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## **ECOLOGICAL ASPECTS OF BASIC SECTORAL POLICIES IN THE 1990s IN POLAND**

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The authors of the paper try to highlight the most important ecological aspects of basic sectoral policies in the 1990s in Poland. Economic policy in the period of system transformation consists of a number of sectoral policies. These policies differed in their range and influence on natural environment, and the ways of its utilization and protection. Not all policies had direct influence on them, e.g. the employment policy and social policy. Different ventures in energy, industrial, agricultural and transport policies will have a special impact. Authors briefly analyse the most important ecological aspects of these sectoral policies. Special attention has been paid to the:

- ecological problems in the conceptions of industrial policy,
- demand and supply factors of energy policy,
- energy saving,
- realizations of ecological policy in the agriculture sector and
- to the environmental aspects of the transport policy.

### **1. INTRODUCTORY REMARKS – SECTORAL POLICIES VERSUS OTHER SOURCES OF ENVIRONMENTAL RECOVERY IN THE TRANSITIONAL ECONOMIES**

The failure of the command-and-control economic system in all the former socialist countries to prevent the natural environment from ecologically disadvantageous outcomes of economic growth underlies a commonly accepted view that the ecological recovery of the countries concerned will be mostly the result of reforming major macroeconomic policies aimed at macroeconomic stabilization, along with the process of widespread privatization of SOEs in all the sectors. There can be indicated three most important market economy related potential sources of improvement of environmental quality. These are:

- reduction of energy and raw material intensity, implied by gradually increasing microeconomic optimality, and by imposing the hard money-budget constraint on all the enterprises (both privatized or being currently subject to privatization and state/cooperatives owned).
- improved use of natural resources, as well as production inputs, due to the introduction of common scarcity and/or full cost recovery pricing;

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– decreasing current emission of major air- and waterborne pollutants due to better housekeeping practices in (chiefly) industrial plants.

As the experiences of all the mature industrial countries were able to prove, the real occurrence of aforementioned market economy related sources of the improvement in environmental quality in the transitional economies cannot be considered unconditional due to the simple fact of the incapability of the market mechanism itself to determine a socially acceptable or desirable level of using the environmental resources, including the environmental assimilation capacity. Therefore, all the countries in transition should create and implement a consistent mix of targeted and regulatory environmental policies and relevant institutional arrangements to address three groups of environmental issues they are faced with (A comprehensive presentation and analysis of such policies and institutional arrangements is included in the Environmental Action Programme for Central and Eastern Europe. See, particularly, its Annex 11):

- those resulting from legacies of the command and control economy,
- related to benefits and dangers which the transition towards a market economy may bring about to the natural environment,
- caused by the future improvement in the standard of living of the population and implied changes in consumption/recreation patterns (it pertains to the composition of both private and public consumption).

Based on the lessons from and experiences of former socialist countries which have embarked upon the way towards ecologically sound and sustainable economic development, and, simultaneously, are commonly considered to be most advanced transitional economies (Poland, Czech Republic, Hungary, Slovenia), one can point out the following major sources of environmental recovery in the former CAC economies that are, to a diversified but generally considerable extent, related to the transition process itself:

- transitional recession, consisting mostly in contracting industrial and agricultural output, along with subsequent changes in the GDP sectoral breakdown;
- industrial restructuring, encompassing both general technological/organizational reconstruction and the switch towards more environmentally friendly technologies and products;
- privatization of state owned enterprises and reforming major macro-economic policies, with special significance to be given to introducing more restrictive budget and monetary policies thus leading to a common occurrence of scarcity and/or full cost recovery pricing. Considered from the environmental point of view, these changes resulted in Poland and other mostly advanced transitional economies in improved use of scarce natural resources and falling energy intensity with respect to the GDP, industrial and other sectoral outputs;

– reforming major sectoral policies, along with the harmonization of their priorities and objectives with those of ecological policy.

The paper presented aims at highlighting the last of the above listed sources of the improvement in environmental quality in Poland, with special attention being paid to ecological aspects of the sectoral policies (including their links to priorities and goals of the ecological policy) in the following sectors: industry, fuel-energy, agriculture, and transport. Under specific circumstances of the Polish economy, a key importance of sectoral policies for addressing major ecological issues the country is faced with results from the fact of a very high share of a few major sectors, and industry and energy in particular, in the current emission of major air- and waterborne pollutants and disposal of solid waste, as well as their impact on the environmental quality in particular regions (or municipalities) and country-wide.

For the sake of illustration, in a statistical annexe attached to this paper we present selected data showing the sectoral breakdown of the emission/discharge of major air- and waterborne pollutants before and in the inception phase of the transition process in Poland, as well as such a breakdown with respect to mostly polluting branches within the industry-energy sector. The latter brings attention to extremely high shares of the energy sector and few industrial branches in the emission/discharge as a whole thus proving the necessity to carefully incorporating the ecological considerations into the industry and energy policy and harmonizing their environmental quality related priorities and goals with those of the state ecological policy.

## 2. INDUSTRIAL POLICY. ECOLOGICAL PROBLEMS IN THE CONCEPTIONS OF INDUSTRIAL POLICY

When designing future industrial policy, ecological issues were considered matters of not primary importance. It proves, among other things, the hierarchy of priorities. They relate to the sequence and weight of specific branch programs. It must be also said that branch priorities within the industrial policy have been set up on the base of assumptions and foundations of general economic policy approved by the Government and accepted by Parliament in 1992. On the priorities list, the highest rank are given to branch programs aimed at promoting export-oriented investment (and other) projects. High priority is also given projects to develop the infrastructure: telecommunication and mail services, banking and financial services, airports and harbors, border crossings. The third place on the priorities list take different branch programs for oil and gas industry and the fourth one modernization programs for the fuel-energy sector, iron and steel, cement, heavy chemicals,

shipyards and railroads. As results from this enumeration, mostly pollution intensive industries (fuel-energy, iron and steel, cement and chemicals) have not a high rank on the list of industrial policy priorities.

Of crucial significance for the environmental protection is the program of closing down 14 hard coal mines in Upper Silesia and 4 in the Wałbrzych hard coal mining district, as well as stabilizing coal extraction at the 140 million t.p.a. level. In hard coal mining liquidation of some mines is planned, however four mines discharging an overwhelming part of saline water, i.e.: "Piast", "Ziemowit", Czczott" have not been included in the program under consideration. It is also crucial to emphasize that the construction of desalinization installations in the mines concerned or other measures to neutralize negative environmental impacts of saline water discharge is currently unfeasible with respect to the financial situation of hard coal branch. There is also no information available whether or to what extent the hard coal branch endeavors after removing/neutralizing mining solid wastes. This is one of the most important ecological problems of hard coal mining (Czaja et al. 1996). It can be stated generally, that ecological issues linked to the development of hard coal mining have not yet been adequately addressed.

The approach towards economic and ecological issues in the iron and steel branch seems to be similar to that in the hard coal mining. Firstly, 6 old steel mills are expected to be closed down and steel production is to fall to the 10 million t.p.a. level which would mean decline a 50% compared to the seventies. The list of enterprises to be closed down includes, among other things, the Szczecin and Ostrowiec Świętokrzyski steel mills, although their environmental arduousness is undoubtedly lower than that of Upper Silesian steel works not covered by the program under examination. A way in which the issue of the so called raw materials divisions in the Sędzimir Iron and Steel Mill is going to be solved is also striking. In defiance of earlier announcements about the ecological harmfulness of the above mentioned divisions for the city of Cracow and its inhabitants, at the end of 1992 the Ministry of Industry and Trade decided to support the construction of continuous steel casting installation at Nowa Huta. As it seems, it is not ecological considerations that prevailed, as the mentioned arguments rather speak for withdrawing such a decision — actually it was political factors and fear of growing unemployment in Cracow. These examples also prove that there are no ecological priorities in the detailed conceptions of industrial policy (Fiedor et al. 1995). In order to stimulate environmental protection investments, the following systematic solutions are proposed in the "Foundations of Industrial Policy":

- stabilizing the real level of fees for using the environmental resources and environmental pollution and maintaining their steady level for several years, or alternately, accepting a fee valorization index relative to the criteria of production profitability,

- concentrating financial means on selected environmental protection projects according to the national environmental protection policy,
- allocating financial means to be achieved through debt-for-environment-swap operations to indirect subsidies for enterprises realizing environmental protection investments, in amounts relative or proportional to expenses incurred for that purpose
- concluding agreements with groups of enterprises to enable them joint actions to reduce the emission level which would facilitate the compliance with environmental standards and regulations (it may be considered an introductory stage of implementation of tradeable emission permits).

In June 1994, a team headed by the Deputy Prime Minister prepared the program of Poland's economic development: "The Strategy for Poland" which does not contain references to governmental policy documents which deal with ecological issues (Kołodko 1995). The document concerned does not refer to any strategy of environmental protection, or even mention Sustainable Development. It uses the notion of equilibrium development not relating, however, this notion to the Sustainable Development concept. Also in their current policies the Cabinet, Ministry of Industry and Commerce and the Ministry of Ownership Transformations present a careless approach towards the issues of environmental protection, regardless of the function of Ministry of Environmental Protection, Natural Resources and Forestry, or the fact that the parliament has passed the "State Ecological Policy" containing also concepts and assignments of a fundamental and strategic character.

### 3. ACTUAL INDUSTRIAL POLICY VS. ECOLOGICAL PROBLEMS

Since at the current stage of economic system transformation Polish industrial policy is still in the conceptual phase, in its analysis one should focus on the effects of specific industrial sector related activities and actions. If they even were not subordinated to an explicitly formulated and politically approved concept, they betray the directions of actual industrial policy and the manner in which this policy is approaching environmental protection issues.

In 1990-1992, numerous non-coordinated activities on different levels of governmental administration were undertaken. They consisted in providing certain branches with better development conditions but, at the same time, some other branches were subject to discriminatory measures. Of special significance from this perspective were tax differentiations, reliefs and postponements in payments for the State Social Insurance Fund and taxes as well. As instruments of broadly conceived industrial policy can also be regarded

quantitative import contingents for certain industrial goods (being manufactured in Poland too) and the differentiation of import duties. Subsidies to certain business entities were granted only exceptionally, chiefly to support investments in high unemployment regions and in the war industry being affected by the loss of orders from former Warsaw Treaty countries and Iraq. Subsidies were also granted to cover costs of liquidation of hard coal mines.

From among those enterprises with the biggest outstanding payments in relation to the State budget and State Social Insurance Fund, a big part constituted hard coal mines, steel mills and business entities cooperating with them. It meant state subsidies to branches belonging to a group of worse than average financial standing, and also the most pollution-intensive ones in the whole industry. The influence on the environment was both direct and indirect, through supplying relatively cheap (also thanks to preferences) products, which limited the access of more environment friendly products to the Polish market.

The Polish car industry was given considerable preferences. They took the shape of creating constraints to car imports. An overwhelming part of output of the branch under consideration makes energy intensive, technologically out-of-date and, as a consequence of this, environmentally unfriendly vehicles. The demand on them was (and still is) artificially stimulated through very high duty and excise tax levels, as well as the use of non-tariff trade barriers.

Declining pollution trends can be observed, both in absolute and relative (pollution intensity) terms. Such trends can be observed for the industrial sector too. They can be, however, only to a very small extent considered consequences of a conscious and selective industrial policy. Such a statement is justified, first of all, with two arguments:

— in the last few years most decisions on closing down or liquidation of industrial plants or their divisions were linked to falling demand and/or other economic factors and to increased efficiency of regulatory measures within the ecological policy.

— declining emissions trends are mostly connected with the market related decline of output and the development of pollution abatement installations, financed in 40-50% from ecological funds.

Ecologically important effects may be linked not only to forms of industrial policy but also to their lack with respect to branches wherein this policy should lead to ecologically desirable structural changes. The lack of this policy makes the industry development structure grow spontaneously in directions given by the market, and not by planned actions of the industrial policy and the conscious use of its instruments. More often they are negative impacts, as in the already mentioned examples of coal or car industries. Also the fast development of cement industry situated in the existing, mostly very dilapidated and

environmentally detrimental cement factories proved very harmful. Market impact upon the development of the wood industry (especially of pallets and coniferous timber) resulted in uncontrolled and excessive exploitation of private forests. The lack of standards or other direct regulatory measures resulted in many industrial branches in the quick growth of production of environmentally detrimental goods (like washing powders containing phosphorus in non-limited quantities) or in using environmentally unfriendly packaging (like unrecyclable plastic bottles instead of glass ones in industry producing mineral waters and soft drinks, plastic bags and carton containers instead of glass milk or cream bottles in dairy industry, carton containers for juices in fruit and vegetable industry).

Under conditions of a free market, with the industrial policy playing an insignificant role in preventing from the influence of changes in the industrial structure on the natural environment, of special importance from this point of view was the foreign trade. Significant transformations occurred in the structure of Polish export of industrial goods. Poland imported mainly, and to a growing extent, processed industrial goods whose production does not create major dangers for the environment, whereas exported mainly, and to a growing extent goods whose production process is more ecologically detrimental.

#### 4. INDUSTRIAL POLICY VS. ECOLOGICAL POLICY

Industrial policy is a necessary element of the economic policy of the State, just like the ecological policy. Separation of these policies is crucial for the approach to ecological problems in concepts of industrial policy and in its actual actions (Czaja et al. 1996). Industrial policy can hardly be considered coherent with the ecological policy of the State, as industry managers failed to make stopping the process of natural environment degradation by industry their major objective, directing the development of industrial production towards better preservation of the assets and resources of natural environment. Good results in the field of environmental protection were not the outcome of active reconstruction of industrial sectors, being the source of the most potent ecological dangers. The important principle of industry restructuring, including liquidation of sources of environment contamination through modernization and change of used production technologies was not popularized.

Neither ecological conditioning or the objectives formulated by ecological policy, or ecological petitions to industrial policy were taken into consideration in creating concepts or in controlling the industrial policy. As it seems, such an attitude to ecological policy is rooted in the fact that officials responsible for industrial policy assume that ecological policy will not be restrictive enough to impede the development of sectors and actions which are harmful for the natural environment.

Subjecting the industrial policy to current economic policy does not leave much room for the full appreciation of the importance of ecology. On the other hand, ecological conditioning appears to have been regarded not as a chance and a potential signpost in the shaping of industrial policy, but rather as a hindrance in the development of industry or at most a burdensome extra in the creation of transformation programs. Plans for the middle run period, tolerant approach towards enterprises with overdue tax payments, changes in the system of fees for environment utilization and the realistic effects of forbearances in industrial policy seem to confirm this suspicion.

Ecological policy realistically carried out vis-a-vis the industry does not yet have an appropriate perspective, which would see not only current problems but also the middle- and long-term ones. Probably the relations between industrial policy and ecological policy will go the other way than happened in highly developed countries. Bargaining the defensive industrial policy and reactive ecological policy for offensive industrial policy and preventive ecological policy will be difficult because the State still owns most of the ecologically detrimental enterprises and tends to prefer political and economic options to ecological demands. In consequence, Polish industry is in danger of becoming the producer of goods bringing relatively serious damage to the natural environment.

## 5. ENERGY POLICY

An important ecological aspect of energy policy was shaping energy prices and subsidizing the production of energy. The reason is that excessive use of energy, stimulated by relatively low prices, was one of the main motives of developing the fuel-energy sector during the times of a centrally managed economy. Maintaining subsidies weakened the possibilities of a more significant transformation of the sector. Because of the structure of fuel carriers and the lack of proper equipment for pollution treatment, the mines, power plants, heat and power generating plants have always been responsible for a majority of air-borne pollutants, most wastes, soil contamination and also for a greater part of waste discharged to surface waters. The energy price policy was able, through inducing a drop in consumption, to influence the level of pollutants emission. However, the main characteristic feature of this policy was raising prices in order to ensure an economic level of energy carriers and end energy prices. On this level, the producers are able to cover the current costs, costs of development and costs of environmental protection. Analyzing the problem from the point of view of adaptations occurring in the Polish economy since 1990 and those still to come, one may not ignore the fact that prices are



shaped in the market under the influence of two factors: demand and supply. In order to reach the level of economic price, there must be a sufficient demand for energy.

### Demand factor

The character of demand depends above all on the payability of customers, conditioned by their income level and the possibility of shifts in the structure of their spending. Another element is the price flexibility of energy demand, and still another is the mixed flexibility of demand connected with substitution between different energy carriers, or substitution between expenses on the purchase of energy and on saving it.

Prices of energy for households grew much quicker than prices of other products and services. Present prices of energy reached a level, as it is commonly believed, close to the limit of social endurance. On the other hand, they are still lower than in most Western European countries. (*Economy...*, 1995, p. 10) As can be seen in Table 1, the buying power of Polish net income dramatically decreased for most energy carriers. The only exception here is the possibility of purchasing petrol, which have increased. This, however, concerns an area in which comparatively quickly competition for the State monopoly on import and distribution appeared.

For most types of households, expenses for energy have already crossed the limit of 10 of their income. Taking into consideration the structure of expenses of an average household, there remains a very narrow range of expenses which might be possibly relocated for the more expensive energy (these include expenses for education, culture, sport and recreation, alcoholic drinks and tobacco).

Price flexibility of demand of households for energy may be estimated in certain approximation, resulting from the availability of data. The flexibility is

Table 1

Purchasing power of an average month net salary for energy products and services in Poland in 1989-1994 and in Europe

Product	Unit of measure	1989	1990	1991	1992	1993	1994	West Europe
Hard coal class I	Mg	7.4	2.4	2.3	2.1	1.9	2.1	4.3
Central heating of homes	m <sup>2</sup>	3,692	1,839	975	500	351	291	*
High methane natural gas	dam <sup>3</sup>	8.99	4.47	1.63	1.13	1.08	1.07	3.53
Electric energy in 24 hours tariff	MWh	10.3	5.1	3.5	3.5	3.2	3.1	11.4
Petrol	1	172	278	344	305	317	363	1,389

\* Incomparable systems of calculation.

Source: own material based on Main Statistical Bureau data.

calculated in relation to individual consumption. Calculations concern the years 1990-1993, when changes in energy prices were extreme. Results of the estimation are presented in Table 2 (Fiedor et al. 1995).

Table 2  
Indices of price flexibility of household demand for some energy purchases  
in years 1990-1993

Electric energy consumption in towns	-0.220
Electric energy consumption in the country	-0.407
Consumption of town gas	+0.01
Heat energy consumption in centrally heated town homes	+0.001

Source: own calculations.

As it results from Table 2, electric energy demand decreased in reaction to price rise. Demand for heat energy and town gas in towns turned out to be perfectly inflexible in the analyzed period. If demand for town gas and heat energy practically did not react to price increase, it implies that there was virtually no substitution between the energy carriers analyzed in Table 2.

Decrease in electric energy consumption is in effect the only reaction of demand for energy which was not accompanied by an increase of demand for another energy carrier. The lack of appropriate data does not allow an estimation of mixed demand flexibility for each carrier. However, it is evident that the relative social impoverishment brought about a limitation in consumption of electric energy, coke, and better quality coal, as well as a reduction in consumption of town gas for heating purposes. Consequently, the consumption of worse quality hard coal increased, as well as of differed waste materials, like used oil, car tires, paper and cardboard, waste wood, plastic waste. Most of them are products of very negative environmental impact.

There is no data of substitution between the purchase of energy carriers and energy saving. Descriptive data let assume that such process took place partially in enterprises. However, in households it was of lesser importance and occurred only these homes where central heating meters had been installed.

### Supply factor

The level of economic price analyzed from the point of view of supply depends on the level of costs incurred by producers. If the costs are too high in relation to the reported demand at a given price, the transaction may not be concluded. But if the government is socially obliged to supply energy at prices acceptable for the customers, it will have to subsidize the production of energy.

Questions that arise, deal mainly with the following: if the range of subsidies is appropriate, if the subsidies are properly allocated, and above all, if it is possible to achieve ecologically beneficial results thanks to these subsidies.

### **Hard coal**

The key to solving many problems connected with the right allocation of subsidies is the hard coal industry. Formally, coal is not subsidized any more, i.e. the extraction itself is not subsidized. Actually the subsidies still come although in an indirect form. For example, losses in coal mining are financed by liabilities towards suppliers and bank loan. Also overdue taxes may be perceived as a form of State subsidy for coal industry. Such reasoning is based on the fact that coal mines are grouped in coal companies comprising of several mines, where small and inefficient mines "ruin" their common financial result, due to which the companies sometimes score negative financial accumulation. Hence there occurs even double subsidizing: the State does not receive the due taxes, and more efficient mines subsidize the weaker ones. Another source of subsidies for coal industry is postponements in payments for the State Social Insurance Fund and fees for environment utilization.

There is also another form of subsidizing, in which the home coal users subsidize its export. The paradox is that the loco price at the mine entrance for a „local“ calorie contained in coal of worse quality was in 1994 1.5 times higher than for one calorie contained in the exported coal. (*Economy...*, 1995, p. 39).

Being able to use so much aid and protection, the coal sector does supply relatively cheap coal. However, this prevents from disclosing the inefficiency of the sector, and does not allow shaping prices on a level appropriate to the level of costs. As a result, consumers prefer to buy cheaper coal than the more expensive, although more environment friendly energy carriers.

### **Electric energy**

The problem of reaching economic level by electric energy prices is basically a political problem. Social resistance towards energy prices increase caused a slowdown in the price rise rate. At the beginning of the 1990s it was assumed that energy prices will have reached the level of economic prices by 1994. The time limit was extended to 1997, and most recent decisions postpone it till 2000. A positive change was the introduction of price structure differentiation for different groups of customers, so that now it resembles the structure of delivery costs.

Reduction of electric energy prices increase rate already enforces indirect subsidies and will delay modernization of power plants, and probably will limit

the range of ventures aiming at restricting the emission of harmful pollutants from electric energy sector.

One of the most important objectives of ecological policy will be restricting the emission of sulphur dioxide. Commercial power plants, as main emitters of this gas have been obliged to a significant reduction of emission. Presently, the main direction of adaptive actions in the energy industry is installing equipment for reducing the contents of pollutants in exhaust gases on existing objects. As a result, all power plants, better and worse, will have installations for flue gas desulphurization. The process can hardly be considered remedial from the point of view of shaping an optimal level of pollutants in the environment, because the basis of regulation are values of emission standards resulting from the desired parameters of environment quality (emission background and ambient concentration standards) as well as from the existing structure of production and technology, not comparisons of costs and marginal benefits.

If we assume that prices of electric energy are to be economic prices, they also should contain a component of environmental protection costs. However, if power plants are required to comply with very high emission standards, higher from the economically reasonable ones in respect to the criteria of external costs generated by emission, it seems necessary to start subsidizing this "over-optimal" level of emission reduction. This concerns both the stage of investment and operating the desulphurizing equipment. If the State wants high levels of emission reduction, it should subsidize desulphurization of the portion which is the difference between State enforced level of reduction and this level of reduction which would be economically rationalized by the amount of reduced external costs. Otherwise power plants will not be able to comply with the requirements of emission reduction, and so the essentially beneficial appeal to reduce emission will not be realized, or will be realized only in some power plants, at excessive cost level. If the State does not want to give power plants guaranties for investment it bids them to carry out, one can hardly see any cohesion in energy policy treatment of the power plant emission problem.

### Heating sector

This sector covers 60% of the consumption of heat for warming purposes and hot water in the residential sector. Prices in this sector are not full cost recovery prices. Minister of Finance sets the price rise limit every year. State subsidy for this sector amounted in 1994 to 5.3 trillion zł (approx. 230 million USD). The paradox here is the fact that city dwellers cannot help using central heating because the city architecture and small flats do not allow a broader use

of gas or oil for heating. It should be added that one calorie in district heating is more expensive than one calorie used for cooking or for sanitary purposes. (*Economy...*, 1995, p. 47) Besides, heat consumers usually pay per square meter of flat surface (heating) and per capita (hot water), so they have no incentive to save.

Building owners who want to pay only for the actual amount of supplied heat, in which they are backed by tenants, are usually confronted by heat suppliers. This results from the fact that this way suppliers can transfer the costs of heat losses and costs of its inefficient production onto consumers. The situation is sanctioned by the fact that in the majority of buildings and flats there is no measuring equipment. Individual consumption of heat for heating purposes is approximately twice the amount consumed in European countries of similar climate.

This policy encourages wasteful use of energy and excessive emission of pollutants from heating sector to the atmosphere.

Gas transmission and distribution system. Gas prices for the consumer are considerably higher in relation to other energy carriers. For an energy unit in gas the consumer pays approx. 2.1. times more than for an energy unit in coal (1.8 is coke, 1.3 in heating oil).

It is not surprising then, that sales of gas in Poland have dropped by 1/4 since 1989, which occurred mainly in effect of reductions in purchases by industrial branches of relatively high energy intensity of production (like sulphur or fertilizer production). Many homes with gas heating who were fairly recently connected to the gas system returned to heating with coal and coke, encouraged by the inconvenient for consumers differentiation of gas and other energy carriers prices. The process leads to an increase in the level of emitted airborne pollutants. Policy of relative prices of gas has then brought about a restriction in consumption of this most "environmently friendly" fuel.

### **Oil transmission and distribution system**

Prices of oil fuels grew slower than the inflation rate, that is why these fuels are getting cheaper in real terms. This is possible thanks to the low prices of oil, and also to the fact that most appliances in Polish refineries are motorized and that Polish tax on oil products is one of the lowest in Europe. In spite of these favorable prices, there is hardly any competition of oil in the field of residential buildings heating, as heating with coal and electric energy is more convenient (because of their low prices). Besides, the capital costs of adapting the heating system to oil are rather high, and potential volunteers cannot expect any reliefs or incentives. Therefore no environmental effect of the relative decrease in oil prices can be noted.

### Energy saving

In energy saving, positive changes in production structure resolving in an increase of commerce and services proportion and decrease of industry and construction proportion are of great importance.

Table 3  
Total energy consumption (in MJ to billion zł of GNB in constant 1990 prices)

Year	1990	1991	1992	1993	1994
Energy intensity	7.516	7.913	7.667	7.446	6.850

Source: *Fuel-Energy...*, p. 13; J. Cz. 1995, p. 10.

The economic growth noted since 1992 occurs at constant limitation of energy intensity. Good results were achieved in the fuel industry and in the building materials industry. Demand for energy was dropping not only because of the decrease in economic activity but also as a result of restructuring of some industry branches and of introduction of energy prices rise policy. Also several mild winters in a row had some influence. Structural changes and improvement of financial standing of enterprises give hope for positive energy saving effects in production sectors and services. In their case market pressure and the urge to reduce costs are the stimulating factors. Sectors and enterprises which will not be able to carry out necessary adaptations and reduce energy costs will not be able to maintain competitive position in the market, in which the pressure of foreign competitors is getting stronger. However, it is not certain to what extend households will be able to undertake energy saving actions, using only private funds.

Price flexibility of demand for energy is very low. Households will not be able to react to a further increase of energy prices with a reduction in consumption. The reason for this is the fact that a decrease in consumption requires appropriate investments, which turn out to be too expensive for a majority of households. Similarly, it can be hardly expected that relatively lower prices of more "environment friendly" energy carriers will bring about a general transfer to these particular carriers.

Reserves of energy consumption saving, if compared to European standards, are significant. Consumption of energy for heating residential buildings and heating water per 1 square meter of flat surface is 2 times higher in Poland than in western countries. Since 1990, costs of modernization of residential buildings have been partly refunded to building co-operatives from the Budget. The Budget also encourages installing thermostatic valves, water meters and heat meters. Budget subsidies for that purpose amounted in 1991 to 300 billion zł, 1.5 trillion zł in 1992 and just below a billion in 1993, so they are relatively

decreasing. Present State policy aims at gradual liquidation of subsidies for operations aiming at energy saving and concentration on concrete investments for this purpose in newly erected buildings.

Energy consumers can hardly be blamed for wastefulness. Simple reserves of energy saving, both in individual customers' and in industry have run out. With the existing state of customers' installations, state of energy supply infrastructure, high price of credit, it is not possible to count on a prompt adaptation of demand to the incentive of higher energy prices.

Energy policy lacks distinct incentives to energy saving and to transferring to more environment friendly energy carriers. These ventures should be realized within more general actions, including among others as soon as possible achieving economic prices of energy, diversification of supply sources, increase in competition range in fuel and energy sector, comprehensive implementation of DSM system (Demand-Side-Management) by energy distributors and last but not least a developed system of energy consulting. The last two groups of ventures seem particularly well suited for possible subsidizing in the future, especially at the take-off of operation.

### **Energy policy — some conclusions**

The answer to the question of whether prices were economic and whether the introduction of economic prices gives desired results in the forms of energy savings and the ecologically desirable substitution of carriers is not easy.

Analyzing the demand side it can be found that adaptations in the form of lower energy consumption concern the economy as a whole, but are stronger in firms than in household budgets. Especially for the latter prices are high and are a significant portion of the budget. However, it is unreasonable to expect further improvement without additional support for energy saving possibilities, including properly allocated subsidies. A negative effect of raising prices was the tendency to replace better fuels with fuels of worse quality, but cheaper. Further increase of prices will rather not bring, without substantial aid for household budgets finances, notable effects in the form of energy savings and choosing cleaner carriers. In the case of firms buying energy, good results should come.

Analyzing the supply side it can be said that a majority of subsectors cover their current costs with their current income. An important exception is the hard coal mining industry, which receives hidden subsidies. However, the level of depreciation in basically all sectors is too low to ensure the realization of development, modernization, and environmental protection objectives. The consequence of too low, uneconomic prices for energy is the lack of sufficient funds for investments, including investments for environmental protection. In this sense, current prices are not economic prices.

Official prices often meant subsidizing some customers by others. Liquidation of official prices involves giving up the costly procedure of price calculation, which enabled, thanks to befitting arguments and a suitably complicated (unclear) system of cost evidencing, obtaining considerable subsidies.

When searching for links of inefficiency in energy economy, in the first place coal distributors should be noted (trade margin, costs of middlemen, costs of freight), electric energy distributors (no chance of using cheaper off-peak energy) and district heat distributors (no chance of regulating temperature). Inefficiency of consumers includes first of all using the district heating system, and to a lesser degree wasting hot water or insufficient thermal insulation of buildings and flats.

## 6. REALIZATION OF ECOLOGICAL POLICY IN THE AGRICULTURAL SECTOR

Preventing and obstructing the negative changes of the surface, realization of a rational economy in soil resources, protecting its production quality as well as soil reclamation in Poland is based on the law on shaping and protecting the natural environment (paragraphs 13-15), law on protection of forest and agricultural grounds, law on public roads, law on physical (country and town) planning, construction law, geological and mining law and others.

Despite existing legal constraints, allocating valuable agricultural grounds for non-agricultural and non-forest uses continues. In the years 1991-1993 the Minister of Agriculture and Food Economy issued over three thousands permits for excluding ca. 40 thousand hectares of arable land class I-III and 60 thousand hectares of arable land class IV from agricultural uses. To minimize disadvantageous processes taking places in soils, the Ministry of Agricultural and Food Economy allocates yearly ca. 1.1 trillion zl (ca 50 million USD) mostly for soil liming and increasing the magnesium contents. In spite of this, the consumption of lime has decreased from 180 to 117 kg/ha.

In order to improve the quality of field crops, as well as to examine soils and plants with respect to needs of fertilizing advisory services, the network of regional agro-chemical stations has been developed. Their investigations embrace, among other things, the PH coefficient, contents of trace elements in soils, liming requirements, nitrate contents in field crops, analysis of feeding stuffs, quality control of fertilizers, pollution of agricultural environment and crops with heavy metals and radioactive contamination. Since 1992, extensive works on the general ecological assessment of soils and field crops are also being carried out. They include the circulation of vestigial elements in the natural environment, their balance in soils and infiltration from soils to the



nutrition chain and waters. The heavy metals contamination encompasses ca. 2.3% of farming soils. With respect to the incapability (due to immense costs) of their reclamation, activities have been launched to exclude contaminated grounds from food production. Simultaneously, areas affected by the contamination concerned are to be allocated for introducing the cultivation of hemp, flax, red osier and other industrial plants. This concerns among others Upper Silesia and Legnica-Glogow Copper Mining District.

The issue of economically rational and environmentally friendly use of chemical and biological means has been addressed in new draft laws on fertilizers and the protection of cultivated plants. In the last four years, due to the remarkable increase in fertilizer prices (brought about mostly by the radical decline of state subsidies), their consumption has shrunk substantially. On the other hand, the Polish agriculture faces the necessity to develop modern and environmentally friendly plant protection systems.

Many environmentalists and agricultural scientists express a view about a need of introducing the notion of minimum "ecologization level" of agricultural production. First of all, it would consist in defining a certain amount of compulsory agrotechnical measures preventing agricultural ecosystems from their deterioration or in the order to apply specified protective activities. The minimum referred to should be regionally differentiated. The program of the ecologization of Polish agriculture may also be linked to activities aimed at the development of "ecological (green) agriculture" and a healthy food market.

## 7. ENVIRONMENTAL ASPECTS OF TRANSPORT POLICY

Since the development of transport infrastructure causes various ecological outcomes, it calls forth a necessity of carrying out the Environment Impact Assessment for particular investments projects. For the same reason, along with such projects, ecological undertakings have to be planned and implemented which will minimize transport related disadvantageous ecological impacts. As far as Poland is concerned, these undertakings might be financed both from internal and foreign sources: The National Fund of Environment Protection and Water Economy, credit lines of international financial institutions, funds existing within the EU and bilateral assistance programs.

The transport sector is the second greatest (after the fuel-energy sector) polluter of the natural environment. Vehicles contribute to one-third of the total emission of nitrogen oxides. Transport (road, rail and air) is one of the main sources of excessive noise (Czaja et al. 1997). Besides flue gases and noise, environmental impacts of transport comprise the earth surface and water

pollution, wastes linked to vehicles exploitation and the deterioration of landscape. Also the transport infrastructure (car parks, fuel and service stations, tram/bus depots) contributes significantly to environmental pollution. The greatest danger resulting from transport occurs in cities. This is connected with highly developed transport infrastructure, large number of means of transport, heavy traffic and good conditions for the formation of smog.

Among all types of transport, the least harmful is the railway. It needs less space, uses less energy, does not pollute the air so much and is relatively safe. In spite of this, rail transport is undergoing a regression in Poland, resulting among other factors from organizational and economic impotence of Polish National Railway.

To limit the ecological arduousness of the transport sector, measures have to be undertaken that will result in the improved performance of different transport systems with respect to flue gas and noise emission standards. In 1992 Poland accepted regulations of European Economic Commission of UN concerning vehicle attestation and take measures to harmonize inland regulations with the EU counterparts, especially in the range of ecological performance parameters of vehicles being manufactured in Poland and imported ones.

So far (except for a very few cases), particular voivodships (regions) and gminas (municipalities) were following no systematic studies on activities to reduce the regional/local environmental impacts of transport and communication. Only single diagnostic stations have had measurement equipment installed. Necessary tests were carried out only by the State Inspection of Environmental Protection.

## 8. CONCLUSIONS

A short discussion of some ecological aspects of macroeconomic policies does not give a sufficient basis for a comprehensive synthesis. One of the more important positive aspects of the presented policies is the better effectiveness of actions within the field of environmental protection and the reduction of the most environmentally harmful forms of pollution.

The most important failures of these policies include the lack of cohesion with the broadly conceived ecological policy, orientation towards immediate effects and the fact that they do not formulate distinct programs for the middle- and long run in which ecological policy would have a vital status.

There is also a considerable disproportion, as examples from the field transport policy imply, between efforts undertaken on a macro level and decisions made on the level of regions and municipalities, where some limited actions aiming at limiting the ecological arduousness were undertaken.

## STATISTICAL ANNEXE

Table 1

Total estimated sulphur dioxide emission in Poland, 1982-1991 (million tonnes/year)

Emission sources	1982-1983	1985-1986	1987	1988	1989	1990	1991
Total, under it:	3.4-4.1	4.30	4.20	4.18	3.91	3.21	2.99
commercial energy generating (1)	2.06	1.93	2.05	2.02	2.02	1.37	1.48
industrial energy generating (2)	0.25	0.99	0.73	0.72	0.69	0.5	0.43
industrial processes (technologies)	0.5-0.8	0.43	0.39	0.38	0.35	0.27	0.24
municipal-residential sector	0.5-0.9	0.86	0.93	0.95	0.76	0.76	0.76
vehicles	0.07	0.09	0.10	0.11	0.11	0.11	0.78

(1) Commercial energy generating comprises production and sale electricity and heat (including cogeneration) for different buyers from outside the energy sector itself.

(2) Industrial energy generating means supplies of electricity and/or heat for industrial (and mining) companies from their own power and heating plants (including cogeneration).

Source: *Ochrona środowiska...*, 1986, pp. 176-177; 1988, p. 161; *Rocznik statystyczny* 1989, p. 22; 1990, p. 25.

Table 2

Total estimated NO<sub>x</sub> emission in Poland, 1982-1991 (million tonnes/year)

Emission sources	1982-1983	1987	1988	1989	1990	1991
Total, under it:	1.57-1.97	1.53	1.55	1.48	1.28	1.22
commercial energy generating (1)	0.61	0.41	0.47	0.47	0.37	0.40
industrial energy generating (2)	0.08	0.21	0.18	0.17	0.13	0.14
industrial processes (technologies)	0.4-0.7	0.40	0.28	0.26	0.20	0.18
municipal-residential sector	0.08	0.14	0.13	0.10	0.10	0.10
vehicles (transport sector)	0.4-0.5	0.36	0.49	0.48	0.48	0.40

(1), (2) – see Table 1.

Source: see Table 1.

Table 3

Total estimated dust emission in Poland, 1982-1991 (million tonnes/year)

Emission sources	1982-1983	1987	1989	1990	1991
Total, under it:	2.9-3.6	3.4	2.4	1.95	1.68
commercial energy generating (1)	1.2	0.9	0.74	0.57	0.47
industrial energy generating (2)	0.1	} 1.5*	} 1.14	} 0.86	} 0.69
industrial processes (technologies)	1.3-1.7				
municipal-residential sector	0.3-0.6	1.0	0.52	0.52	0.52

\* For the years 1987-1991, joint emission related to industrial energy generation and industrial processes.

(1), (2) – see Table 1.

Source: see Table 1.

Table 4  
Structure of industrial waste generation in Poland 1980-1991 (%)

Branches	1980	1985	1989	1991
Industry as a whole	100.0	100.0	100.0	100.0
under it:				
1. fuel-energy	58.7	57.8	58.2	57.5
2. metallurgical	26.7	25.0	22.8	25.2
3. chemical	5.4	6.2	6.2	5.3
4. mineral	3.0	5.3	5.2	4.4
1-4 jointly	93.0	94.1	92.4	92.4

Source: see Table 1.

Table 5  
Industrial untreated sewage disposed of into surface water  
in Poland 1980-1991 hm<sup>3</sup>/year

Branches	1980	1985	1989	1991
Industry as a whole	679	755	445	330
under it:				
1. fuel-energy	190	187	140	156
2. metallurgical	258	357	117	72
3. chemical	78	81	92	50
4. mineral	28	33	12	16

Source: see Table 1.

Table 6  
Dust emission in industry in Poland 1980-1991 (thousand tonnes/year)

Branches	1980	1985	1989	1991
Industry as a whole,	2238	1778	1513	923
under it:				
1. fuel-energy	1174	959	806	510
2. metallurgical	286	235	149	78
3. chemical	251	206	172	86
4. mineral	437	198	138	70

Source: see Table 1.

Table 7  
Gas emission by industry in Poland 1980-1991  
(thousand tonnes/year)

Branches	1980	1985	1989	1991
Industry as a whole	5135	4932	5113	3552
under it:				
1. fuel-energy	2176	2775	2870	2131
2. metallurgical	2068	1249	1071	587
3. chemical	398	352	303	206
4. mineral	165	114	194	133

Source: see Table 1.

Table 8  
SO<sub>2</sub> emission by industry in Poland 1980-1991 (thousand tonnes/year)

Branches	1980	1985	1989	1991
Industry as a whole, under it:	2755	2652	2790	2035
1. fuel-energy	1996	2038	2165	1590
2. metallurgical	345	193	139	93
3. chemical	189	164	144	99
4. mineral	53	32	40	26

Source: see Table 1.

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