneously, it was characterized by declining quantities of commodities whose inflow from abroad into Poland could diminish the load of natural environment in our country. Within industrial imports, there were appearing – to a growing extent – goods whose inland manufacturing would

not bring major dangers to the natural environment. In consequence of that one can speak of a very specific „labour division” between Poland and abroad, and EU countries in particular. To a visibly growing extent Poland is receiving (importing) from abroad manufactured goods whose production does not cause essential dangers to the environment. As regards exports, Poland is specializing, to a still greater extent, in selling goods whose production significantly loads its natural environment.

### DIAGRAMS ILLUSTRATING THE ENVIRONMENTAL EFFECTS OF POLISH EXPORTS AND IMPORTS\*

Diagram 1

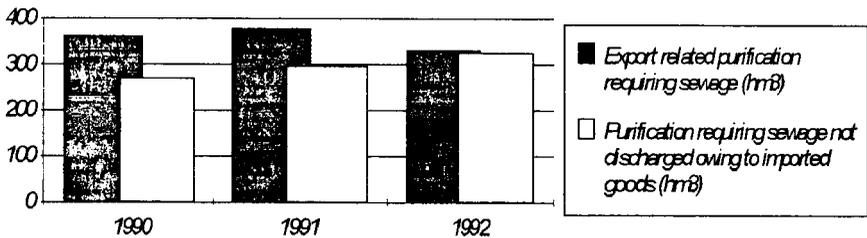


Diagram 2

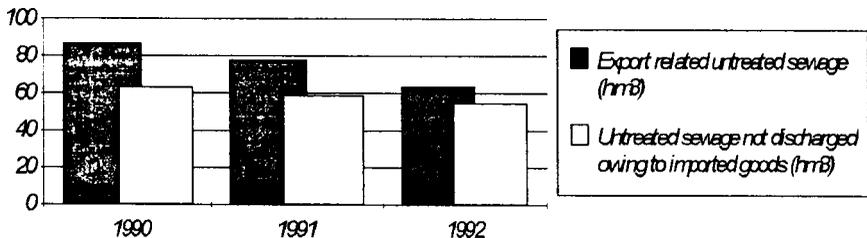
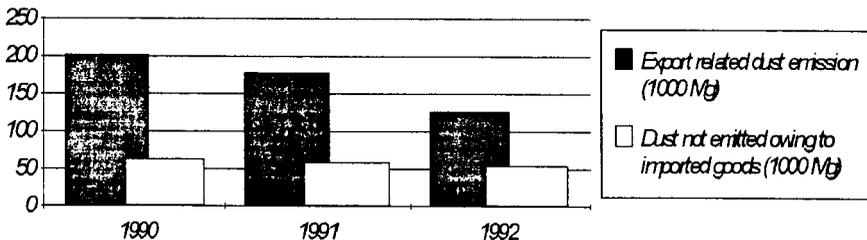


Diagram 3



\* Diagrams presented above are related to section 7 of this paper.

Diagram 4

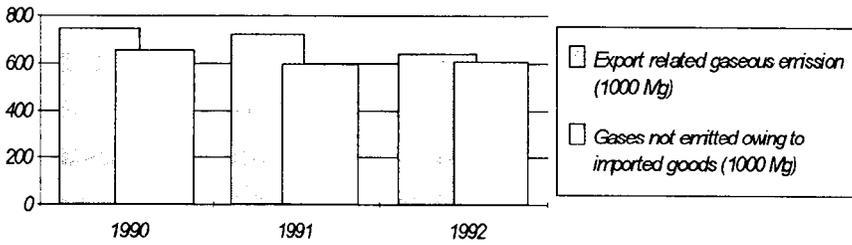


Diagram 5

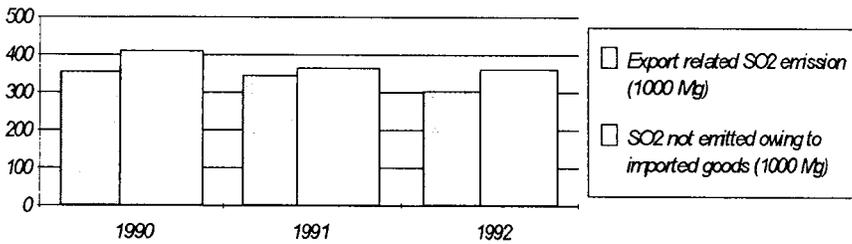


Diagram 6

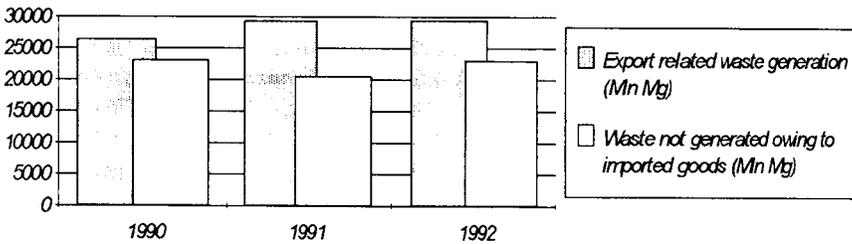
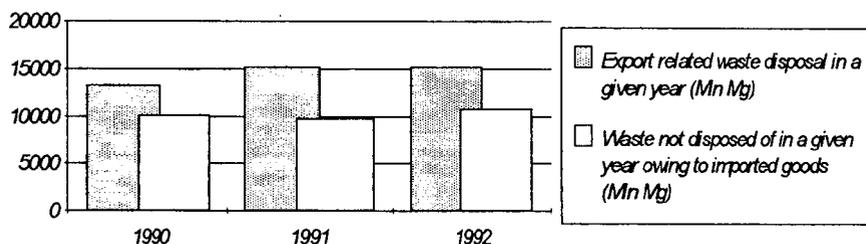


Diagram 7



Source: Authors' own calculations based on data from the Statistical Yearbook, Statistical Yearbook of Foreign Trade, Statistical Yearbook of Environmental Protection (different issues).

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