Problems of the Polish paper industry in its efforts to return to a market economy

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The most expensive experiment of all is the one associated with the alteration of the economic system, and Poland is one of those countries that must pay this price twice.

Traditions of the Polish papermaking craft go back to 1491. It was at Pradnik Czerwony near Cracow where 500 years ago the first paper mill was put into service. It is worth mentioning that in that period, 1491–95, Nicolaus Copernicus studied at the Cracow Academy.

The years 1500–1650 in our history are called the Golden Age of Poland, and one may add that this refers also to the Polish papermaking. At the end of the 16th century, paper was hand-made in 47 paper mills on Polish soil, its annual output was about 33.8 million sheets. As about 4.5 million inhabitants lived in Poland in that period, paper consumption was about 7.5 sheets per head. The fate of Polish papermaking has been closely associated with the political and economic situation in Poland.

The first change in the economic system.

After World War II, Poland fell under the control of the Soviet Union. The Polish economy was systematically and brutally transformed into a new economic system whose theoretical basis was not completely clear. This system was based on:

1. Subjugating all property rights to the state and elimination of the demands of the market
2. Introducing doctrinarian and centralized methods of economy management based on the communist ideology and on a so-called collective property and responsibility
3. Dictatorial and political control over all spheres of life.

Paper had become a propagandist and, consequently, strategic material for authorities of the new political and economic system. Such an assumption gave rise to the following consequences for the paper industry:

1. Paper had to be at the disposal of the communist propaganda, so its production and distribution had to be subject to control.
2. The price of paper had to be low in order to facilitate the achievement of propaganda objectives in education, culture, and science.
3. The paper industry was included with the deficit industries, and thus subsidized by the state budget.

The classification of paper as propaganda material made it impossible to carry on a normal financial policy (prices, earnings, investment).

In the post-war period, the paper industry needed restoration from war damage and, in time, expansion of existing mills and erection of new ones. While the restoration and expansion processes were carried out quite efficiently owing to the enthusiasm and often disinterested commitment of people, the creation and erection of new mills proceeded very slowly. The investment periods of the two largest pulp and paper mills erected between 1967–89, Swiecie and Kwidzyn, were 16 and 13 years old, respectively. In the final period of the restoration of the paper industry, i.e., in 1947, 61 pulp and paper mills were operating 59 papermaking machines, 11 board machines and 35 intermittent board machines. The production in those years was, respectively: 88,200 tons of groundwood, 95,400 tons of pulp, 201,400 tons of paper, and 24,400 tons of board.

In 1980, 21 big pulp and paper enterprises, comprising 57 smaller mills, were in operation. These enterprises used a total of 111 paper and board machines. Within 36 years, the production of groundwood, pulp, paper, and board increased by 64.2%, 451%, 412%, and 787.5%, respectively. As far as paper is concerned, this means that the annual average increase in its output was about 5.5%, which corresponded with world trends. However, the consumption of paper per head was still several times lower than those in other European countries. The above situation is illustrated with more details given in **Tables I and II**. Table I shows that, in that period, chemical pulp was practically not exported. In 1975–80, a serious deficit of domestic pulp was observed. Since its production in this period was maintained at the same level, it was necessary to increase imports, which approached 30% of the consumption of this raw material. The situation improved when in 1981 a pulp mill with an output of 170,000 tons/year started up at Kwidzyn.

In 1990, the percentage of semichemical pulp in the pulp production was about 9%. In 1983–89, the utilization of wastepaper was about 420,000 tons/year, amounting to 32% of the total consumption of fibrous materials. Table II shows that, in the period under discussion, the export of paper approached 7.5% of the production output. By 1970, there was inconsiderable import of paper, but since 1975 it has reached about 15% of the paper consumption. The year 1977 was a turning point in the production and consumption of paper and board, when the total output of paper and board was 1,361,000 tons and the consumption 44.3 kg per head. This was brought about by the startup, in 1974–77, of three new paper machines at Swiecie, one at Myszkow, and one at Klucze.

I. Production and consumption of chemical pulp and groundwood in 1960-89 x 1000 tons

Specification	*1960*	*1965*	*1970*	*1975*	*1977*	*1980*	*1985*	*1989*
Production	291.5	348.3	470.4	538.4	665.6	525.7	594.8	754
Pulp export	—	—	14.2	0.5	1.7	—	31.5	12
Pulp Import	66.2	68.0	145.6	233.3	178.7	210.4	141.7	187
Pulp consumption	357.7	416.3	601.8	771.2	842.6	736.1	705.0	929
Groundwood production	163.3	164.4	162.8	152.9	175.6	144.8	117.5	106
Total consumption	521.0	580.7	764.6	924.1	1018.6	880.9	822.5	1035

II. Consumption of paper and board in 1960-89

Specification	*1960*	*1965*	*1970*	*1975*	*1977*	*1980*	*1985*	*1989*
				Paper(1000 tons)				
Production	503.7	637.5	764.3	980.6	1081.3	1032.8	1072.7	1180.0
Export	37.5	25.9	11.9	6.9	17.6	33.8	78.5	135.0
Import	14.7	20.6	70.8	187.1	164.6	150.2	116.1	91.0
Consumption	480.9	632.2	823.2	1160.8	1228.3	1149.2	1110.3	1116.0
				Board(1000 tons)				
Production	136.6	177.9	196.9	271.7	280.4	243.6	228.4	217.0
Export	2.5	5.9	1.3	0.7	0.3	0.9	0.3	—
Import	16.2	12.3	59.6	24.5	25.9	34.0	15.0	7.0
Consumption	150.0	184.3	255.2	295.5	306.0	276.7	243.1	224.0
Total consumption	631.5	816.5	1076.4	1456.3	1534.3	1425.9	1353.4	1340.0
Consumption kg/head	21.2	26.0	32.8	42.8	44.3	40.1	36.1	35.1

It is also worth mentioning how the number of employees changed within this period: in 1977 there were 53,643 employees, and in 1990 37,291 employees. The newest pulp and paper mill at Kwidzyn employed about 4300 persons at the turn of 1989.

In summary, we may say that since 1978 a gradual crisis has taken place in the Polish paper industry. The causes of its appearance should be looked for, first of all, among the basic postulates of the communist economy. As far as the paper industry is concerned, they can be specified as follows:

1. The imposition of prices for raw materials, paper, and its products by the centralized authority made the paper industry unprofitable.
2. The unprofitableness, in turn, gave rise to the shortage of capital for regeneration or modernization. Mills had to ask the central authority for money for their objectives.
3. The pulp and paper mills were not able to work out the required accumulation since they were deprived of a considerable part of their depreciation allowance and possible profits.
4. Long investment cycles (Swiecie, Kwidzyn) brought about the freezing of serious means, and consequently intensified the deterioration of the technical condition of the paper industry.
5. Restricted contacts with a free market economy and scarcity of competition, and any motivation to lower overhead costs and to improve product quality created an economy with very low effectiveness.
6. The rule of the market was replaced by political propaganda. The communist party exerted pressure on staffs of mills to achieve the maximum output. There was a sort of sports competition with slogans such as "work race" and "work leadership." This resulted in the complete exploitation of machines and equipment, increasing failure frequency and production decline, as well as the fatigue and discouragement of employees.

At the end of the '70s, the state was faced with the necessity to pay back foreign credits obtained at the beginning of the '70s. This changed for the worse the already difficult economic situation of the country, bringing about another great social discontent (Solidarity Movement), and after a further 10 years, communism collapsed.

The second transformation of the economic system

Balcerowicz's plan and its consequences

In mid-1989, the communists ceded their power to the opposition. On Jan. 1, 1990, the

III. Characteristics of Polish pulp mills

No.	Pulp mill	Production capacity, tons/year	Pulp grade	Year of establishment	Remarks
1	Swiecie	284,000	Sa ubl, NSSC	1967 and 1972	
2	Kwidzyn	220,000	Sa bl, NSSC	1981	
3	Ostroleka	95,000	Sa ubl, NSSC	1965 expansion in 1976 and 1985	
4	Kostrzyn	57,000	Sa ubl, bl	1958 expansion	
5	Wloclawek	46,000	Si ubl, bl	1899 expansions in 1930-35, 1955-58, 1971-80	Shut down in 1991
6	Krapkowice	40,000	Sa ubl	1946 expansion in 1961	
7	Niedomice	35,000	Si ubl, bl	1937 expansion in 1953, 1963 and 1987	Shut down in 1992
8	Kalety	25,300	Sa ubl	1884 expansion in 1992	Shut down
	Total	802,300			

new government enforced rules that started the transformation from the communist economic system to a market economy. The so-called Balcerowicz plan included:

1. Establishing a new dollar rate (increased by about 100%), making the Polish currency (zloty) convertible on Polish territory, and consequently eliminating several different U.S. dollar rates
2. Increasing the interest rate in zloty up to 120% (currently it is about 60%)
3. Introducing a strict monetary policy, including the control of wages and liberation of prices
4. Enforcing strict tax rules for enterprises (particularly state-owned factories)
5. Abolishing almost all custom restrictions
6. Placing ccnsiderable limitations on the subsidies of the state budget
7. Granting all an opportunity to develop economic activity.

In that determined way, the Polish centralized and state-controlled economy clashed against a market economy. This immediately resulted in a rise in prices, in market competition, in a decline in production, in shock in state and cooperative enterprises, and in striving for foreign credits with low interest rates.

The factories, which in that period carried on an investment process with foreign credits (e.g., US$), automatically faced a very difficult financial situation. The factories that were prepared to invest or that required modernization developed difficulties. Thus, the factories which had completed and cleared their investment tasks were least harmed. All at once, the Polish economy was forced to take up a competitive fight with the highly developed Western economy. This necessitated undertaking activities to lower the prime cost of production and to improve the quality of products as much as possible.

A process of adaptation to the requirements of the market economy, which was named industrial restructuring, has begun in the whole state-controlled sector and cooperatives. The restructuring is likely to be accomplished in three stages, which can be defined as follows:

1. Plain (or organizational) restructuring including:

- Closing down old and worn out production departments
- Division of large production companies into smaller units subject to their own economic accountability
- Decline in employment (by 15% as compared with 1989)
- Liquidation of social services such as holiday centers and sanatoria or convalescent homes, dispensaries, housing estates, canteens, etc.
- Selling needless machines and equipment, buildings, rooms, lands and surplus stores.

2. Technical restructuring including technology, equipment, and machinery which will consist in:

- Introducing new management methods and techniques into marketing and telecommunication
- Replacement of old technologies and equipment by new ones more suitable to the requirements of the market economy (effectiveness, quality, profitability)

- Modernization of not too old existing processes and equipment in order to adapt the product to free market standards
- Launching new production
- Taking up technical and organizational activities to reduce raw material and energy consumption, employment, and high charges for environmental pollution.

3. Complex restructuring, which will include organizational and technical changes as well as the fusion of single mills and plants into strong concerns.

After two years, one can say that the plain restructuring of the Polish industry has been partly completed. The consequence is that some state-owned and cooperative enterprises have gone bankrupt and the number of unemployed has approached 2.5 million. Polish goods in the market have been seriously replaced with commodities from the West. Nevertheless, the major part of state enterprises are still in operation, though being threatened with bankruptcy. The adopted economic strategy has faced unexpected phenomena such as:

- Collapsed market in the former Soviet Union
- Very slow inflow of Western capital to the ruined Polish economy (about US$ 800 million by May 1992)
- Enormous holdup of the flow of payment, from enterprise to enterprise, from enterprises to banks, from enterprises to the treasury
- Acute shortage of money in the market (circulating and investment capital),

The above mentioned events have brought about the following in 1992:

- A very severe budget deficit (5% of GNP as planned currently, i.e., about US$ 5 billion)
- Intensifying business recession
- Considerable political fragmentation of the society and protests of workers for economic reasons.

IV. Characteristics of Polish paper and board mills[a]

No.	Mill	Output, 1000 tons per year	Year of establ.	Grade of paper and board	Number of PM
1	Swiecie	378.9	1961	wrapping, toilet, board, fluting, bag	6
2	Kwidzyn	270.0	1976	writing, printing, wrapping, special, newsprint	4
3	Ostroleka	182.5	1959	bag, fluting, wrapping, backing	4
4	Skolwin n/Stettin	122.3	1947	newsprint, toilet, special, printing, writing, wrapping,	5
	Total	953.7			19
5	Krapkowice	94.5	1901	bag, wrapping, board, toilet	6
6	Jeziorna n/ Warsaw	90.8	1760	writing, printing, filter, toilet, board	9
7	Kostrzyn o/Oder	86.9	1958	writing, printing, wrapping, tissue, backing, special	3
8	Myszkow	82.8	1894	newsprint, writing, printing, backing, drawing	6
9	Wloclawek	50.8	1899	writing, printing, wrapping, toilet, special	6
	Total	404.9			30
10	16 mills	10–36	1833–1928	miscellaneous	
	Total	285.1			46
11	16 mills	2–10		miscellaneous	
	Total	93.8			24
	Sum	1737.5			

[a]Mills with output below 2000 tons are not included

Prospects of further restructuring in the paper industry

The restructuring of the Polish paper industry is based on privatization, which is accomplished in two ways:

1. As reprivatization or return of state-owned assets to original owners (if applied for)
2. Selling state assets by way of auction.

In order to proceed properly with the reprivatization of pulp and paper mills, it was necessary first of all to assess the technical condition of permanent assets, to evaluate the value of the assets and organize a privatization procedure.

Evaluation of the technical condition

Table III shows the characteristics of pulp mills. Of these, those at Swiecie and Kwidzyn are in the best technical condition. Those mills operate with moderately modern production technologies and equipment. Also in quite good technical condition is the mill at

V. The paper industry portion of environmental pollution by the Polish industry in 1989

	Pollution	*Paper industry, 1000 tons/year*	*Percentage of the load of the whole industry*
	Gases, total	68.0	1.4
	SO_2	29.8	1.1
Air	CO	24.9	1.9
	Other gases	13.3	1.3
	Dust	27.0	1.8
Solid waste	Produced	1162.3	0.7
	Utilized	625.4	0.6
	Stored	491.2	0.7
	COD	105.0	30.0
	BOD	27.0	20.0
	Suspended matter	abt.37.0	25.0
Water	Effluents, total	230 mil.m^3/year	11.7

VI. Dust emission by pulp and paper mills

No.	*Mill*	*Unit*	*Recovery boiler*	*Rotary kiln*
1	Kwidzyn	kg/t pulp	1.8	0.1–0.3
2	Swiecie	kg/t pulp	abt.3.0	0.6
3	Ostroleka	kg/t pulp	abt.3.0	2.7
4	Kostrzyn	kg/t pulp	22.0	—
5	Pols, Austria	kg/t pulp	0.5	0.15

Ostroleka, which has been recently modernized and expanded. One cannot say the same about the mill at Wloclawek, which was closed down in 1991 due to problems with environmental protection. The other mills are decidedly in bad technical condition and with environmental pollution problems. They are unprofitable. Three of them already have been closed down. Soon Poland will face a shortage of pulp due to a decrease in its production capacity of about 25%.

The equipment of the first three pulp mills includes continuous digesters. Two of the digesters (Swiecie), made by Kamyr, have been used for 20 years and are in quite good technical condition and produce sulfate unbleached and NSSC pulps. Two Bauer digesters have been in service for 15 years (Swiecie), and eight years at Kwidzyn. They are in quite good technical condition and produce NSSC pulp with capacities of 220 and 120 tons/day, respectively,

One Pandia digester has been in operation for 25 years (Ostroleka). It is in quite good condition and produces NSSC pulp with a capacity of 40 tons/day.

The equipment of the other mills includes batch digesters. Only at Kwidzyn are these in good technical condition. There are also two lines for processing mixed and deinked wastepaper at Kwidzyn, both being in good technical condition. The mill at Swiecie has one line for processing mixed wastepaper, and its technical condition is evaluated as tolerable. Also, the mill at Ostroleka has two lines for processing strong wastepaper which were rebuilt in 1990. The other production lines are in poor technical condition. Groundwood is produced in old installations, which makes it impossible to get a good quality product. To sum up, one should conclude that the three largest pulp mills need modernization as soon as possible.

Characteristics of paper and board mills are given in **Table IV**. Within the group of the four largest paper mills, the lines at Kwidzyn and Swiecie are in the best technical condition. Then come the lines at Ostroleka, which have been modernized, and those at Skolwin which were partly modernized. The second group of five medium-sized mills include relatively new and modernized lines as well as old and worn out ones. In the third group of 16 small mills, one can find modernized, but not modern, installations along with old and worn out ones. Modernized but rather old and worn out installations are also in operation in the mills of the fourth group comprising 16 very small mills. It is assessed that of the total number of paper machines, about 40% are in poor technical condition and should be scrapped. This would bring about, in the nearest future, a decrease in the total paper and board production capacity of 25–35%.

There are 16 paper machines that are less than 20 years old, seven of which are about 10 years old. Only five paper machines have a width of about 5.5 m. The fastest paper machines include:

- PM of 1976 at Klucze producing toilet tissue with speed of about 800 m/min
- PM of 1976 at Myszkow, producing newsprint and offset paper with speed of about 500 m/min
- PM of 1954 at Skolwin (modernized in 1986), producing newsprint with speed of 500 m/min
- Also, three PM in Kwidzyn running at about 600 m/min.

To be able to produce paper for a competitive market, about 55 paper machines must be rebuilt or modernized to some extent.

Assessing the paper industry condition, one must not ignore the problem of environmental protection. The paper industry portion of the total pollution of the natural environment in Poland is shown in **Table V**. As is seen, these portions are considerable in the case of water pollution, while the air pollution and the amounts of solid waste are rather low; nevertheless, when referred to the local conditions they are noticeable. **Table VI** contains average values of dust emission from recovery boilers and rotary kilns (line burning). In addition to recovery boilers, power boilers also emit SO_2. An average annual emission of SO_2 from these boilers is about 16.7 kg SO_2/ton of coal. The emission of SO_2 from sulfate pulp mills is below 10% of the total SO_2 emission from these mills.

VII. Allowable concentrations of toxic gases in the paper industry (Polish and international)

Gas pollutant	Polish			International	
	Concentration, mg/m³				
	per 30 min.	average per day	average per year	average per day	average per year
SO_2 up to 1998	600	200	32	70	20
SO_2 from 1999	400	150	32		
NO_x	500	150	50	—	30
H_2S	30	5	1	—	—
CO	5000	1000	120	—	—

It is assessed that about 42% of the effluents from pulp and paper mills undergo mechanical treatment before being discharged to receivers. Another 42% undergo chemical and biological treatments, while 16% (37.0 million m^3) are discharged to receiving bodies of water without any purification. Of the 40 pulp and paper mills in 1989, 12 discharged untreated effluents, and four mills had no equipment and facilities for wastewater treatment at all. The pulp and paper mills which have no wastewater treatment plant, discharge a load of 21 tons COD, 3.7 tons BOD, and about 31 tons of suspended matter. In Poland, legal problems of environmental protection are regulated by the act of 1980. The allowable concentrations of toxic gases in air emitted by the paper industry, according to the regulations (Dziennik Ustaw No. 15, 1980, item 32), are given in **Table VII**. It follows from the given data that the Polish requirements in relation to SO_2 and NO_x are considerably milder than the international ones.

According to the above mentioned regulations, paper mills using water shall possess legal water permits which determine the allowable quantities of discharged effluents, their condition, and composition.

The environmental protection facilities in Polish pulp and paper mills present the following technical condition:

1. The facilities for water and air protection at Kwidzyn are in a good condition.
2. Swiecie and Ostroleka possess quite good facilities for effluent treatment, but their installations for air protection are not satisfactory.
3. The remaining pulp and paper mills, except sedimentation tanks, which reduce the amount of suspended matter, have no facilities for environmental protection.

Evaluation of asset value and organization of privatization

The communist economic system lowered the exchange rate of convertible currency, e.g., US$, for political reasons. This complicated the economic cooperation between Poland and free market countries. Since several different exchange rates of US$ were in operation in Poland, namely an official, "tourist," and black market rate, the situation in the internal economy was bound to be abnormal. At the moment of transition to a market economy, the evaluation of fixed assets of the industry in Polish currency created many problems. First of all, such an evaluation had not been possible before the exchange rate of Polish zloty acquired its real measure in 1990. The estimation of the selling price of a factory is, however, more complex since it comprises both the material and nonmaterial values (trademark, market activity, etc.). Therefore, such estimates are carried out by specialized consulting firms, both Polish and international ones. Privatization of the state-owned enterprises had become possible since 1989. Various types of partnerships such as Polish, foreign, and mixed companies could be established. This right was exercised by the Ostroleka mill in 1990 when a joint venture with the Intercellulosa AB in Sweden and CHZ "Paged" was created. However, in other paper mills, such a transition progressed very slowly. In order to accelerate privatization, the Polish government issued special regulations in this regard in July 1990. The Ministry of Ownership Transformation was created, which began to realize so-called capital privatization. The first stage of this approach consisted in the assignment of a group of state-owned factories to be privatized first. This group included the best paper mills such as Swiecie, Kwidzyn, Skolwin, Kostrzyn, Klucze, Jeziorna, Krapkowice and Malta. Their production capacity is 62% of the whole production capacity of the Polish paper industry. These mills, after being evaluated, have been transformed into one-man companies of the Treasury. The so-called employees' councils, which functioned previously, have been replaced by supervisory boards which appointed boards of directors. The privatization of these mills was commissioned by the Polish government to be carried out by the Hambros Bank Ltd. in London. Based on the general assumptions of the privatization, 20% of the shares are to be reserved for employees of the mills. It is assessed that the privatization costs will amount to 10–15% of the selling price of a mill.

The future of the paper industry

To prepare a prognosis for Polish papermaking, one should first determine the future demand for its products in Poland. Based on the total paper and board consumption, for example in 1989 (Table III), one can determine the growth of demand, e.g., up to the year 2000.

In 1987–88, this problem was worked out by a team of Polish experts. The resultant prognosis included the year 2000 when the foreseen demand is to be as follows:

1. Newsprint—231,000 tons/year
2. Printing and writing—554,000 tons/year
3. Wrapping, filtration, bag—1,159,000 tons/year
4. Technical paper—175,000 tons/year
5. Absorbent and filtering paper—181,000 tons/year
6. Paper total—2,300,000 tons/year
7. Board—525,000 tons/year
8. Paper and board total—2,825,000 tons/year.

Taking into account the foreseen number of inhabitants in the year 2000, about 40 million, quite a moderate consumption index of about 70.6 kg/head would be obtained.

The foreseen demand for pulp raw materials include the following:

1. Paper grade pulp—1,053,000 tons/year
2. Conventional groundwood—167,000 tons/year
3. Semichemical pulp—132,000 tons/year
4. Defibrator pulp—9,000 tons/year
5. Rayon grade pulp—56,000 tons/year

- Total—1,417,000 tons/year.

This demand does not include wastepaper. Nor does it foresee any implementation of the production of considerable amounts of high-yield pulp because of its high energy consumption and power problems appearing at the time of the forecast elaboration.

According to the so-called Swedish report, published in 1990 by NLK-Celpap Engineering AB at Norrkoping, whose consultants have examined the Polish paper and board industry, the paper and board demand forecast up to the year 2000 is shown as follows:

1. Newsprint—151,000 tons/year
2. Printing and writing—472,000 tons/year
3. Kraft liner—96,000 tons/year
4. Packaging materials—281,000 tons/year
5. Boxboard—336,000 tons/year
6. Tissue—179,000 tons/year
7. Wrapping and other—555,000 tons/year

- Total—2,070,000 tons/year.

With the population foreseen in the year 2000, the above forecast gives per capita consumption about 51.75 kg, which means that Poland would not be able to decrease the difference between this country and Hungary and Czechoslovakia, which in 1989 reached 65 and 79 kg/head, respectively.

The Swedish forecast, however, is based on the assumption that the demand will be covered, possibly owing to modernization and expansion of the Polish paper and board industry. The situation in the year 2000 is to be as follows:

1. Production of paper and board—2,267,000 tons
2. Demand of the domestic market—2,070,000 tons
3. Possible export—197,000 tons.

In order to determine a real increase in the deficit of paper products, one should assume that the production capacity of the Polish industry will decrease to about 1,250,000 tons/year in the period 1992–94, which will give a production of about 1,100,000 tons/year. This means that the deficit of paper and board between 1994 and 2000 will be according to the following:

1. Polish report—1,725,000 tons/year
2. Swedish report—970,000 tons/year.

It is difficult at the moment to determine precisely how to satisfy the needs. Expansion and modernization of the paper industry along with import of paper products seem to be the most probable solution. Poland is most interested in expansion and modernization since it is faced with the necessity to take advantage of its own assets, raw materials, and labor force (including high-skilled manpower).

The following reasons should encourage foreign capital to take up such activities:

1. Proximity to the Eastern market (which is bound to boom within a few years), and to Eastern raw material resources
2. High annual logging amounting to 19–21 million m^3, with about 30% for the paper industry
3. Competitive prices for raw materials (wood, water, power)
4. Availability of skilled and low-cost labor (from a laborer to an engineer) owing to the long papermaking tradition in Poland (500 years)
5. Not too rigorous requirements for environmental protection
6. An extensive base of research and education (research and teaching institutions, and consulting and engineering offices in Lodz).

Conclusions

- Poland possesses a 500-year-old papermaking tradition.
- The economic policy of the communist system and the treatment of paper as propaganda material have ruined the Polish paper industry.
- The per capita consumption of paper in Poland is several times lower than those in the Western European countries.
- The paper industry in Poland needs urgent modernization and expansion, and this could be accomplished with the help of foreign capital.
- In order to gain foreign capital, the paper mills are now undergoing difficult expensive transition procedures such as rebuilding and changes in ownership status as well as privatization.
- Poland has common frontiers with several East European countries and, consequently, is in proximity to Eastern raw materials resources and markets which are bound to boom soon. Thus, Poland is a good place for capital investment.
- Current problems and the future of the paper industry in Poland are Polish and also international problems. TJ

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