

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
FEDERAL MINISTRY OF ENERGY, MINING AND INDUSTRY
BOSNIA AND HERZEGOVINA

**FEASIBILITY STUDY ON THE REHABILITATION OF A PULP,
KRAFT PAPER AND PAPER PACKAGING FACTORY IN
BOSNIA AND HERZEGOVINA**

**FINAL REPORT
(SUMMARY)**

AUG. 1998

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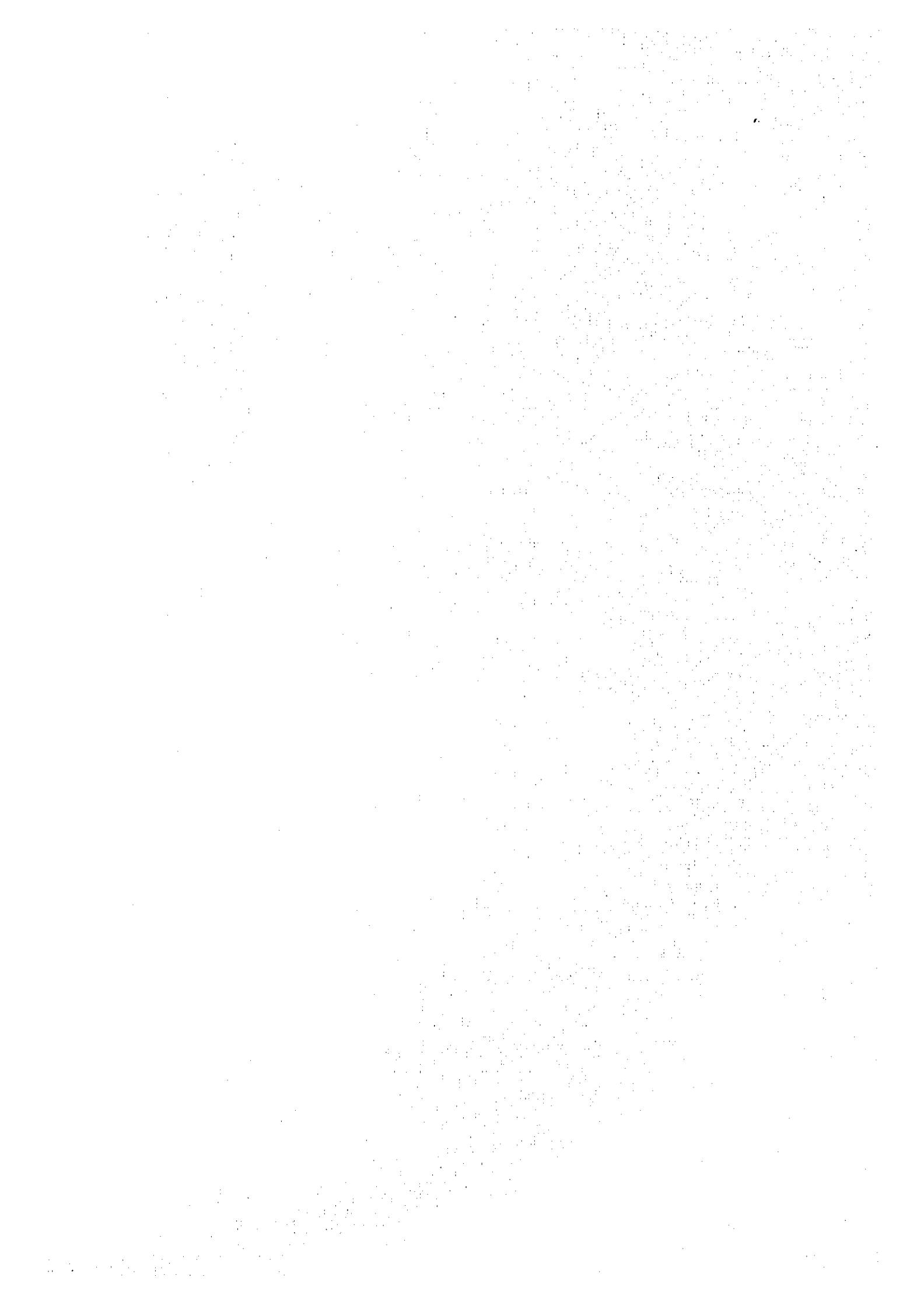
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FEASIBILITY STUDY ON THE REHABILITATION OF A PULP, KRAFT PAPER AND PAPER PACKAGING FACTORY IN BOSNIA AND HERZEGOVINA FINAL REPORT (SUMMARY)

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PREFACE

In response to a request from the Government of the Bosnia and Herzegovina, the Government of Japan decided to conduct Study on the Rehabilitation of a Pulp, Kraft Paper and Packing Factory of a government-owned enterprise "NATRON" in the Bosnia and Herzegovina, and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent a study team, lead by Mr. Masatoshi MIZUNO of Daiwa Institute of Research Ltd. and constituted by members of Daiwa Institute of Research Ltd. and other organization to the Bosnia and Herzegovina two times from February 1998 to August 1998.

The team held discussions with the officials concerned of the Government of the Bosnia and Herzegovina, and conducted related field surveys. After returning to Japan, the team conducted further studies and compiled the final results in this report.

I hope this report will contribute to rehabilitation of the factory in the Bosnia and Herzegovina and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Bosnia and Herzegovina for their close cooperation throughout the study.

August 1998



Kimio Fujita

President

Japan International Cooperation Agency

Letter of Transmittal

August 1998

Mr. Kimio Fujita
President
Japan International Cooperation Agency

We have the pleasure of submitting herewith our report for the Study on the Feasibility Study on the Rehabilitation of a Pulp, Kraft Paper and Paper Packaging Factory In Bosnia and Herzegovina. The report describes the result of the Study conducted by Daiwa Institute of Research Ltd. In accordance with the contract with the Japan International Cooperation Agency (JICA).

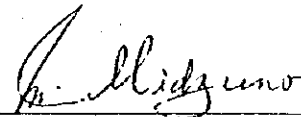
During the Study, our Study Team carried out field surveys two times in the period between February 1998 and July 1998. The Team held sufficient results of the field surveys and study activities In Japan, and drew up plans for contributing to the rehabilitation of NATRON Maglaj d.d.

Regarding these plans in close cooperation with the BH side, the Team then researched subjects such as the overall policies and practices of the BH industrial sector, the overall condition of NATRON, the production processes, the production management, the financial management and the outside factors such as the market and pursued technology transfer for concrete improvements in the factory, and then prepared this report.

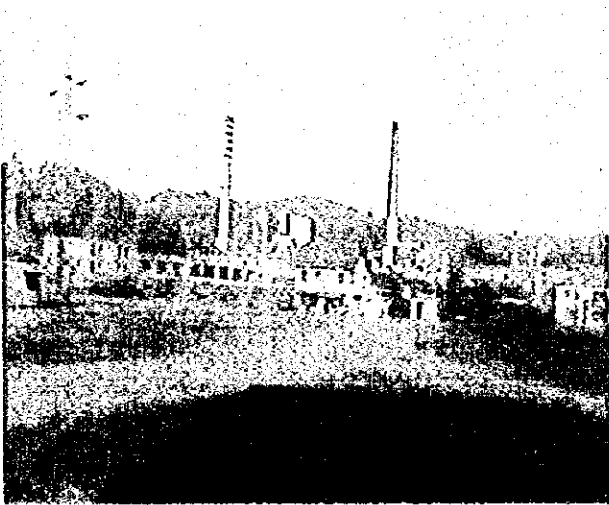
We would like to express our heartfelt gratitude to the Government of B H and the organizations concerned in the country for the kind cooperation they extended to our Team regarding the implementation of the Study as well as for their warm hospitality provided during our stay in BH.

Our thanks are also due to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Japanese Embassy in Austria, the Japanese Embassy in BH, and the JICA Austria office for their valuable advice and support rendered to us throughout the Study.

Yours faithfully.



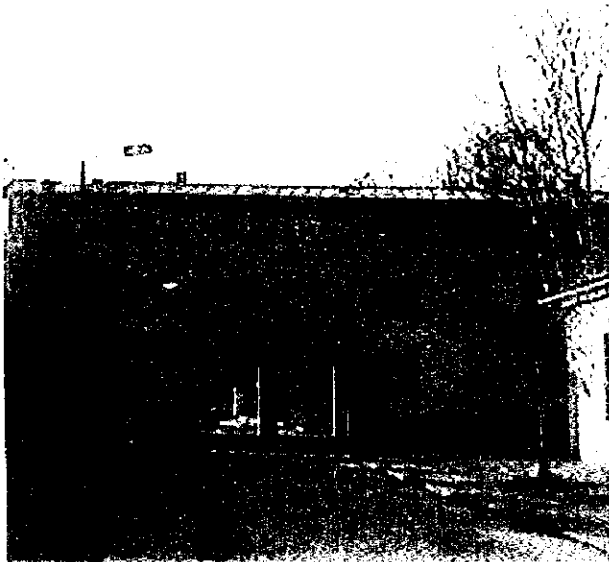
Masatoshi Midzuno
Leader of the Japanese Study Team
for the Study on the Feasibility Study
on the Rehabilitation of a Pulp, Kraft
Paper and Paper Packaging Factory
in Bosnia and Herzegovina



1) Entrance to the mill site



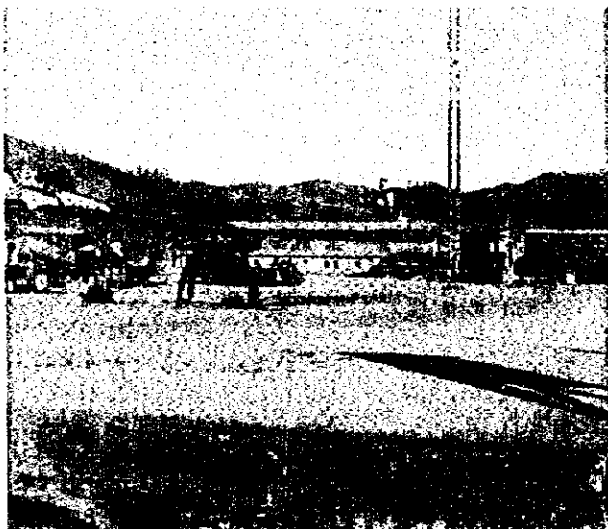
2) Entering management building



3) Management building



4) Main road on mill site



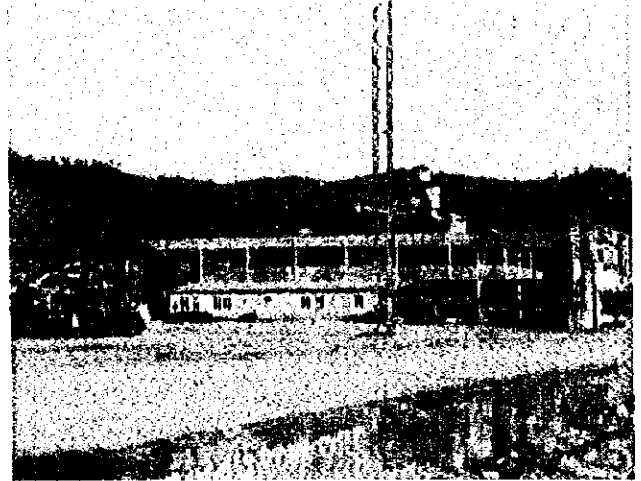
5) Wood handling area



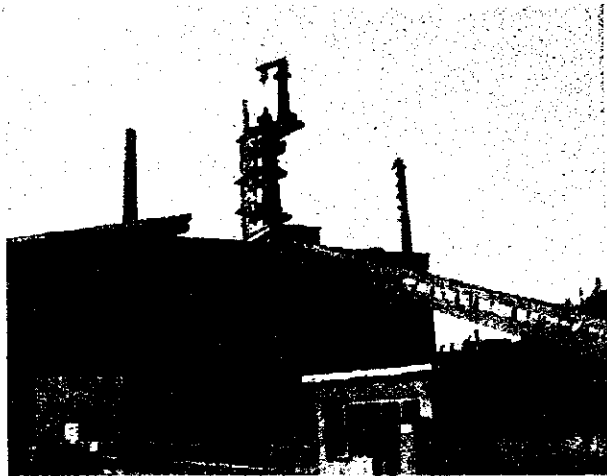
6) Woodyard, floating chanal and pulp mill



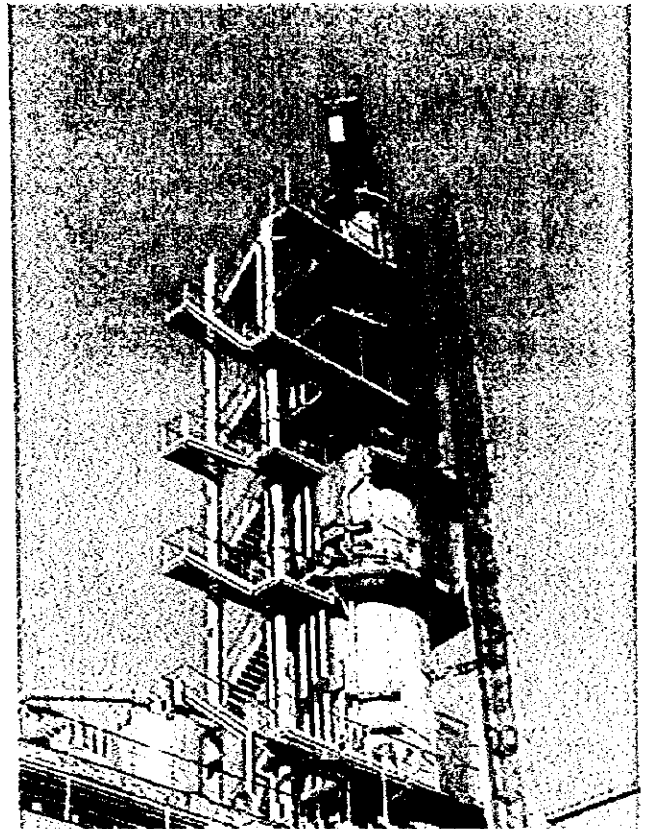
7) Ring debarker and chipping plant



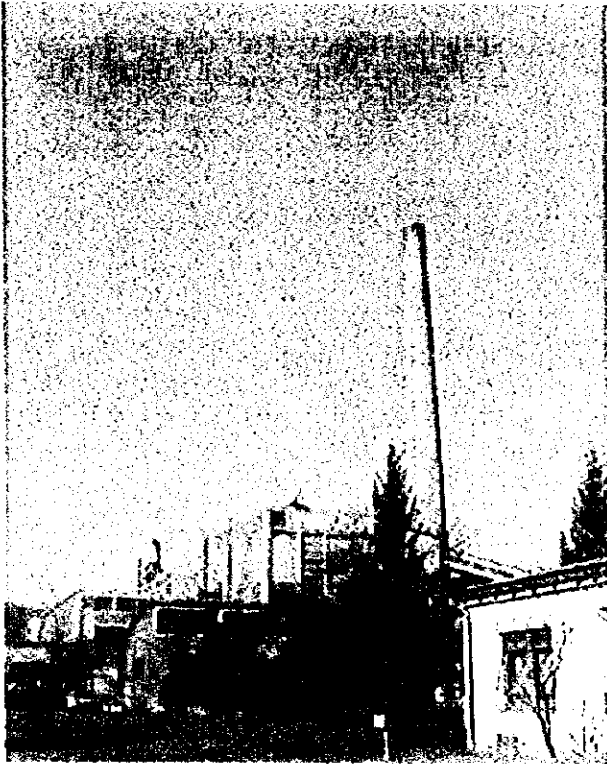
8) Ring debarker, chipping plant and chip conveyor



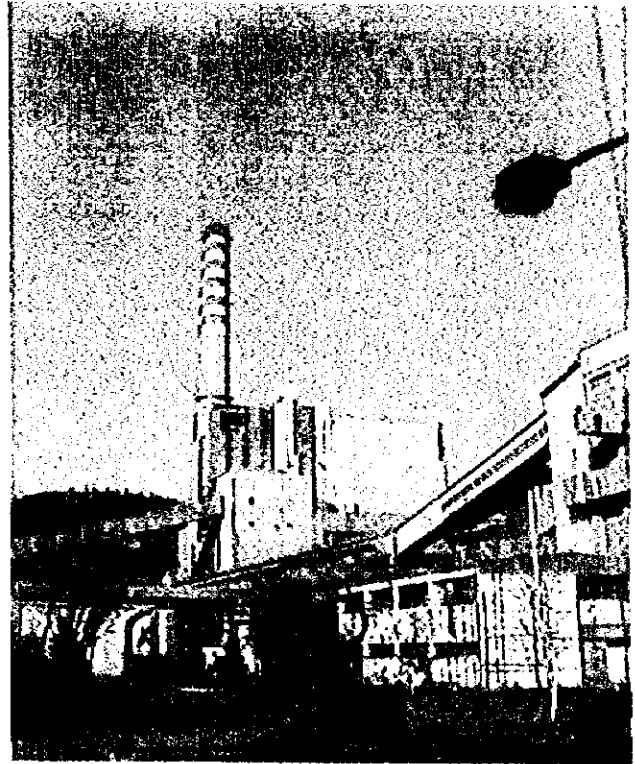
9) Chip conveyor, storage and kamyr digester



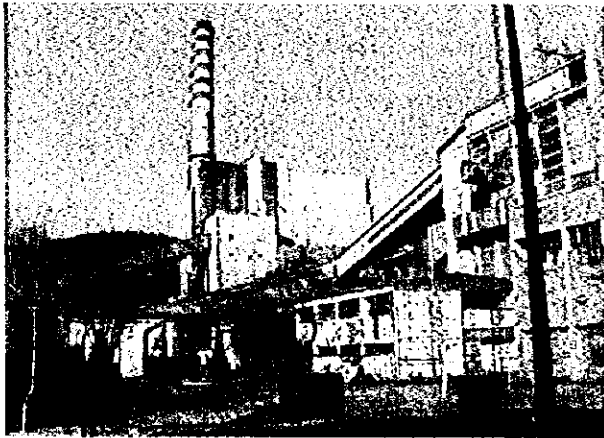
10) The top of Kamyr digester



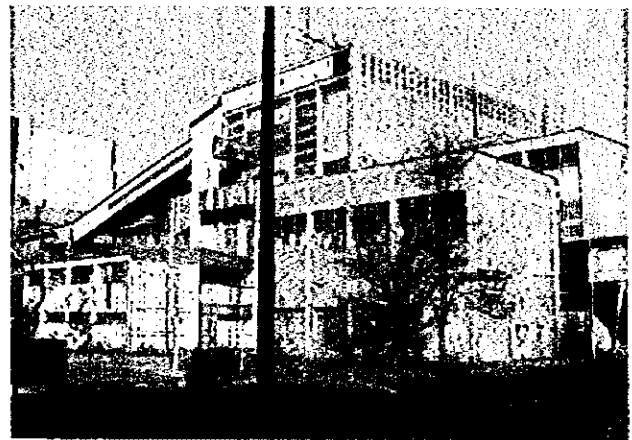
11) Power plant



12) Power plant



13) Power plant and butch pulping line



14) Butch pulping line facilities



15) Paper machine PM1 stock preparation



16) Paper machine PM1 wet end



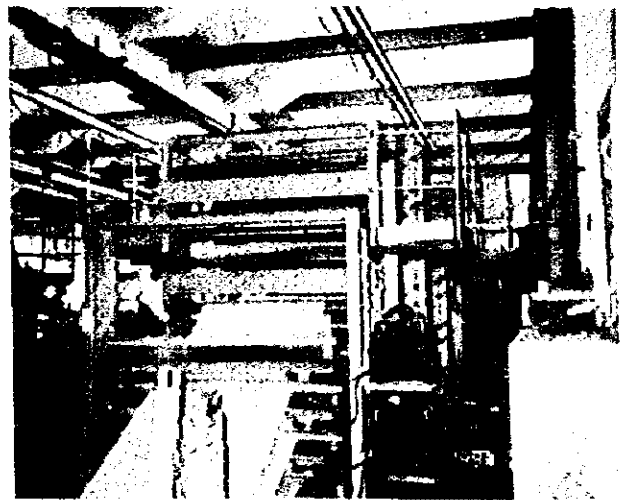
17) Paper machine PM1 head box



18) Paper machine PM3



19) Paper warehouse



20) Sacks machine



21) Sacks with handle



22) Sacks machine



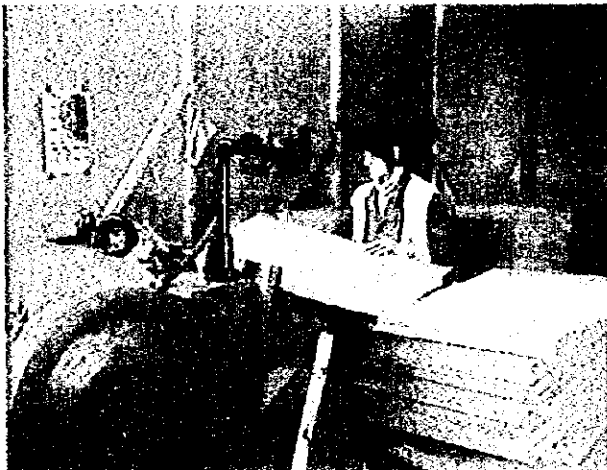
23) Corrugated box production unit



24) Corrugating plant



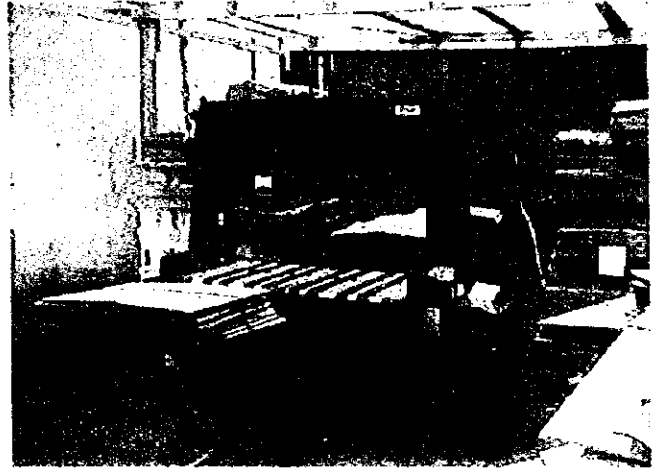
25) Corrugated box stitching unit



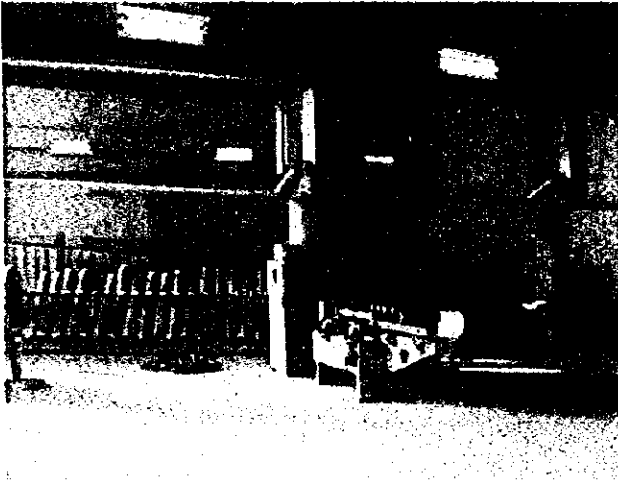
26) Corrugated board die cutting unit



27) Corrugated box production unit



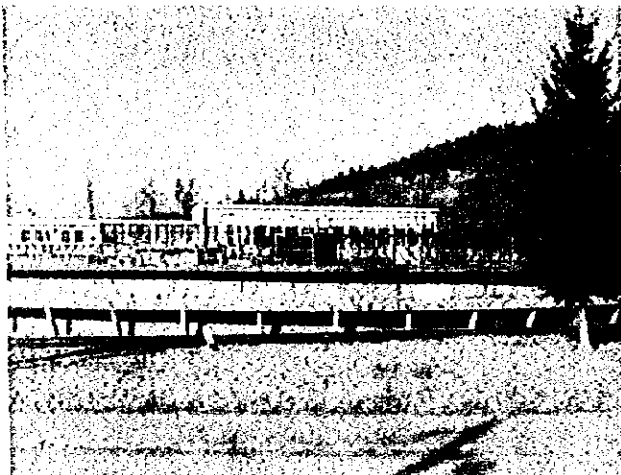
28) Corrugated board box packing



29) Repair shop



30) Burn-out corrugating section



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Drawings

Mill Site Layout

LIST OF UNITS TO BE USED

Quantity	Units to be used	Abbreviation
Acceleration	meter per square second	m/s ²
Amount of substance	mole	mol
Angle	degree	o
Area	square metre	m ²
	square centimetre	cm ²
	square millimetre	mm ²
Biological oxygen demand(BOD)	milligram per litre	mg/l
	gram per litre	g/l
	ton per day	t/d
Brightness	ISO degree	o ISO
Chemical oxygen demand (COD)	milligram per litre	mg/l
	gram per litre	g/l
	ton per day	t/d
Compression strength	newton per square millimetre	N/mm ²
Concentration	mole per cubic decimetre	mol/l
	milligram per litre	mg/l
	gram per litre	g/l
Conductance	siemens	S
Conductivity	millisiemens per metre	mS/m
	siemens per metre	S/m
Consistency	percent	%
Content	milligram per kilogram	mg/kg
	kilogram per cubic decimetre	kg/l
	milligram per cubic metre	mg/m ³
	gram per litre	g/l
	milligram per normal m ³	mg/m ³ⁿ
Currency	German mark	DM
	Japan yen	JPY
	USA dollar	USD
Density	kilogram per cubic decimetre	kg/l
Dry solids content	percent	%
Electric charge	coulombe	C
Electric current	ampere	A
	kiloampere	kA
	milliampere	mA
Electric potential (voltage)	volt	V
	kilovolt	kV
	millivolt	mV
Electric power		
	- active power	watt kilowatt megawat
- apparent power	voltampere	VA
	kilovoltampere	kVA
	megavoltampere	MVA
- reactive power	var	VAr
	kilovar	kVAr
	megavar	MVAr

Quantity	Units to be used	Abbreviation
Electric power factor	cos phi	cos M
Electrical energy	kilowatt hour	kWh
	megawatt hour	MWh
	gigawatt hour	GWh
Energy, work	kilojoule	kJ
	megajoule	MJ
	gigajoule	GJ
	litre per second	l/s
Flow rate	litre per minute	l/min
	cubic metre per hour	m ³ /h
	cubic metre per day	m ³ /d
	tons per day	t/d
	Force	newton
	kilonewton	kN
	meganeutron	MN
Freeness of stock	millilitre	ml CSF
Frequency	herz	Hz
	kiloherz	kHz
Grammage	gram per square metre	g/m ²
Gravity	newton	N
Hardness of water	milliequivalent per litre	mval/l
Heat of reaction, enthalpy	kilojoule per kilogram	kJ/kg
	kilojoule per mole	kJ/mol
Heat transfer coefficient	watt per °C per square metre	W/(°C m ²)
Heat capacity	kilojoule per kelvin	kJ/K
	specific heat capacity	kilojoule per kilogram and kelvin
Heat value	kilojoule per kilogram	kJ/kg
	megajoule per kilogram	MJ/kg
	gigajoule per ton	GJ/t
Humidity of air	gram per cubic metre	g/m ³
	- absolute	kg/kg dry air
	percent	%
- relative	percent	%
Illuminance	lux	lx
Kappa number	-	-
Length	millimetre	mm
	metre	m
	kilometre	km
	percent	%
Luminance, Y value	percent	%
Luminous flux	lumen	lm
Mass	ton	t
	kilogram	kg
	gram	g
	milligram	mg
	kilogram per second	kg/s
Mass rate of flow	air dry(90%) ton pulp per day	ADt/d, I/d
Modulus of elasticity	newton per square millimetre	N/mm ²
Moisture content	percent	%
Moment of force	newtonmetre	Nm

Quantity	Units to be used	Abbreviation
Pressure (effective)	bar, kilopascal, megapascal	bar, kPa, Mpa
Pressure, absolute	bar(abs)	bar(abs)
Pressure, pumps	metre liquid column	mle
Production rate		
- paper	ton per hour	t/h
	ton per day	t/d
	ton per annum	t/a
- pulp	air dry ton per hour	ADt/h, t/h
	air dry ton per day	ADt/d, t/d
	air dry ton per annum	ADt/a, t/a
Resistane	ohm	ohm
	kilo-ohm	kohm
Rotational frequency	rounds per second	1/s
	rounds per minute	rpm
Shopper Riegler of stock	millilitre	ml SR
Sound pressure level	decibel (A)	dB(A)
Specific weight	kilogram per cubic decimetre	kg/dm ³
	kilogram per cubic metre	kg/m ³
Specific volume	cubic decimetre per kilogram	dm ³ /kg
Surface load	newton per square metre	N/m ²
Stress	kilopascal	kPa
	megapascal	Mpa
	newton per square millimetre	N/mm ²
Thermal conductivity	watt per oC and metre	W/(oC m)
Time	second	s
	minute	min
	hour	h
	day (24h)	d
	year	a
Velocity	metre per second	m/s
	metre per minute	m/min
Viscosity dynamic	millipascal second	mPa s
kinematic	square millimetre per second	mm ² /s
Volume, general	cubic metre	m ³
	litre	l
	millilitre	ml
Volume, wood	cubic metre solid over bark	m ³ sub
	cubic metre solid under bark	m ³ sub
Web tension	newton per metre	N/m

1. BACKGROUND AND OBJECTIVE OF THE PROJECT

Bosnia and Herzegovina (BH) suffered severe losses through a civil war (Apr. 1992 - Oct. 1995) after it gained independence in the beginning of 1992. Especially hard hit was the manufacturing sector, and output in August 1997 was only 15% of the level in August 1991, indicating the extent of the depression in industrial activity caused by the war.

“NATRON Maglaj d.d.” (NATRON Pulp and Paper Mill in Maglaj city), which is the object of this project, developed following the end of World War II to be a representative member of former Yugoslavia’s pulp and paper industry, located in a region rich in forestry resources. During the civil war, factory buildings and corrugated cardboard manufacturing facilities were badly damaged. The paper machines and pulp making facilities except wood preparation section were undamaged by war itself, but most equipment rusted or corroded while they have stopped working for about 4 years. Current operation levels for the production of corrugated cardboard and paper bags from product stock, recycled paper and purchased paper are currently 10% of their pre-war level.

NATRON, which with 70% government ownership is essentially a state run enterprise, which in January 1997 ranked 15th on a list of 76 priority projects in the economic recovery plan of a council of the BH cabinet. They hope that this project will serve to increase employment and be a great help in the region’s economic recovery.

The goal of this study is to, based on the BH government’s request, and placing the greatest emphasis on the privatization in 1998 of NATRON, examine feasibility for an “Immediate restoration plan” for NATRON to survive by improving management and strengthening the currently operational waste paper recycling division, and to make a “Mid to Long term plan” aimed at forming a step-wise restoration plan to restart pulp production and to prepare for the privatization of the company. Moreover, during the feasibility study the team will provide technical transfer in such areas as quality control, production management, and financial management.

We all, members of the study team of this project, hope that the result of our study will help improvement in NATRON’s management and production to a model enterprise adapting to the market economy and privatization, and that it will help NATRON attract foreign investment. We also hope the Maglaj area will recover its prosperity through NATRON’s restoration in near future.

2. SOCIAL ECONOMIC SITUATION

The Republic of Bosnia and Herzegovina (hereafter BH) consists of the Federation of Bosnia and Herzegovina (hereafter the Federation or F M&C, Federation of Muslims and Croats) and the Republic Srpska (hereafter RS).

Although the government of BH prepared key laws like the privatization, and related laws, banking law, etc. for social reform and economic reconstruction, the legislative process has looked slow and the expected implementation of social and economic reforms seems hesitant due to political reasons.

During the war years more than 1.2 million refugees evacuated from BH to neighboring countries or further afield. In the two years since the signing of the Peace Agreement over 200,000 refugees have returned. Both the repatriation of refugees and re-settlement of the displaced persons are very important for the stabilization of BH society.

The Federation suffered enormous damage by the war. Direct damage is estimated to amount about US \$ 80 billions. A broad support for the reconstruction of BH has been initiated by the international community immediately after the Dayton Peace Agreement.

2.1 POLITICAL SITUATION

Republic of Bosnia and Herzegovina has emerged from a war. The war over four years (1992-1995) left serious consequences on all segments of political and social life in the country. The infrastructure, the main prerequisite for the normal life was paralyzed like as well industrial sectors over the country.

Bosnia and Herzegovina has the following limited responsibilities under the Basic Principles confirmed at Dayton: the establishment of a Constitutional Court, a Commission for displaced persons, a Human Rights Commission, a Central Bank, public corporations to manage and operate Transport and Telecommunications, a Commission to preserve National Monuments, and a system of arbitration between the two entities. Foreign trade is also to be managed by the government of BH. (EIU)

2.2 ECONOMIC SITUATION

At present concrete economic industrial programs are not observed in BH.

Up to now, the BH government has tried to work in line with the agreement in the Dayton Accord. They have managed to arrange one by one the basic national structures - general elections, setting-up of a Central Bank, issue of new currency, enactment of a series of laws and regulations for market economy etc.

Unemployment is still over 50%. More than 30% of the population depends on humanitarian aid, while some 75% of the housing stock still needs rehabilitation. Only 15% of the industrial facilities have been restored according to Government officials. The Government has intentions to shift its policy from the present emergency recovery system toward a long-lasting sustainable economic system.

Among the reconstruction programs, priority is placed on peace-keeping, resettlement of refugees, relief to victims of the war and the unemployment, reconstruction of distracted infrastructure and damaged environment.

The huge amount of expense for reconstruction infrastructure and environment depends almost on foreign aids. The amount of foreign aid in 1997 was US\$ 1,100 million and the same amount is expected also in 1998. The uses and allocation of funds are to be decided at the donor conference held once or twice a year in Brussels.

2.2.1 GDP

GDP for the state as a whole showed a strong growth in the first two years after the war, although the growth was not as strong as in the federation. 1996 GDP at \$3.4 billion was 65% higher than the 1995 GDP. The projected 1997 GDP at \$4.5 billion represents growth 35% from 1996 (Federation Institute of Statistic).

Regarding BH GDP growth in the near future, IMF and IBRD expect 21% real growth rate per year on average from 1996 to 2000, and 8.4% from 2001 to 2005. They forecast its GDP in 2002 will surpass US\$ 8,199 million in 1991. In this report hereinafter this forecast is used for Natron's business plan.

The two institutions also forecast the income per capita of BH. The real income per capita declined in 1995 to US\$ 524 from US\$ 1,872 in 1991. And then recovered to US\$ 726 in 1996. IMF and IBRD forecast it will smoothly recover in the near future, and will reach US\$ 1,150 in average between 1996 and 2000, US\$ 2,123 between 2001 and 2005.

The rate of inflation in the FM&C was - 0,25 % in 1996, and 10,8 % in 1997.

2.2.2 Employment

A major priority of the government policy is to create the conditions for rapid reduction of unemployment.

No employment figures are available for Republic Srpska.

Although the unemployment rate on average in the Federation is said to be about 50%, the rate in Maglaj city is 68%. The city of Maglaj is in a crucial situation. (city officials)

2.2.3 Banking System

One of the most significant events in the banking sector was the establishment of the Central Bank of Bosnia and Herzegovina (CBBH). This was in line with the Dayton Agreement and at the same time the National Bank of Federation and National Bank of Republic Srpska ceased to act as Central Banks.

In the commercial banking sector, there were 57 banks as of September 1997, 46 of them in Federation, 11 in the RS. Privately owned banks account for 60% of the total number and in the remaining 40% of banks, the State is the majority shareholder. Due to the easy regulation on setting up, most of the private banks mushroomed in the chaos during and after the war. They are usually very small and weak. The commercial banking sector is now insolvent and burdened by non-performing assets mainly to state owned enterprises. Therefore the banking sector is not strong enough to support the reconstruction of the industry sector. No foreign banks exists in the country.

2.3 INDUSTRIAL SITUATION

Although the domestic and export market for BH industrial products will recover in the near future, the restoration of the former Yugoslavia markets on which BH has largely depended is not observed at this stage. Before the war, the export of BH to the former Yugoslavia countries was DM 251 mil, 74% of total BH exports. This declined to only 7% in 1996.

Generally speaking the industry of this country has excess capacity, at the same time as acknowledged by the government officials, the most enterprises have kept excessive work force and its labor productivity is very much below Western standards. They also point out that the management capability of most enterprises is not adequate to carry on business in the coming market economy. Financial and technical improvement is strongly needed for many enterprises. In this area foreign assistance has been requested.

Industrial production, which grew by 80% in the first months after the war now, experiences large monthly fluctuations. Trade, which had grown rapidly in the first year after the war, now appears to have shrunk with January 1997 figures 40% below figures for January 1996. Large

monthly fluctuations are frequently seen also in employment wages and prices in general.

2.3.1 Pulp and Paper Industry

The pulp and paper industry, although the number of companies in this sector is limited to 6 headed by Natron Maglaj, is very important for the country as enterprises that provide employment, export and pay taxes. Furthermore their importance is that the pulp&paper industry sustains wide-spread skirt industries such as timber industry, publishing, transportation, chemicals, machinery etc. Everyone knows the paper (industry) supports the culture of a nation . It should also be noted that the industry can maintain the forest as a national heritage in good condition and regenerate the forest through tree farming and forest maintenance.

Wood is potentially a strong sector with good export prospects. Currently the sector is surviving almost solely on the quality of its raw material. Bosnian beech, spruce and pine enjoy strong demand in Europe, especially Italy. However, the average length is declining due to lack of forest management during the war and over-cutting of the more accessible forest areas.

2.3.2 Infrastructures Situation

International organizations and a lot of countries have helped the reconstruction of BH's infrastructure which is extremely important for economic recovery.

(1) Water

During and after the war (period 1992-97) main activities of the Water management Company were focused on water supply systems have already been rehabilitated. Over 60,000 meter of water pipelines, 12,000 m³ of reservoir space, 14 pumping stations of various capacities and many water intakes have been reconstructed or newly constructed. (Source Public Water Management Enterprise "Vodoprivreda").

(2) Electricity

Currently in Republic BH they have enough electrical energy for their consumption.

(3) Telecommunications

Reconstruction of telephone and telegram network has been remarkable, however recovery of the telecommunication service is not adequate. Telephone and facsimile circuits are still in shortage.

(4) Railway Transportation

As of March in 1998, recovery of the railway transport system is not realized except in few local lines. Especially regular railways operations across the countries are not served.

(5) Road

Due to its geographical features, BH road transportation situation is rather poor. In F M&C there are about 7,000km roads from the national level to local communities and some 40 damaged bridges which are now partly repaired (Federal Ministry of Telecommunication & Transport).

2.4 PRIVATIZATION PROGRAM

The Federation adopted a privatization law in October 1997. In the Federation of M&C, there exists a specialized organization (institution) for privatization called Federal Agency for Privatization. This Agency has its under control ten Agencies at the Canton level. Process of privatization has three phases. First for apartments, second for enterprises and third for claims and compensations .

There are seven relevant laws:

(1) The Law on Privatization of Enterprises

Process of privatization of enterprises will be in three phases:

- 1) Small enterprises with property below 500 000 DM, less than 50 employees
- 2) Middle and big /enterprises with property above 500 000 DM, above 50 employees
- 3) State strategic important companies as water supply, electric company, PTT, etc.

(2) The Law for the Banks

(3) The Law on Opening Balance Sheet of Enterprises and Banks

(4) The Law on Sale of Apartments with Existing Tenancy Right

(5) The Law on Determination and Realization of Citizens Claims

(6) The Law on Restitution

(7) The Law for Private Investments Funds

2.4.1 Present Situation of Privatization

The privatization in the Federation has been initiated by the Federal Agency for Privatization which was set up in October 1997. But the Proceeding is apt to be behind by the lack of staff in the Agency and delay of legislation of related laws.

As with effectiveness of the related laws for the privatization for apartments and small size companies, the Agency has practically ordered the district Agencies in canton level to start the initial work for privatization like confirmation of applicable assets, asset appraisals, confirmation of ownership and present management etc.

Regarding the privatization for medium and large enterprises, they are already required by the Law on Opening Balance Sheets to submit to the Agency for it's investigation their financial

statements made to European standards within 6 months of legislation of the related law i.e. by the end of September 1998. The Agency will estimate the share price of each enterprise on the basis of its financial statements.

There are two aspects to privatization in the Federation. The first is the positive side where, just like successful cases in Central Europe, the government wishes to realize a market economy as soon as possible through privatization and modernization of enterprises by introducing foreign capital and technology. In the passive side comes the government financial situation. The government aims to utilize the funds to be received through privatization for compensations before and during the war.

The government along with promotion of privatization is preparing to establish a Stock Exchange and some 10 investment funds by utilizing their savings and developing the securities market.

2.4.2 NATRON and Privatization

The popular pattern of privatization in the former socialist countries in Central and Eastern Europe is to start, first of all, improvement of management structure of state owned enterprises, and next to try to sell to investors the company's shares at market price as high as possible. In the Federation the government seems to promote improvement of management and privatization at the same time or for a very short period. It naturally needs for the government a strong and powerful leadership. For the enterprises quick action for tough management reformation is required

The management of Natron Maglaj is willing to privatize the Company in line with the government policy and is now preparing the initial procedure. Natron in its present poor situation is not in a position to be privatized by the ordinary privatization process. First the reconstruction of management should be implemented, then privatization can be forwarded.

The present difficult situation of Natron Maglaj has obviously become the critical problem for the local community of Maglaj. In January of 1998 the municipality Council of Maglaj together with other parties concerned resolved unanimously to make a special appeal to the Federal Government to request strong support to rescue Natron. In reply to this appeal the Government showed strong intention to help Natron and the municipality.

It is quite reasonable and not contradictory to the spirit of free economy to help a troubled state owned enterprise like Natron which has been damaged by the war. Furthermore it is proper for the Government to support the management reform until the transfer to the private sector.

3. PULP AND PAPER INDUSTRY OF BOSNIA HERZEGOVINA /FORMER YUGOSLAVIA

3.1 GENERAL

In 1991 prior to the civil war in Bosnia Herzegovina the country had five pulp and paper mills producing in total 160,000 tons of pulp and 230,000 tons of paper. This production drastically declined due to the war to about 45,000 tons of pulp and 70,000 tons of paper the following year.

The five mills have the capacity to produce various packaging grades, tissue as well as printing & writing paper. The situation of those mills was unclear at the time of preparing this report and it was possible to obtain information from only one mill other than the NATRON mill.

(1) "Cazin-Tvornica Kartona i Ambalaze"

Cazin is a paper board mill capable of producing duplex and triplex board based on waste paper. The machine has the following specification:

PM 1 Fourdrinier 3.2 m, max. speed 200 m/min.

The total capacity is 45,000 t/a: The factory was attacked several times during the recent civil war which caused some damage, particularly on the energy supply installations. At the time of preparing this report, the paper machine was not yet in operation.

(2) "CELPAK, Fabrika Celluloze i Papira"

Celpak has a total bleached pulp capacity of 40,000 t/a of which 10,000t/a sulphate and 30,000 t/a sulphite. The waste paper plant consumes 5,000 t/a wood-free waste paper and 4,000 t/a filler and coating pigments can be used in the paper production. The company produces printing & writing, coated wood-free, packaging and tissue grades.

The total paper and paper board capacity is 55,000 t/a divided to four paper machines.

PM 1 Fourdrinier 3.2 m with a size press; 30,000 t/a.

PM 2 Fourdrinier 3.2 m ; 15,000 t/a

PM 3 Cylinder machine 3.2 m; 10,000 t/a

PM 4 Cylinder machine 3.2 m; 10,000 t/a

The situation after the war is not clear.

(3) "Dvar Papir"

Dvar has the capacity to produce 35,000 t/a printing and writing papers as well as industrial grades on two paper machines.

PM 1 Fourdrinier 3.2 m; max. speed 400 m/min

PM 2 Cylinder machine 3.2 m; max. speed 250 m/min

The situation after the war is not clear.

(4) "INCEL - Banja Luka"

The total pulp capacity of INCEL is 76,000 t/a of bleached softwood sulphite, fluff pulp and dissolving pulp from beech. The tissue paper capacity is 33,500 t/a on two paper machines.

PM 1 2.5 m; max. speed 500 m/min

PM 2 5.0 m; max. speed 1,500 m/min

The mill has been damaged during the war and is only operating at 10-20% of its capacity. It is estimated by the mill that DEM 5 million is required to repair war damage and DEM 3 million for working capital before it can increase production.

(5) "NATRON Maglaj"

NATRON has two pulping lines, one batch digester line of 50,000 t/a and a continuous digester line with a capacity of 70,000 t/a. Additionally, NATRON can process 50,000 t/a waste paper.

The five paper machines have a nominal combined capacity of 165,000 t/a:

PM 1 Fourdrinier 4.2 m; max. speed 350 m/min

PM 2 Fourdrinier 3.2 m; max. speed 350 m/min

PM 3 Cylinder machine 2.8 m; max. speed 250 m/min

PM 4 Fourdrinier 5.4 m; max. speed 400 m/min

PM 5 Fourdrinier 2,2 m; max. speed 150 m/min

The mill has a paper sack plant of capacity 180 pieces million per day and corrugated box plant with a capacity of 120 million square meters per year

The pulp mill ceased operation in during the spring 1992 as a result of the civil war. During the spring of 1998 only PM 1 was in operation producing schrenz and test liner based on waste paper and purchased pulp. The operation is intermittent on one paper machine only due to shortage of both raw material and customers.

The converting operation was, during the spring of 1998, at 5-10% capacity utilisation.

3.2 MANUFACTURE AND TRADE OF PAPER AND PAPER PRODUCTS

Because of insufficient official statistics, we could obtain only the following figures (from the Institute of Statistics of BH)

(1) Manufacture of paper and paper products (index)

Average 1991	Jan/91	Dec/91	Dec/97	Jan/98
100.0	107.9	56.7	5.3	1.5

(2) Trade of paper and paper products for Jan. 1 to Dec. 15 (US\$1,000)

Export		97/96	Import		97/96
1996	1997	%	1996	1997	%
539	357	66.2	1,903	14,340	753.5

(Note: Ton-kilometre = Tonnage transported * Kilometre transported)

3.3 DEMAND FORECAST

Through interviews with main customers of NATRON, it is found that their present operating level is about 30% to 40% in comparison with pre-war level and that they plan to increase production to 30%-50% of capacity in 1998 year comparing with 1997.

Sales of NATRON's corrugated board and boxes are to be increased (by quality improvement) using own pulp and by marketing promotion.

Transportation condition has gradually improved and freight transportation has been increasing as follows: (Institute of Statistics BH)

Metric ton-kilometre(1,000)	1996	1997	
Vehicle freight	129,917	222,477	171%
Rail freight	17,827	46,539	261%

4. EXPORT MARKET

Considering the fact that the domestic market in BH has contracted and even at full capacity is limited in its size, export of production is very important for revival of NATRON.

The study team investigated the present situation of neighbouring countries of BH for potential export quantities and sales prices for sack paper and NSSC fluting. The potential export quantities is used in the development plan.

The objects of the investigations are as follows:

- (1) Product specification and quality requirements: to clarify product specification and quality requirements for NATRON so as to produce suitable commodities matching markets' demand.
- (2) Demand: to identify market size by studying consumption volume and demand trends.
- (3) Production: to identify quantity to be imported by studying local production and trade balance, and then make forecast of the future demand by calculating GDP growth.

At the same time the investigation covered the production capacities of main local manufacturers, who could be competitors or potential partners, and also, projects for increasing capacities.

- (4) Prices: Analysing price trends in the last ten years in the German market, which is a price setter in Europe, forecast market prices for the future are to be calculated.

- (5) Based on the output from (1)-(4) above, quantities and prices for use in long term plan have been estimated.

4.1 SACK PAPER

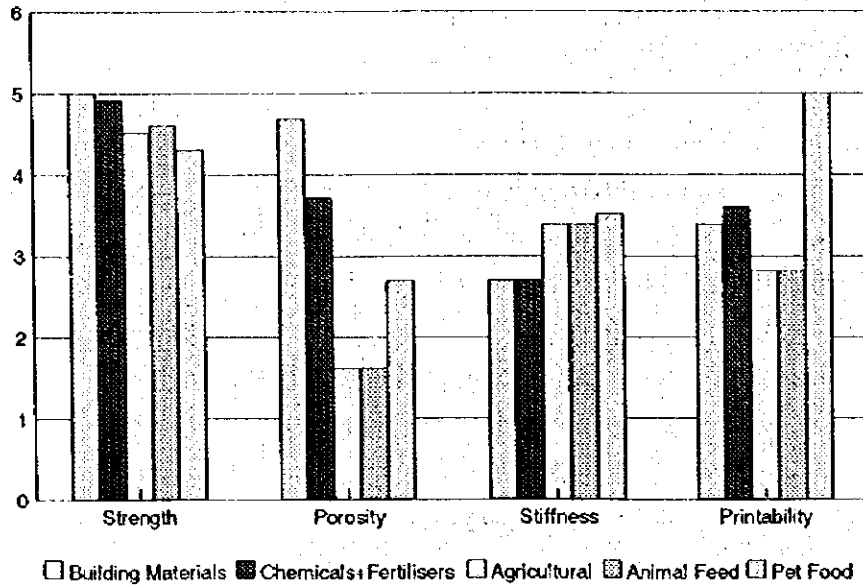
4.1.1 Product Definitions and Quality Requirements

(1) Product Definition

Sack paper is normally produced from 100% unbleached kraft pulp, but it can also be produced using recycled fibre (mainly OCC, Old Corrugated Container). Sack paper may be produced in one to four layer structures, depending on the end use and other applied packaging materials. The weight is typically over 60 g/m². The main end uses are cement and chemicals packaging, agricultural end uses, animal feed and pet foods packaging, and as refuse bags.

(2) General Quality Requirements

FIGURE 4.1
SACK PAPER
QUALITY REQUIREMENTS BY END USE
 (5=very important, 1=not important)



4.1.2 Demand

(1) Demand by Market

The largest single sack paper consuming countries in the study area are Italy, Turkey, Russia/CIS, France, and Spain. Altogether they account for 67% of the total consumption among the countries examined.

Western Europe: France, Spain, Italy, Greece, Austria

Eastern Europe: Hungary, Slovenia, Croatia, Bosnia, Yugoslavia, Bulgaria, Albania, Romania, Russia

The Near Middle East: Turkey, Syria, Lebanon, Jordan, Israel, United Arab Emirates, Saudi-Arabia, Kuwait

North Africa: Egypt, Algeria, Tunisia, Morocco

FIGURE 4.2
SACK PAPER CONSUMPTION IN WESTERN EUROPE (1996)

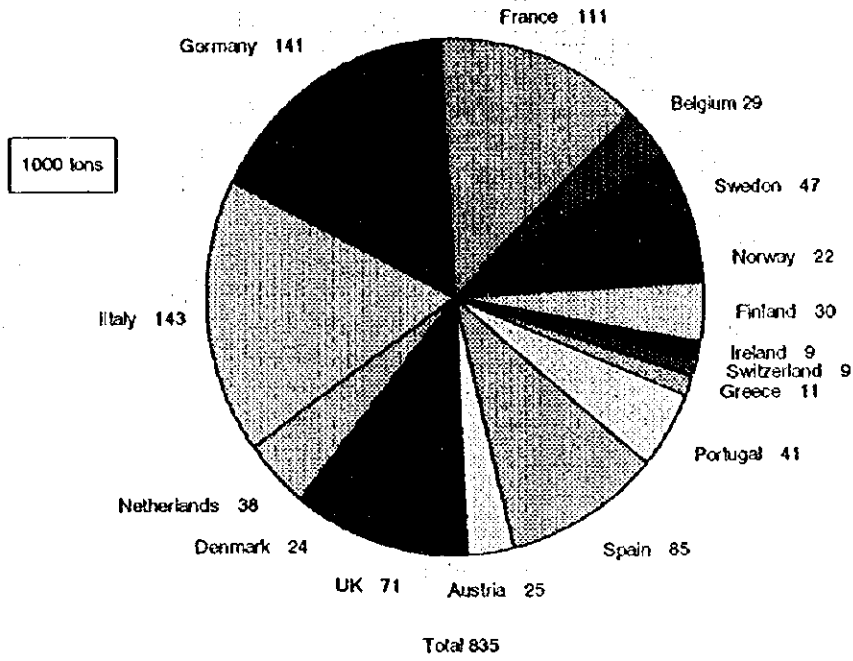


FIGURE 4.3
SACK PAPER CONSUMPTION IN SELECTED WESTERN AND EASTERN EUROPEAN COUNTRIES (1996)

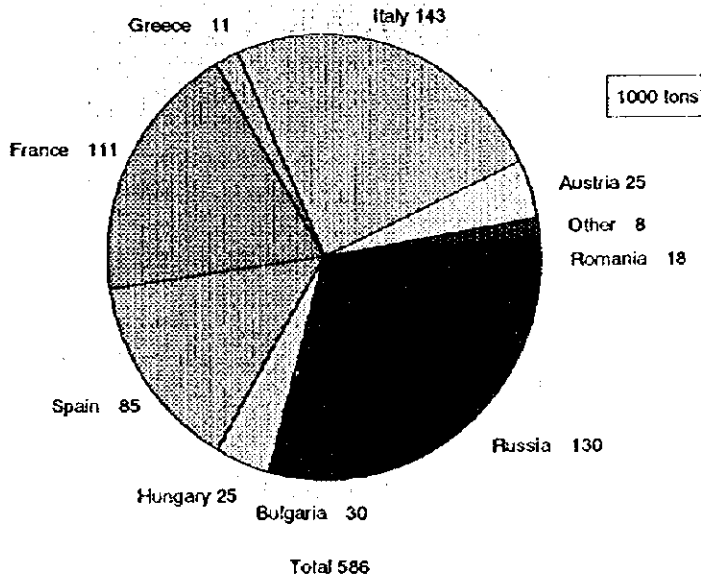
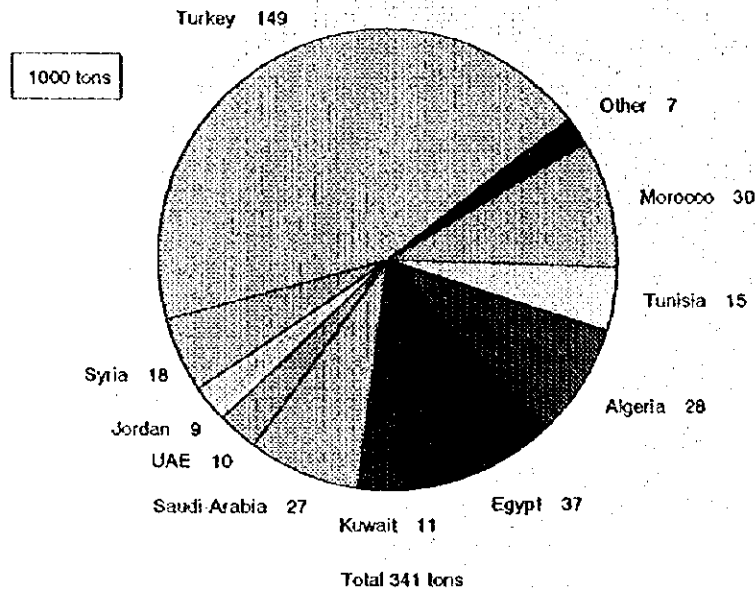


FIGURE 4.4 SACK PAPER CONSUMPTION IN SELECTED MIDDLE EAST AND NORTH AFRICAN COUNTRIES (1996)

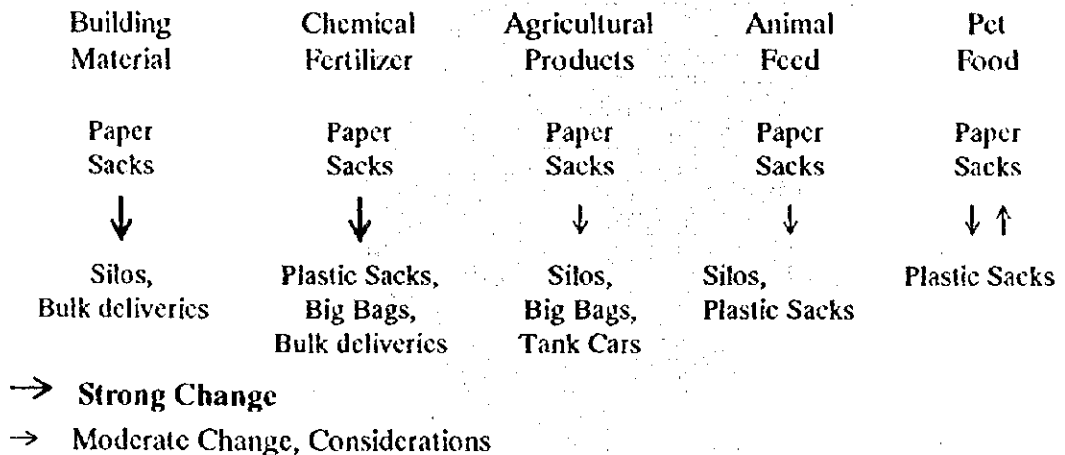


(2) Main Demand Trends

1) Substitution Trends.

Trends to other packaging materials by quality and form from sack papers are as follows:

FIGURE 4.5 SUBSTITUTION TRENDS IN THE END-USE SEGMENTS



2) Main Product Development Issues

Product development issues in sack paper end uses differ:

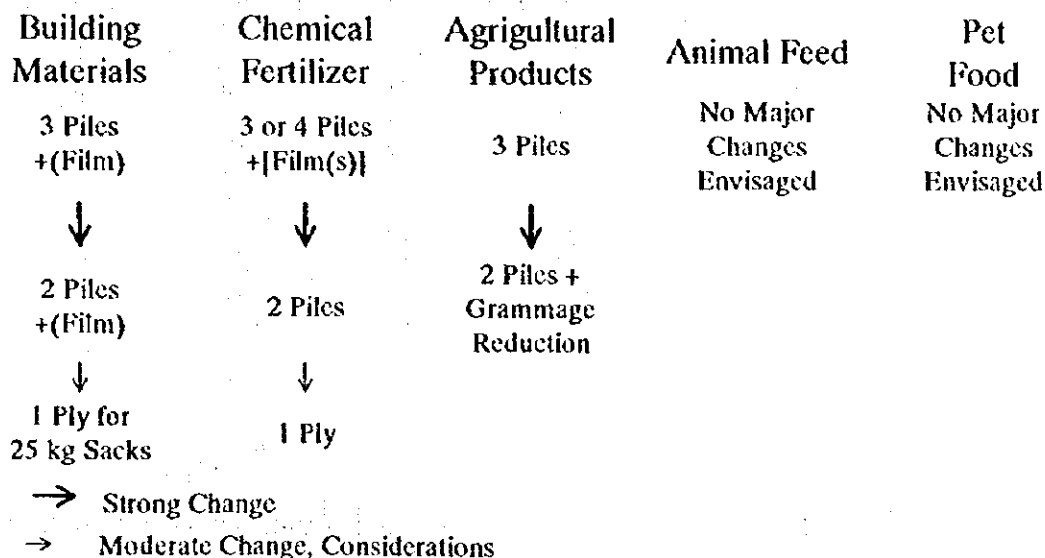
- higher TEA, better porosity, better tear, friction and lower grammage are the main product development issues.
- better porosity and better tear are the most important aspects in building materials packaging.
- in chemicals and fertilisers, better porosity and lower grammage are important.
- agricultural products packaging requires better tear.
- higher TEA, better tear, friction and higher stiffness is needed in animal feed packaging.
- pet food packaging requires higher stiffness, better tear, better printability and lower grammage. In addition, greaseproof characteristics are important.

3) Paper Grades Used

Special treatment is required by end use to absorb shock in handling:

4) Trends in Sizes, Material Constructions and Basis Weights

FIGURE 4.6



5) Demand Outlook For Sack Paper

Judging from actual demands in the past and GDP growth forecast (cf. 4.2.2(2)), market potential has been estimated.

TABLE 4.1
Sack Paper Production, Trade and Consumption in Western Europe 1996

Country	Production	Import	Export	Trade balance	Consump- tion
	- 1,000 tons -				
Finland	120	1	91	91	30
Norway	10	12	0	-12	22
Sweden	501	1	455	454	47
Belgium	0	35	6	-29	29
Germany	0	149	8	-141	141
Netherlands	0	61	23	-38	38
Denmark	0	24	0	-24	24
Ireland	0	9	0	-9	9
UK	0	74	3	-71	71
Switzerland	0	9	0	-9	9
Portugal	52	17	29	12	40
Austria	145	3	123	120	25
Spain	148	42	105	63	85
France	60	75	24	-51	111
Italy	15	138	10	-128	143
Greece	0	11	0	-11	11
WEU TOTAL	1051	660	878	218	835

TABLE 4.2
Long-term Demand Forecast for Sack Paper in Western Europe 1995-2005

Country	1994-96	1996	2005	Growth	%a
	- 1,000 tons -				
Finland	29	30	24	-5	-1.8
Norway	22	22	21	-1	-0.7
Sweden	51	47	47	-4	-0.9
Belgium	32	29	32	-0	-0.1
Germany	152	141	145	-7	-0.5
Netherlands	48	38	48	0	-0.1
Denmark	20	24	20	0	0.0
Ireland	13	9	12	-1	-0.7
UK	101	71	96	-5	-0.5
Switzerland	9	9	9	0	0.0
Portugal	27	40	27	0	0.0
Austria	27	25	27	0	0.0
Spain	103	85	101	-2	-0.2
France	122	111	114	-8	-0.7
Italy	167	143	157	-10	-0.6
Greece	11	11	11	0	0.0
TOTAL	934	835	891	-43	-0.5

TABLE 4.3
Long-term Demand Forecast for Sack Paper in the Middle East and North Africa 1995-2005

Country	1995	2005	Growth	%a
	- 1,000 tons -			
Turkey	142	185	43	2.7
Saudi Arabia	22	26	4	1.7
Kuwait	20	24	4	1.8
UAE	22	26	4	1.7
Rest of Middle East	24	27	3	1.2
Egypt	70	80	10	1.3
Algeria	22	24	2	0.9
Tunisia	19	22	3	1.5
Morocco	33	38	5	1.4
TOTAL	374	452	78	1.9

(4) Demand Outlook by End-Use Sector

Demand features by area and end use are as follows:

a) Western Europe

TABLE 4.4
Major End-use Trends in the Western European Paper Sack Markets

End-use segment	Major trends
Building materials	<ul style="list-style-type: none"> ▪ The Western European construction industry is slowly recovering from the recession ▪ Strong change from paper sack usage to silos and bulk deliveries ▪ From standard and tight creped kraft to semi-extensibles and extensibles ▪ Strong change from three-ply to two-ply composition

Chemicals/fertilizers	<ul style="list-style-type: none"> ▪ Strong change from paper sack usage to plastic sacks, big bags and bulk deliveries ▪ From standard kraft to semi-extensibles and high porosity papers/duplex grades ▪ Strong change from three- or four-ply to two-ply composition ▪ Moderate change to/introduction of one-ply sacks
Agricultural products	<ul style="list-style-type: none"> ▪ Moderate change from paper sacks to silos, big bags and tanks cars ▪ From standard kraft to semi-extensibles and extensibles ▪ Strong change from three ply to reduced grammage two-ply composition
Animal feed	<ul style="list-style-type: none"> ▪ Moderate change from paper sacks to silos and plastic tanks ▪ No major changes in sack paper grade patterns and material compositions
Pet food	<ul style="list-style-type: none"> ▪ Moderate substitution between paper- and plastic-based sacks (both ways) ▪ No major changes in sack paper grade patterns and material composition

2) Russia/CIS

The main end uses for paper sacks in Russia are construction materials (nearly 50% of the total markets) and chemicals, including granulates and fertilisers (35% of the total). The demand for cement sacks in Russia is forecast to resume a growth trend due to the growth in small-scale construction and private building projects, and the lack of modern infrastructure for bulk transportation.

4.1.3 Production and Competition

Competitions by country and supplier are as follows:

(1) Main Producer Countries

FIGURE 4.7

SACK PAPER PRODUCTION IN SELECTED WESTERN EUROPEAN COUNTRIES (1996)

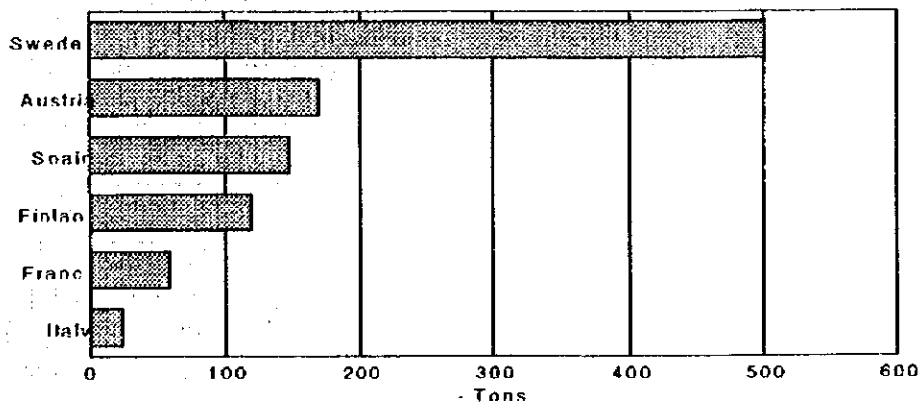
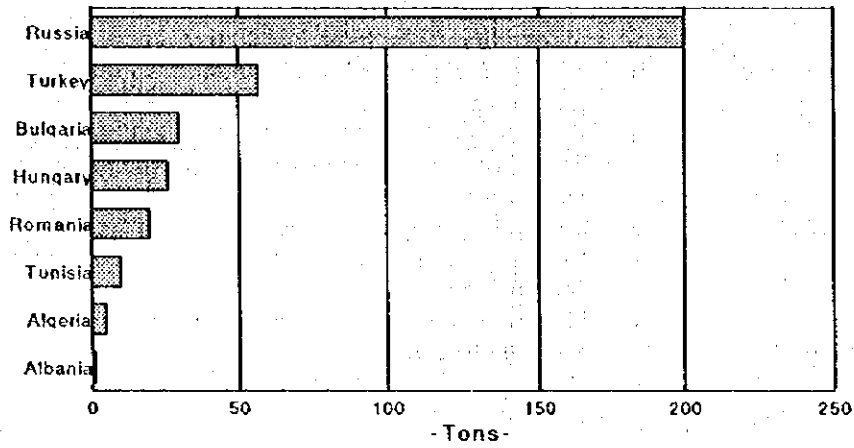


FIGURE 4.8
SACK PAPER PRODUCTION IN EASTERN EUROPEAN, MIDDLE EAST
AND NORTH AFRICAN COUNTRIES (1998)

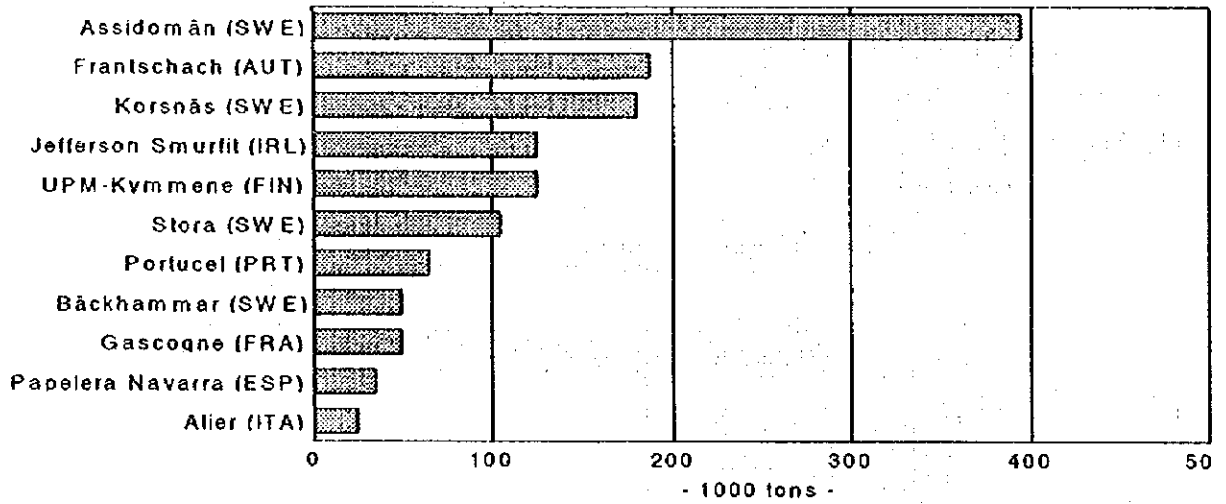


(2) Major Sack Paper Producing Companies

1) Western Europe

FIGURE 4.9

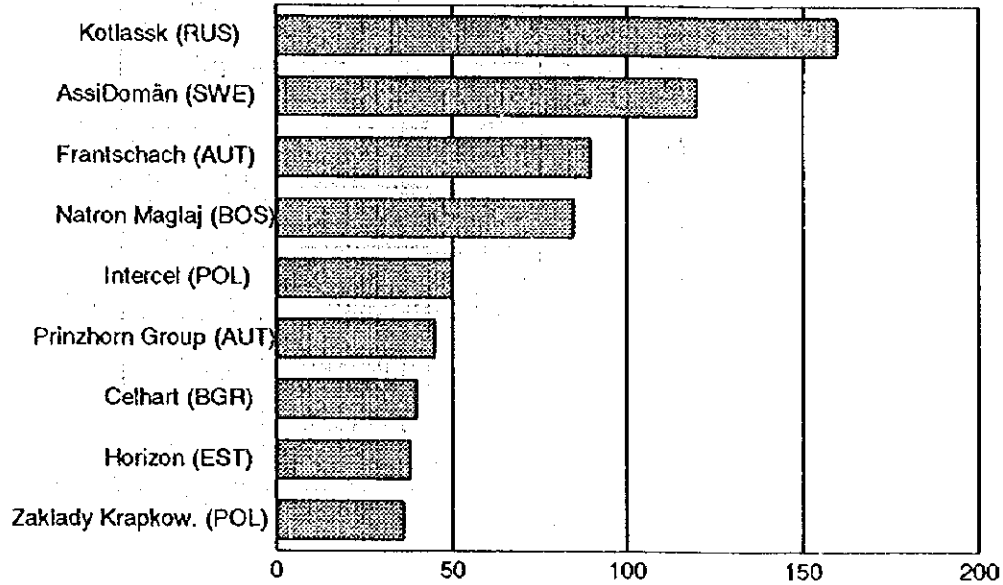
MAJOR SACK PAPER PRODUCERS IN
WESTERN EUROPE (1998)



2) Eastern Europe

FIGURE 4.10

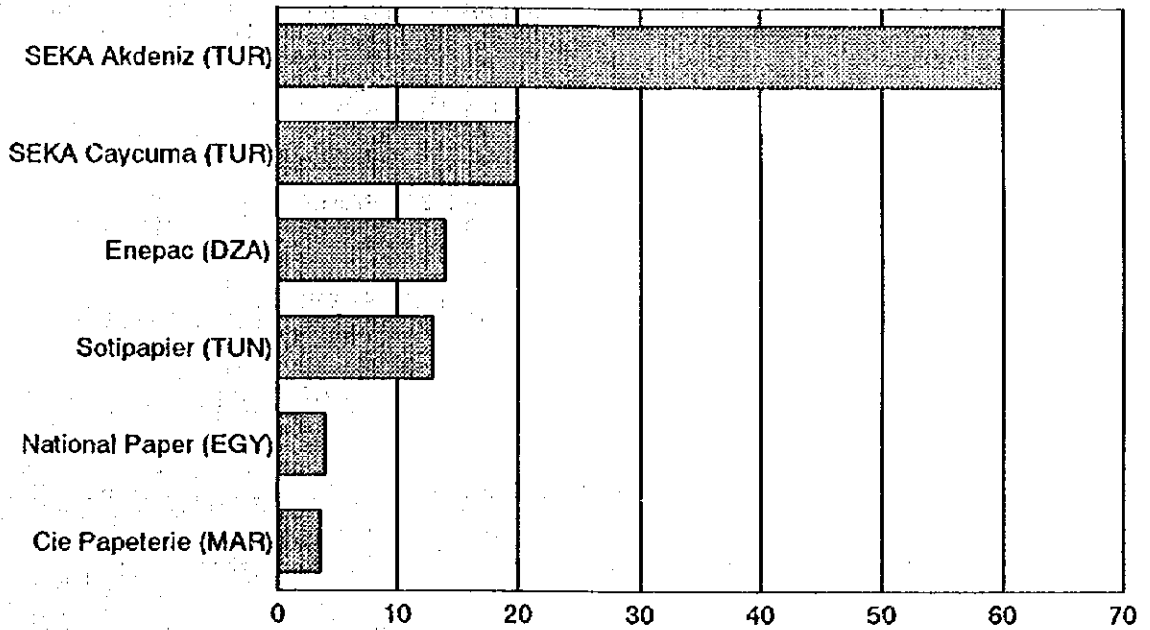
EASTERN EUROPE (1997)



3) Middle East and North Africa

FIGURE 4.11

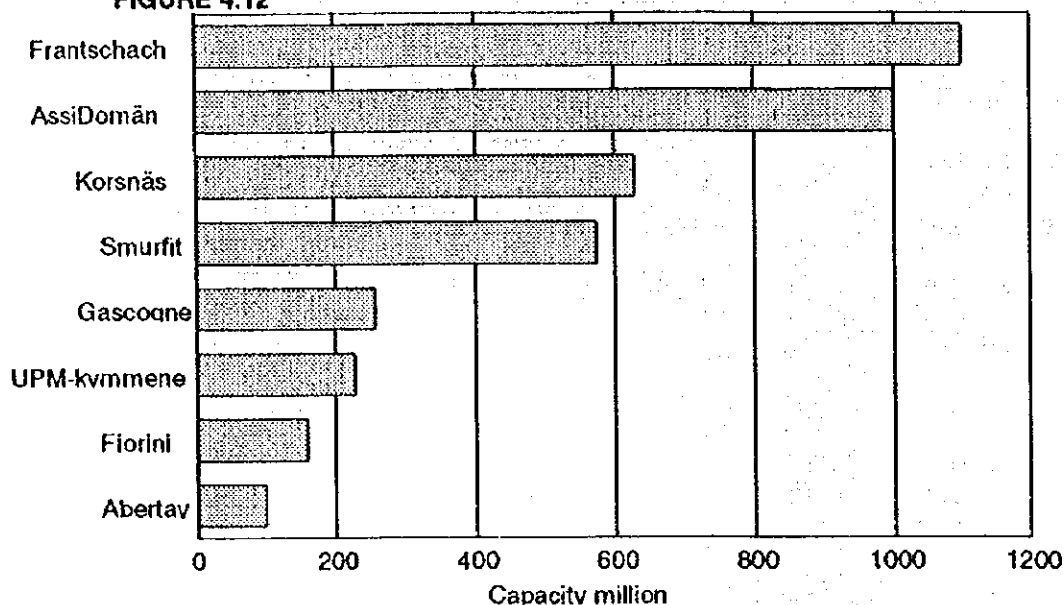
Major producers in M/East and N/Africa



(3) Major Sack Paper Converters in the Study Region

1) Western Europe

FIGURE 4.12



(4) Trade Flows in the Study Region

1) Western Europe

TABLE 4.5

Sack Paper Production and Consumption in Selected Western European Countries 1996

Country	Production	Import	Export	Trade Balance	Consumption
				- 1,000 t/a -	
France	60	75	24	- 51	111
Italy	25	138	10	- 128	153
Spain	148	42	105	63	85
Austria	170	3	123	120	50
Greece	0	11	0	- 11	11
TOTAL	403	269	262	- 7	410

2) Eastern Europe

TABLE 4.6

Sack Paper Production and Consumption in Selected Eastern European Countries 1996

Country	Production	Import	Export	Trade Balance	Consumption
				- 1,000 t/a -	
Hungary	26	2	3	1	25
Slovenia	0	3	0	- 3	3
Croatia	0	3	0	- 3	3

Bosnia-Herzeg.	0	0	0	0	0
Yugo-slavia	0	1	0	- 1	1
Albania	1	0	0	0	1
Bulgaria	30	0	0	0	30
Romania	20	0	2	2	18
Russia	200	0	70	70	130
TOTAL	277	9	75	64	211

3) Middle East and North Africa

TABLE 4.7
Sack Paper Production and Consumption in the Middle East and North Africa 1996

Country	Production	Import	Export	Trade Balance	Consumption
	- 1,000 t/a -				
Turkey	57	95	3	- 92	149
Syria	0	18	0	- 18	18
Lebanon	0	3	0	- 3	3
Jordan	0	9	0	- 9	9
Egypt	0	37	0	- 37	37
Tunisia	10	5	0	- 5	15
Algeria	5	23	0	- 23	28
Morocco	0	30	0	- 30	30
TOTAL	72	206	3	- 203	289

4.1.4 Pricing

(1) Quality Aspects in Sack Kraft

Typical quality ranking of European sack kraft producers:

1. Highest ranking	Korsnäs
2. High ranking extensible quality producers	most of the Swedish machines, one machine in Finland and Austria
3. Medium ranking, extensible standard producers, high grade natural kraft	all the other machines of Scandinavia, some more machines in Western Europe
4. Other producers	poorly developed machines in Western Europe, many of the Eastern European machines as they were in 1995

- About 60% of the production in Western Europe falls into the categories 1 and 2, and minority to category 4. The new Eastern European entrants have considerably increased the supply of the lowest category.
- The machine in Natron Maglaj will have basic capabilities to enter group 3 after the planned investments. The final position will be specified after the stabilisation of the operations, when also the other parameters affecting in the quality have been established, e.g. quality of wood raw material, pulp quality, finishing degree and stability of the quality.

- Most of the non-European sack paper machines can produce paper which belongs to the above quality categories three and four. Only three paper machines in Canada produce paper which is competitive with the European paper in quality two.

(2) Paper Prices

TABLE 4.8
Prices for Semi-extensible Sack Paper

Semi-extensible sack paper (DM/ton)	1998	Trend
Western Europe	1,400	1,280
Eastern Europe	1,300	1,240
Turkey	1,210	1,120
Middle East	1,350	1,240
CIS	1,120	1,040
North Africa	1 300	1 200

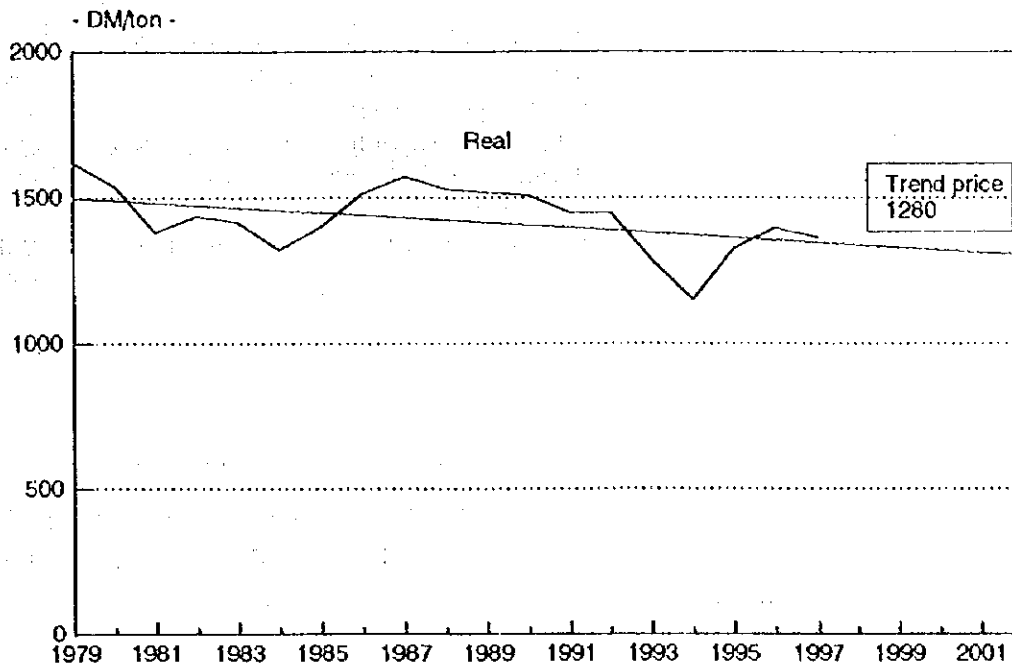
(3) Price Outlook

From historical perspective, the real prices have shown a declining trend. As no global shortage of sack paper supply is foreseen in the future, the declining real price trend is expected to continue in the long term.

Figure 4.13 shows the real price development of sack paper in Germany from 1979 to 1997. This price development illustrates also the overall Western European trend where the real prices have been gradually declining. The estimated trend price level beyond year 2001 would be DM 1,280/ton.

FIGURE 4.13

**SACK PAPER IN GERMANY
REAL PRICE 1997**



4.2 NSSC FLUTING

4.2.1 Product Definitions and Quality Requirements

(1) Product Definitions

Corrugated raw materials are used in manufacturing of corrugated boxes for transportation packaging.

Corrugated raw materials consist of linerboards and fluting (corrugating mediums). Linerboards are mainly used as outer layers in corrugated board packages and fluting as corrugating medium (between linerboards). NSSC (semichemical corrugating medium) fluting is one of the main corrugating mediums but recycled fibre-based grades are also common.

Typical weight for NSSC fluting are 127, 150 and 112 g/m² in Europe and 26, 31 and 40 lb. in the USA.

**TABLE 4.9
Fluting Definitions in Western Europe**

Grade/subgrade	Fibre furnish	Most common grammages (g/m ²)	Main use
Semichemical corrugating medium	60-100% semichemical hardwood pulp, rest waste paper or high-yield softwood pulp	127, 150, 112, 175, 210	Middle corrugating layer of corrugating board
Recycled corrugating medium	OCC and mixed waste	150, 120, 127, 112	Middle corrugating layer of corrugated board

**TABLE 4.10
Recycled Linerboard Definitions in Western Europe**

Grade/subgrades	Fibre furnish	Grammages (g/m ²)	Main use
Unbleached recycled linerboards	Combinations of OCC, mixed waste, de-inked waste, sulphate pulp	125, 140, 150, 175, 200	Outer and inner facing of corrugated board
White top recycled linerboards	White waste paper in the top layer, OCC, etc. in the bottom layer	140, 150, 175, 200	Outer facing of corrugated board
Mottled recycled linerboards	OCC, mixed waste	140, 150, 175, 200	Outer facing of corrugated board

(2) Quality Requirements

1) General

Fluting (and linerboards) used for corrugated boxes have two basic functions:

- a) to protect the goods packed in a corrugated box during handling, warehousing and transport
- b) to provide a printing surface to promote the packed goods and/or the packing/manufacturing company.

Virgin fibre based grades are preferred in a number of end-uses as:

- they have initial higher crush and puncture strength
- moisture and adverse climate do have less effect on strength decrease compared to a waste based material.

2) Quality Requirements for Fluting

Runnability is the most important quality requirement for corrugating mediums. To ensure good runnability on a modern high-speed corrugator, a certain minimum Machine Directions (MD) strength is required. With sufficient long fibre in the furnish, this has not proved to be problematic. The mechanical quality requirements of NSSC fluting are based on CMT (Concora Medium Test) and CCT 60 tests.

TABLE 4.11 MECHANICAL QUALITY REQUIREMENTS

Weight (g/m ²)	CMT (N)	CCT 60 (kN/m)
112	210	1.50
127	250	1.80

Both virgin-based and recycled fibre-based fluting grades have found suitable applications thanks to a wide variety of end-uses for ready-made boxes. The substitution of recycled grades for virgin fibre-based grades will frequently result in the production of a more cost-effective box.

From the corrugated box manufacturer's point of view, the following changes in box quality and composition are expected:

- a) Edge crush test (ECT) will become the main quality requirement
- b) Weight of fluting are likely to increase

- c) Greater flexibility of the mills create new box designs through differentiation and potential for fibre savings and higher levels of recycling
- d) Increased frequency of ring crush testing (RCT) at the mill.

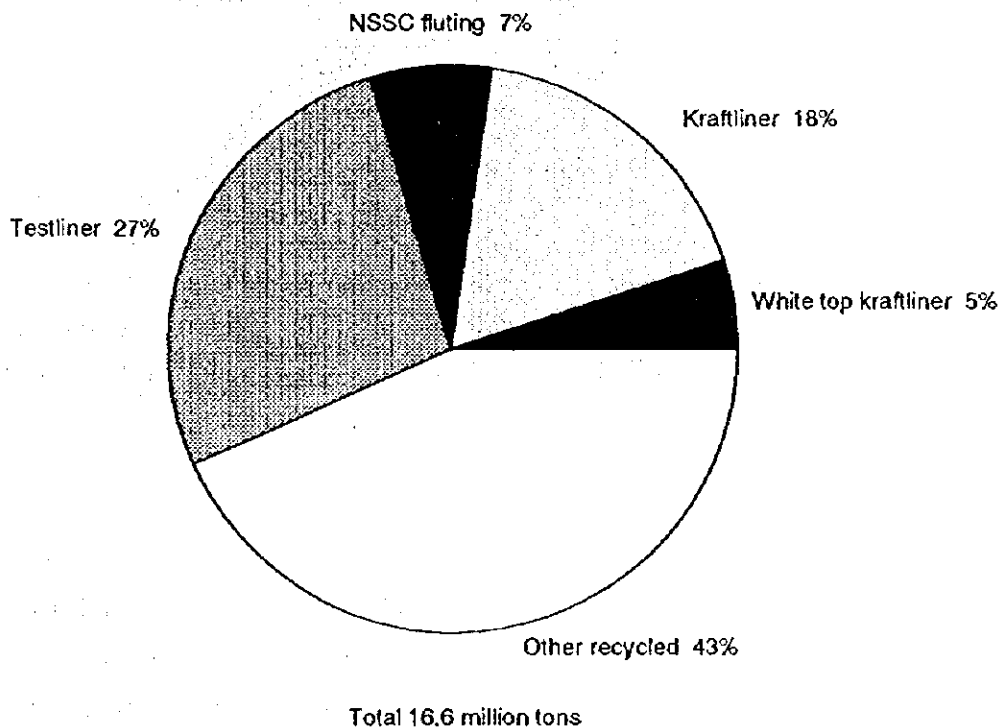
4.2.2 Demand

(1) Demand by Market

Western Europe

Total corrugated board raw material market in Western Europe amounted to 16.6 million tons in 1996. Recycled grades dominate the consumption with a share of 70%. The share of NSSC fluting was 7% of the total consumption.

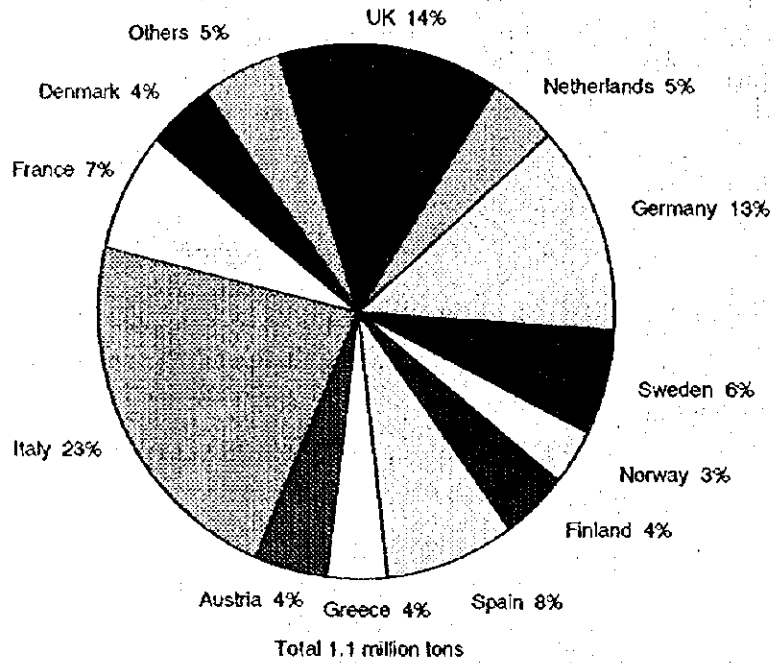
FIGURE 4.14 SHARE OF MATERIALS FOR CORRUGATED BOARD



Total demand of NSSC fluting in Western Europe amounted to 1.1 million tons in 1996 and in selected markets (Austria, Greece, France, Italy and Spain) to 507,000 tons. The main markets for NSSC fluting in Western Europe are Italy, UK, Germany and Spain.

NSSC fluting markets in Western Europe have decreased in most countries whereas the demand for recycled fluting has been growing. There are, however, a few countries, especially in the Mediterranean region that are growing markets for NSSC fluting.

FIGURE 4.15 CONSUMPTION IN WESTERN EUROPEAN COUNTRIES 1996



Food and beverages is the biggest end-use sector for corrugated boards in most Western European markets, accounting for 40-60% of the total consumption. As a whole the market outlook is positive with the most rapidly growing products including branded food products, fruit and vegetables and beverages (multi-packs of bottles and cans).

Italian Markets

Italy is the largest Western European market for NSSC fluting. Consumption in 1996 reached 246,000 tons which was 23% of the total Western European consumption that year.

The Italian NSSC fluting demand has grown steadily averaging 1.3%/a since 1990. Italy is among the growing markets in Western Europe. This is mainly due to a rapidly growing fruit business (similar to Spain).

Italy's own production covers only 20% of the consumption. Total imports amounted to 218,000 tons in 1996 and they originate mostly from other EU countries (144,000 tons) and Eastern Europe (38,000 tons). Main Western European importers are Sweden, Belgium and Finland. Imports from Eastern Europe originated mainly from Croatia and Russia.

TABLE 4.12
Imports to Italy from Western and Eastern Europe in 1996 (1,000 tons)

Sweden	Belgium	Finland	France	Austria	Russia	Croatia	TAL (incl. others)
60.5	24.9	24.2	14.8	14.8	7.3	23.3	182.1

Italy exported some 23,000 tons of NSSC fluting in 1996. This was the highest export volume in the 1990s. Among the main export markets are France and Greece.

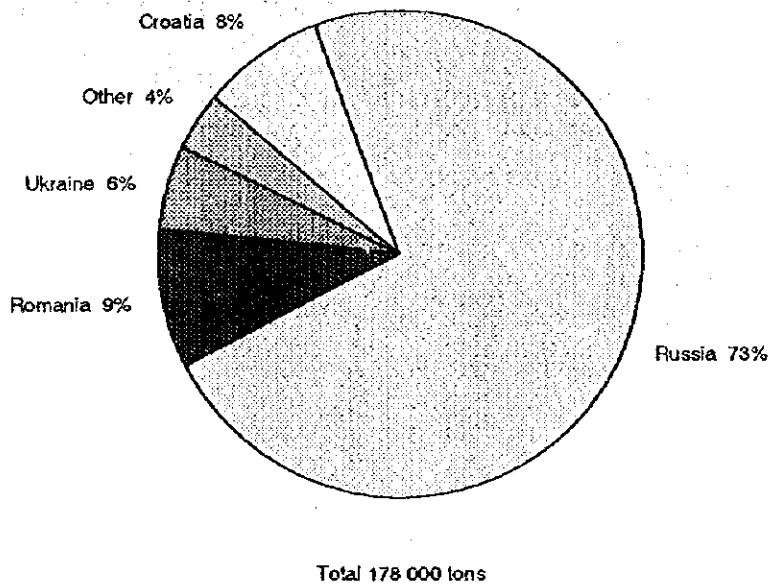
NSSC fluting production capacity in Italy totals 60,000 t/a. The only producer is Industria Chimica Legno. There are no confirmed or planned NSSC fluting projects presently but several recycled fluting projects have been decided and planned, totalling some 100,000 t/a.

In Italy there are some 60 corrugated board companies. Their total production was 2.9 million tons in 1996. Several board companies have been acquired by the dominating corrugated raw material manufacturers, like Assi Domän, SCA and Jefferson Smurfit but there are nevertheless numerous independent converters.

2) Eastern Europe

In Eastern Europe NSSC fluting consumption amounted to 180,000 tons in 1996. The main markets are Russia, Romania and Croatia. The consumption development has been unstable due to political and economical instability in the region during the 1990s. Demand in Russia and Hungary has collapsed whereas in Croatia it has remained in 1992 level. Romanian, Bulgarian and Slovenian markets have been growing.

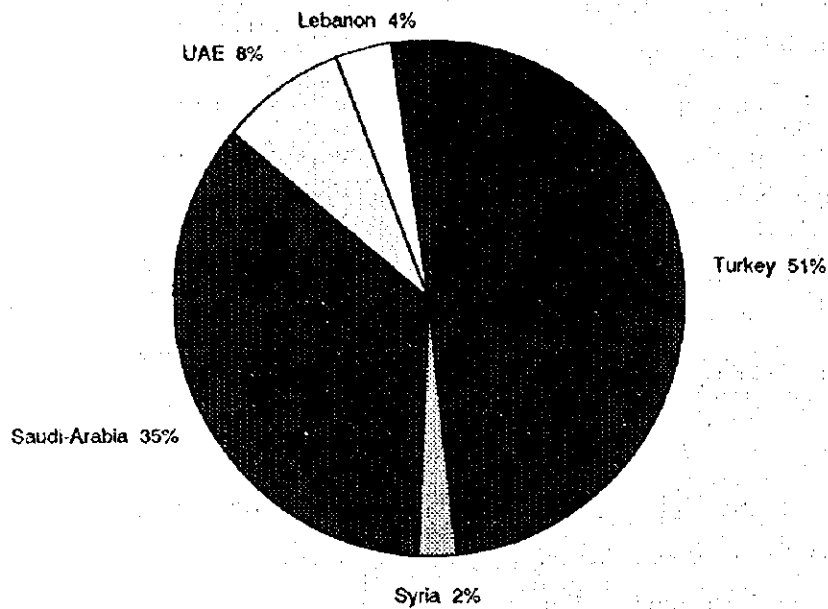
FIGURE 4.16 CONSUMPTION IN EASTERN EUROPEAN COUNTRIES 1996



3) Middle East

Consumption in Middle East is estimated at 85,000 tons in 1996. The dominating markets are Turkey and Saudi Arabia. The Middle Eastern market has been a growing market since 1992 although there are countries having no NSSC fluting consumption. The Turkish market has been the most dynamic.

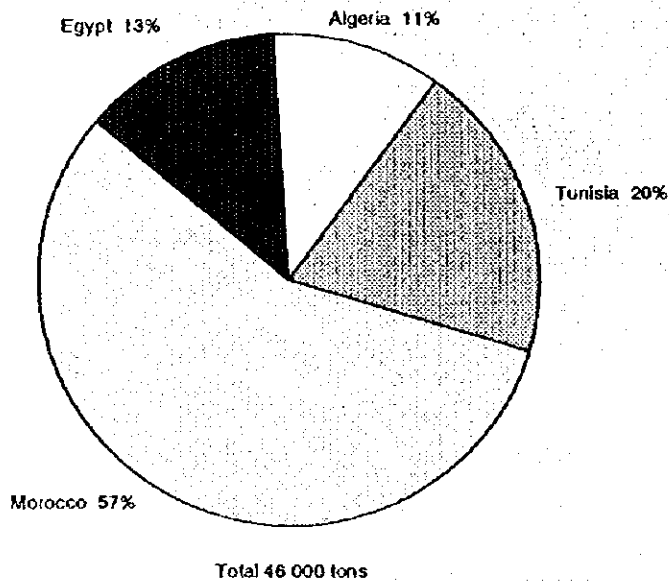
FIGURE 4.17 CONSUMPTION IN MID EAST COUNTRIES 1996



4) North Africa

In North African countries the consumption of NSSC fluting amounted to 46,000 tons in 1996. Morocco has traditionally been the largest NSSC fluting market. The NSSC demand has been growing from 1992, especially in Tunisia and Morocco.

FIGURE 4.18 CONSUMPTION IN NORTH AFRICA 1996



(2) Main Demand Trends

Economic growth rates and growth of industrial production, combined with an analysis of end-uses and grammage trends are among the main factors for forecasting the demand for corrugated board and corrugated board raw materials.

1) Economic growth

TABLE 4.13
REAL GDP GROWTH FOR WESTERN EUROPEAN COUNTRIES (%/a)

Country	1998	1999
Italy	2.4	2.7
Greece	3.0	3.4
Spain	3.5	3.3
France	2.9	2.8
Austria	2.7	2.9
EU	2.7	2.8

Source: OECD

The Balkan war split the Yugoslavia into several countries. Although the war ended in 1996, the newly formed Yugoslavia and Bosnia-Herzegovina have barely functioning economies. The economic outlook is however mostly positive, 3-5% GDP growth for the next two years, but there are still notable differences between the countries.

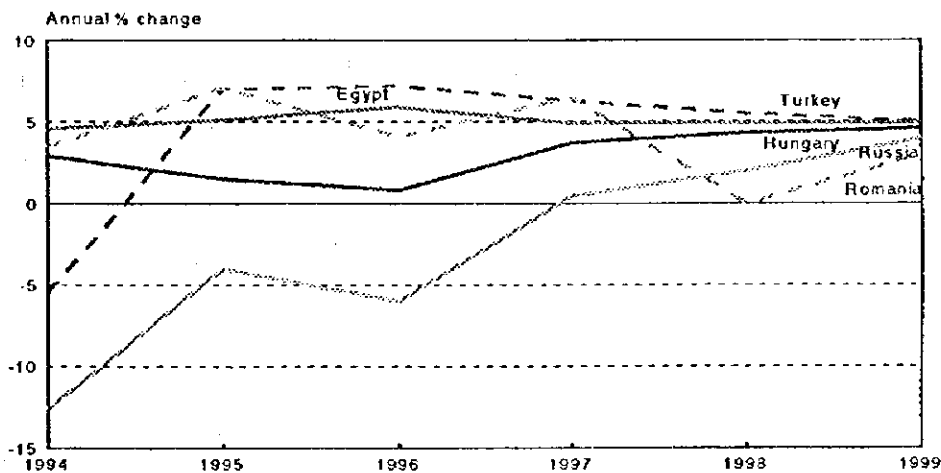
Turkey is a member of NATO but its application for the EU-membership has not been approved so far mainly due to country's treatment of minorities and human right infringements. The economic outlook is positive as GDP growth is estimated to be 5.5% in 1998 and 5.0% in 1999.

The economic growth in Middle East is expected to be 3.0-3.5% in 1998-1999.

The average real GDP growth in North Africa is projected to be some 4.0% in 1998-1999. The most rapid growth is expected for Egypt.

FIGURE 4.19

REAL GDP GROWTH IN SELECTED COUNTRIES OF THE STUDY REGION 1994-1999



Source: OECD

(3) Demand Outlook

The total demand forecast for corrugated board raw material in Western Europe average 2.1 %/a up to the year 2005. In Eastern Europe the growth is estimated at 5.3 %/a.

NSSC fluting growth in Western Europe will be low, 1.2 %/a. In 2005 the total would thus reach 1.2 million tons. In Italy and Spain the growth will be steady.

Eastern European demand growth will depend on the economic and political development of these countries. The demand growth will average 3.1 %/a and it will increase from the current 178,000 tons to 234,000 tons in 2005.

Along with establishment of consumer product industries in Middle East and North Africa, the packaging materials consumption will rise. In addition, the opening up of the relatively closed economies will also add paper and board consumption. Both in Middle East and North Africa the average growth is estimated at 3.0 %/a. The total consumption would thus amount to 110,000 tons in Middle East and to 60,000 tons in North Africa in the year 2005.

TABLE 4.14
DEMAND OUTLOOK FOR THE STUDY REGION UP TO 2005

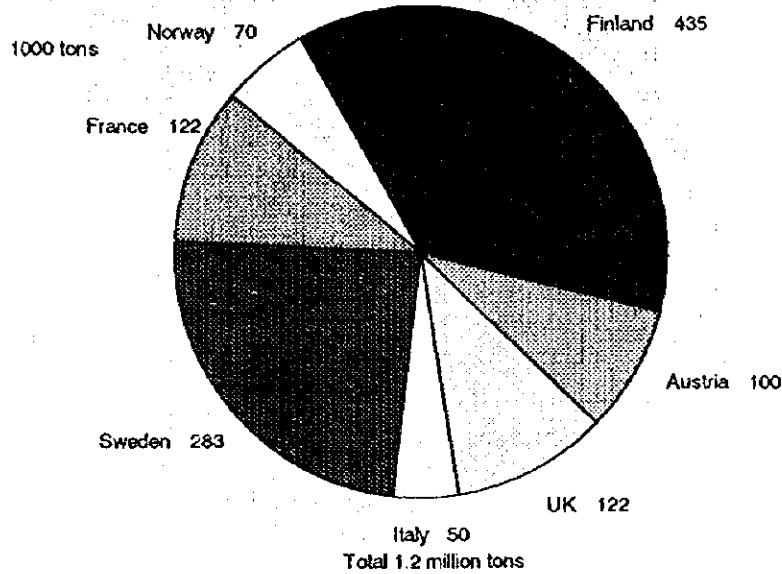
Region/Country	1996	2005	%/a
	- 1,000 tons -		
Western Europe	1 101	1 225	1.2
• France	81	83	0.3
• Italy	246	276	1.3
• Spain	92	103	1.3
• Greece	40	45	1.3
Eastern Europe	178	234	3.1
• Hungary	1	1.5	4.5
• Bulgaria	3	3.3	1.1
• Romania	16	20	2.5
• Russia	130	150	1.5
Middle East	85	110	3.0
• Turkey	43	64	4.5
North Africa	46	60	3.0

4.2.3 Production and Competition

(1) Main Producing Countries

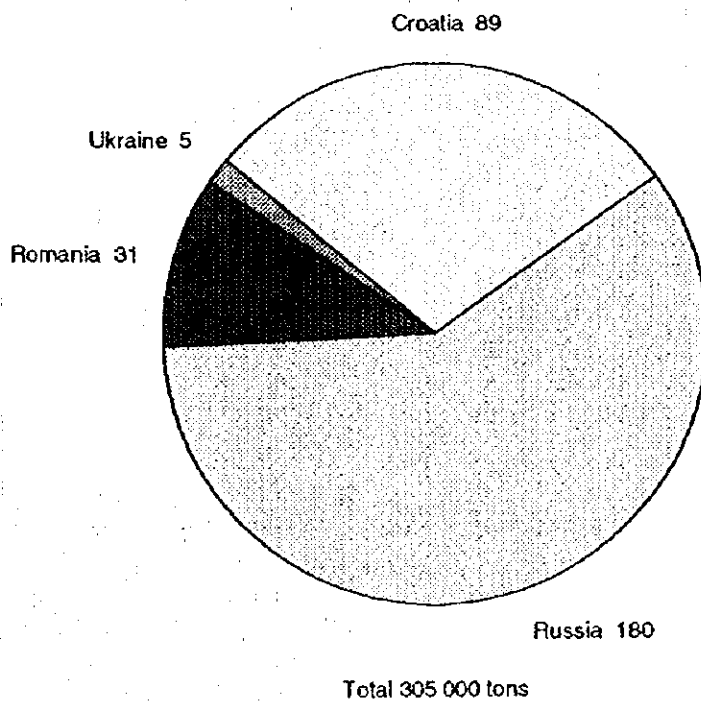
1) Western Europe

FIGURE 4.20
NSSC FLUTING PRODUCTION IN WESTERN EUROPE 1996



2) Eastern Europe

FIGURE 4.21
NSSC FLUTING PRODUCTION IN EASTERN EUROPEAN COUNTRIES 1996



(2) Main Producers

FIGURE 4.22

Main NSSC Fluting Producers in Western Europe 1998

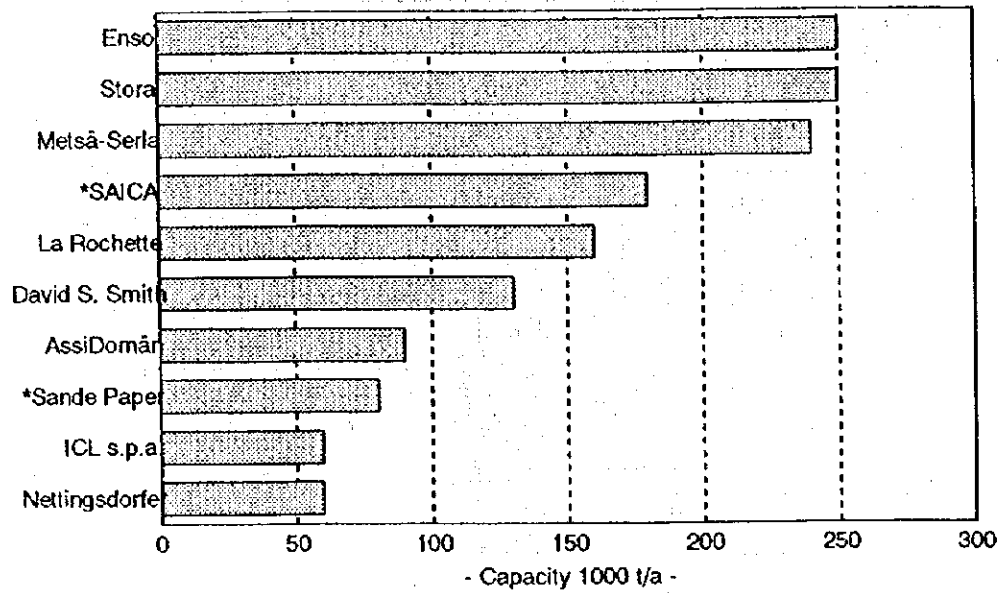
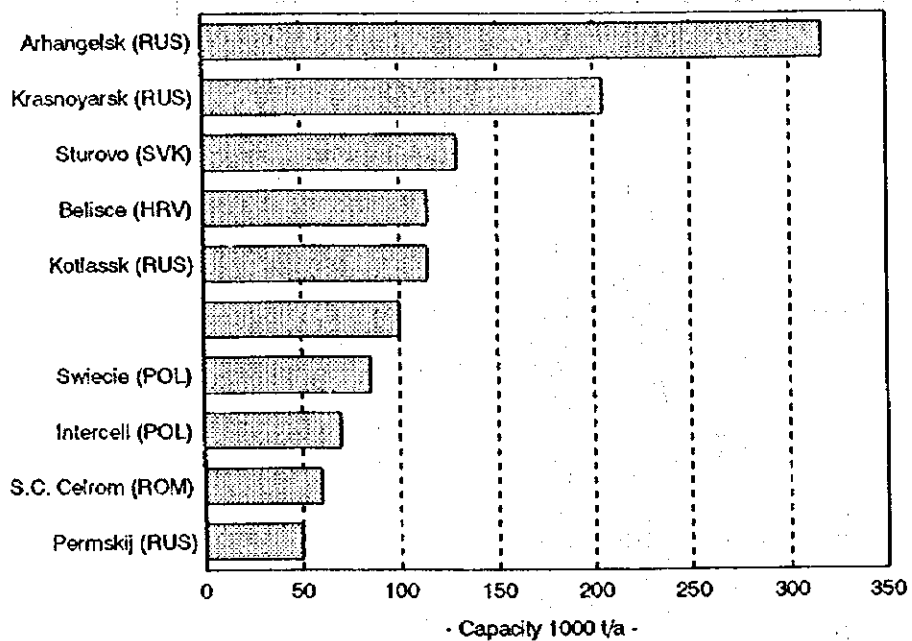


FIGURE 4.23

Main NSSC Fluting Producers in Eastern Europe 1998



1) Converting in Eastern Europe:

Several foreign companies have entered the Central and Eastern European corrugated raw material converting business by acquiring and modernising local companies. Other forms of operations in these countries are partial ownerships or joint ventures. The most active Western

European companies in entering the converting business have been KNP BT, David S. Smith, AssiDomän, Otor and Nettingsdorfer. It can be assumed that this converter acquisition trend will continue as the Western European producers are focusing on the emerging markets.

2) Middle East and North Africa

NSSC production in North Africa reached 10,000 tons in 1996. The production is estimated to be non-wood fibre-based. In Middle East the production amounted to 20,000 tons supplied by Turkey. Turkey is the only country in Middle East having NSSC fluting production capacity. The combined capacity of mills Olmuksa and SEKA amounts to 50,000 t/a.

(2) Trade Flows in the Study Area

Possibility of sales is to be judged by the trade balance.

1) Western Europe

TABLE 4.15
Trade Balance of NSSC Fluting in Selected Western European Countries 1996

Country	Production	Imports	Exports	Trade balance
	- 1,000 tons -			
France	122	62	103	41
Italy	50	218	23	-195
Austria	100	14	66	52
Greece	-	40	-	-40
Spain	-	99	7	-92
TOTAL	272	433	199	-234

Eastern Europe

TABLE 4.16
Trade Balance of NSSC Fluting in Selected Eastern European Countries 1996

Country	Production	Imports	Exports	Trade balance
Hungary	-	1	-	-1
Bulgaria	-	3	-	-3
Slovenia	-	3	-	-3
Romania	31	4	19	15
Russia	180	-	50	50
Croatia	89	-	74	74
Ukraine	5	5	-	-5
TOTAL	305	16	143	127

3) Middle East

TABLE 4.17
Trade Balance of NSSC Fluting In Middle East 1996

Country	Production	Imports	Exports	Trade balance
	- 1,000 tons -			
Lebanon	-	3	-	-3
Syria	-	2	-	-2
Jordan	-	-	-	-
Albania	-	-	-	-
Turkey	20	25	2	-23
Kuwait	-	-	-	-
United Arab Emirates	-	7	-	-7
Saudi Arabia	-	30	-	-30
TOTAL	20	67	2	-65

4) North Africa

TABLE 4.18
Trade Balance of NSSC Fluting In North Africa 1996

Country	Production	Imports	Exports	Trade balance
	- 1,000 tons -			
Morocco	9	17	-	-17
Tunisia	-	9	-	-9
Algeria	-	5	-	-5
Egypt	-	6	-	-6
TOTAL	9	37	-	-37

4.2.4 Pricing

(1) Average Sales Prices

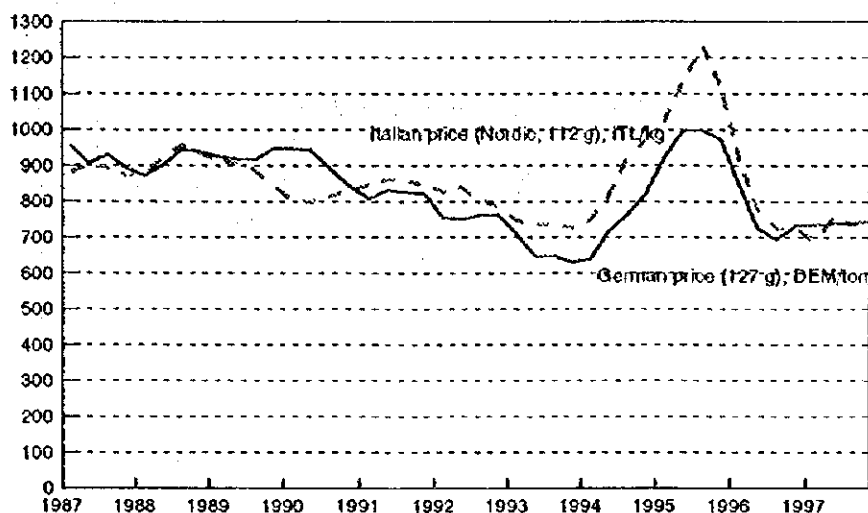
1) Western Europe

Containerboard prices tend to fluctuate according to business cycles. NSSC fluting prices are, however, more stable than other corrugating grades. Limited number of suppliers and differentiated product types have kept the prices at a more constant level.

Currently the Western European price averages DM 760/ton. Italian price level is ITL 750/kg for Nordic NSSC fluting.

The trend of a rather stable prices should continue in the future.

FIGURE 4.24
REAL PRICE DEVELOPMENT OF NSSC FLUTING IN WESTERN EUROPE
1987-1997



2) Other Regions

NSSC fluting prices in other target regions follow international prices, mainly those in Western Europe.

Presently NSSC fluting price averages DM 750/ton in Middle East, DM 720/ton in North Africa and DM 700/ton in Turkey.

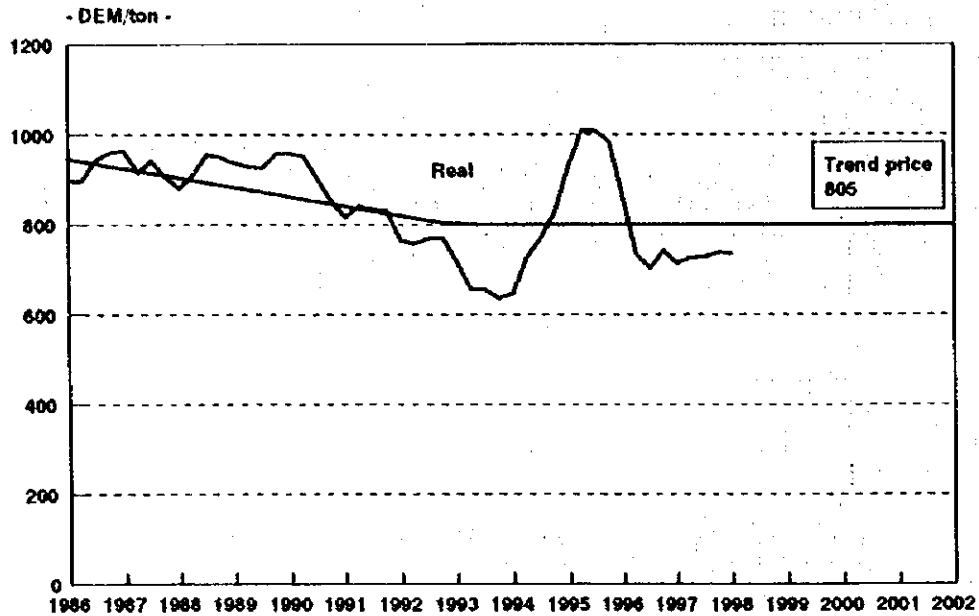
The trend prices vary from DM790/ton in Middle East to DM750/ton in Turkey.

TABLE 4.19
Present and Trend Prices in the Study Regions

	1998 price	Trend price
Western Europe	760	805
Middle East	750	790
North Africa	720	760
Turkey	700	750

(2) Price Outlook

FIGURE 4.25



4.3 MARKET POTENTIAL AND OPPORTUNITIES

Following the analysis in sections 4.1 ("Sack Paper") and 4.2 ("NSSC Fluting"), export quantities of production items are estimated as follows and used in the long-term plan:

Sack Paper	37,000 t/a	at DM1,200~DM1,280/t
NSSC Fluting	50,000 t/a	at DM760 ~ DM805/t

(1) Sack Paper

As basic for the long-term plan, market potential in quantity and price level have been estimated.

TABLE 4.20
Market Potential In Western European Countries (1994-1996)

Country	Consumption	Production	Import	Potential for Natron Magla]	
				1,000 tons	Market Share
Italy	167	21	151	13	8
Spain	103	162	43	-	-
France	122	55	91	4	3
Austria	27	145	25	-	-
Greece	11	0	11	2	18
Western Europe	430	383	321	19	4

TABLE 4.21
Market Potential in Selected Eastern European Countries 1996

Country	Consumption	Production		Import
		- 1,000 tons -		
Russia/CIS	130	200	0	0
Bulgaria	30	30	0	0
Romania	20	20	0	0
Hungary	25	26	2	2
Albania	1	1	0	0
Yugoslavia	1	0	1	1
Croatia	3	0	3	3
Slovenia	3	0	3	3
Eastern Europe	213	277	9	9

TABLE 4.22
Market Potential in Selected Near Middle East Countries 1996

Country	Consumption	Production	Import	Potential for Natron Maglaj	
				1,000 tons	Market Share
Turkey	149	57	95	5	3
Syria	18	0	18	2	11
Jordan	9	0	9	-	-
Lebanon	3	0	3	-	-
Israel	4	0	4	-	-
Saudi-Arabia	27	0	27	3	11
Kuwait	11	0	11	-	-
UAE	10	0	10	-	-
Near Middle East	231	57	177	10	4

TABLE 4.23
Market Potential in Selected North African Countries 1996

Country	Consumption	Production	Import	Potential for Natron Maglaj	
				1,000 tons	Market Share
Egypt	37	0	37	3	8
Algeria	28	5	23	2	7
Tunisia	15	10	5	-	-
Morocco	30	0	30	3	10
North Africa	110	15	95	8	7

2) Table 4.24 shows for sack paper, the estimated quantities and prices in potential markets. These estimates have been incorporated in the long-term plan.

TABLE 4.24
Natron Maglaj sack Paper Sales Plan and Forecasted Trend Market Prices

Market	1,000 tons	Trend Price DM/ton
Italy	13	1 280
France	4	1 280
Greece	2	1 280
Turkey	5	1 120
Syria	2	1 240
Saudi-Arabia	3	1 240
Egypt	3	1 200
Algeria	2	1 200
Morocco	3	1 200
TOTAL	37	

(2) NSSC Fluting

In the study region, recycled grades are mostly produced locally and used for local packages. Higher qualities such as NSSC fluting are imported, mainly from Nordic countries. These materials are used for export packages and for food packaging.

1) Potential Market

The international trade is marginal in recycled fluting, although trade between neighbouring countries may grow. As there are no NSSC fluting capacity changes, the market balance favours higher grades. Natron Maglaj's NSSC fluting could be directed to following markets:

- Western Europe: Italy, Spain, Greece
- Middle East: Turkey, Saudi Arabia
- North Africa: Morocco, Tunisia, Egypt.

TABLE 4.25
Criteria for Market Potential of Selected Countries

	1996 Imports 1,000 tons	1996 Trade balance 1,000 tons	Growth 1996-2005 1,000 tons	Market Growth %/a	Economic Outlook 1998- 1999 %/a
Western Europe					
• Italy	218	20 -195	246→276	1.3	2.4-2.7
• Spain	99	5 -92	92→103	1.3	3.5-3.3
• Greece	40	5 -40	40→45	1.3	3.0-3.4
Middle East					
• Turkey	25	5 -23	43→64	4.5	5.5-5.0
• Saudi Arabia	30	5 -30	30→39	3.0	1.9-1.9
North Africa					

• Morocco	17	5	-17	26→34	3.0	3.0-3.0
• Tunisia	9	3	-9	9→12	3.0	4.0-4.0
• Egypt	6	2	-6	6→8	3.0	4.9-4.9

2) Table 4.26 shows for NSSC Fluting, the estimated quantities and prices in potential markets. These estimates have been incorporated in the long-term plan.

TABLE 4.26
Natron Magla] NSSC Fluting Sales Plan and Forecasted Trend Market Prices

Market	1,000 tons	Trend Price DM/ton
Italy	20	805
Spain	5	805
Greece	5	805
Turkey	5	750
Saudi-Arabia	5	790
Morocco	5	760
Tunisia	3	760
Egypt	2	760
TOTAL	50	

5. RAW MATERIAL

5.1 FOREST RESOURCES

It is estimated that in the long term, 450,000 m³/year coniferous as well as more than 400,000 m³/year deciduous pulp wood can be made available for Natron.

5.1.1 General Description of Forest resources within the Federation of Bosnia and Herzegovina

Bosnia and Herzegovina, BH, is by the Dayton Agreement signed in Paris on 14 December 1996, divided into Republika Srpska and the Federation of Bosnia and Herzegovina. By this agreement 51% of the total land area of 51,564 km² is within the federation.

The woodlands in the Federation are divided into 36 regions of which 27 are shared by the Federation and RS, each of them between 20-85 thousand hectares of size. Each region is reporting to an SPP (Sumsko Privredno Područje of Forestry Economic Area) organisation. The SPP organisations have until the war been responsible to prepare comprehensive 10-year plans for maintenance, re-forestation, silvicultural development and forest road construction. The Annual Allowable Cut quotas and cut schedules for an individual forest area had been determined on this basis. The current situation of Bosnia Forests is unclear and no new 10 year development plans have been developed since the outbreak of the war. In BH 95% of the forests are natural and only 5% cultivated. The objective with silviculture is to retain the natural diversity of the forests.

The local SPP organisations carries out the function of cutting and marketing the logs to the mills. This activity is relatively free from state control. The SPP organisations are free to sell logs to any enterprise within B&H, but not to export. It is anticipated that in the future cutting rights will be sold to private firms and entrepreneurs and the role of the SPP organisations will be changed.

Out of the total forest area of two million ha within BH, 56% is within the Federation. The total annual yield is 10.5 million m³ of which 5.6 million m³ is within the federation.

About 60% of the standing volume consists of hardwoods. Beech constitutes about 75% of the hard-wood stock. The remaining is softwood of which spruce constitutes 85%, the rest is pine. The quality of the timber has deteriorated during and since the war. War damage is also substantial. The war has left as much as 15-20% of the Federation's forest areas inaccessible due to mines (informed by BiH Forests in Sarajevo). The areas with mines are concentrated along the frontiers during the war. Furthermore, trees contain shell and bullet fragments which could cause problems in wood processing at the mill.

5.1.2 Suitability of Available Fibrous Raw Materials for Paper Making

From the paper maker's point of view, fibre length and fibre flexibility are essential parameters which determine the suitability of the fibre for paper making. Conifers such as spruce and pine gives long and flexible fibres with collapsible lumens which will provide a large bonding area and thus gives a better consolidated structure.

The most important strength parameter for sack paper is its Tensile Energy Absorption (TEA) value. A detailed study in Sweden to compare the relative order of TEA values for papers produced from different wood species reveals that pine normally produces a paper with a slightly higher TEA value than spruce.

When producing pulp for fluting the stiffness of the fibre is of importance. Experience has showed that both birch and beech produces an excellent semi-chemical pulp for fluting.

5.1.3 Presentation of Forest Resources available for Natron Mill in Maglaj

A proposed production plan for the Maglaj mill has been developed. This plan would imply the utilisation of both coniferous and deciduous pulp-wood.

At the time of the field visit at Maglaj the political situation between The Federation of B&H and Republika Srpska was still unclear. The mill management was, however, convinced it would be fully possible to receive shipments from that region. In this study, however, we assume that most of the pulp-wood would be supplied from within the Federation.

The Annual Allowable Cut, AAC, within the Federation has been estimated to 1.5 million m³ for coniferous wood and 2.3 million m³ for deciduous woods. Of that, all the coniferous would be economically harvested while 20% of the deciduous wood is from forests with low productivity and therefore excluded from consideration.

**Table 5-1 Available Pulp-Wood from within the Federation for Maglaj
Coniferous in 1,000 m³ per year**

Total	1,493	100%
Not extractable	243	16%
Net available	1,250	100%
F Logs	25	2%
Log classes I-II-III	847	68%
Poles	85	7%
Pit-props *	145	11%
Pulp-wood	148	12%

* The demand of wooden pit-props is substituted by mettalic ones and has diminished.

Pit-props and pulp-wood then altogether makes about 300,000 m³ per year. The saw mill industry normally produces substantial amounts of saw-mill chips which preferably can be used

for pulp production. A portion of this is expected to be made available for pulp production in the future when saw mills have invested in debarking equipment. It is therefore estimated that about 450,000 m³ coniferous pulp-wood, including saw-mill chips, can be made available for pulp production in the future.

Table 5-2 Economically available deciduous wood in 1,000 m³ per year

Total	1,933	100%
Not extractable	226	12%
Net available	1,707	100%
F&L Logs	72	4%
Log classes I-II-III	550	32%
Pulp-wood	423	25%
Fuel-wood **	662	39%

** The use of fuel-wood is temporary and is expected to be reduced in the future.

The total quantity of deciduous pulp-wood is expected to become substantial in the future, at minimum 400,000 m³/year but could as well become twice as much when the demand for fuel-wood has decreased.

5.1.4 Cost of Wood Raw Materials

The government has till now exercised price control for logs with minimum prices. These minimum prices appears now to be subject for negotiation so both lower and higher prices can be expected.

During the field mission it was, however, made clear that the different regional forestry organisations are prepared to undercut the official minimum price list. The roadside prices proposed were DM 40-60 /m³ instead of the "list price" of DM 60/m³ for coniferous pulpwood and DM 50 for pitprops.

Pitprops is a declining assortment which may in a longer perspective decrease the general price level for pulpwood.

The BH price level of pulp wood above should be seen in an international perspective. The table below presents the actual price situation for coniferous and deciduous pulpwood in Sweden, Germany, Poland as well as in B&H. A corresponding comparison for beech hardwood has not been possible to make. Beech is normally accepted as a minor proportion of other deciduous species.

Table 5-3 Roadside Prices in DM per m³ for Pulpwood in some European Countries

Country	Coniferous	Deciduous
Sweden	48	52
Germany	38	43

Poland	29-35	28-34
Bosnia-Herzegovina	60	50

5.1.5 Conclusions and recommendations.

Based on the presentation above it can be concluded that in the long term there will be about 450,000 m³ of coniferous wood and well above 400,000 m³ deciduous wood available for pulp production at Natron mill in Maglaj.

Prices of pulp-wood delivered at mill gate to be used in the calculations are estimated at:

Coniferous:	DM 75/m ³
Deciduous:	DM 50/m ³

The price of coniferous is in an international perspective on the high side, the price of deciduous is difficult to establish but realistic. However, the possibility to keep or even reduce the present prices, once the B&H economy enters more normal stages, will depend on the further developments in the forestry sector.

5.2 WASTE PAPER

This chapter describes the overall supply situation of waste paper as raw material base for paper production at Natron mill in Maglaj.

During 1998 it is estimated that domestic sources can supply Natron with approximately 12,000 tonnes of waste paper. The quality of domestic waste paper is poor, primarily due to poor sorting, and offered at a high price compared to western standards.

It is realistic to assume that the collected quantities can be more than doubled within a few years time.

5.2.1 General Description of Waste Paper Situation within the Bosnia and Herzegovina

During 1991 paper production in Bosnia and Herzegovina was 230,000 tonnes, imports 15,000 tonnes and exports 10,000 tonnes which gives an apparent domestic consumption of 235,000 tonnes, equivalent to 53 kg per capita and year.

As a result of the war the economic activity within the country is very low and the waste-paper collecting system is poor. As economic activity gradually recovers, paper consumption will increase and the prospects to collect waste-paper will improve.

At the same time the nation will have to improve its waste paper collection system to increase the recovery rate of paper. This is a time consuming process which starts at Governmental levels with legislation and laws concerning waste paper and refuse collection.

5.2.2 Presentation of waste Paper Resources available for Natron Mill in Maglaj

The available raw material base, OCC, is related on the quantity corrugated board consumed within the country. As been mentioned before, the current situation in BH is not normal and the year 1991 is used as the reference point. At that time the consumption of corrugated board has been estimated to be approximately 8 kg per capita per year. This is a realistic figure and compares well with other countries with similar GDP per capita and Western Europe during the late 1950- or early 1960-ies. The specific consumption in western Europe is today substantially higher, see table below:

Table 5-4 Corrugated Board Consumed within Western Europe

Country	Average consumption of corrugated board in kg per capita, 1991
Germany	40
Sweden	35
Greece	18
Czechoslovakia	11
Bosnia and Herzegovina	8
Poland	7
Turkey	6

The consumption of corrugated containers follows the economic development of a country. With a relatively low consumption as in BH, the incremental growth is initially expected to be higher than the growth in GDP.

A recovery rate of OCC of about 80% is established in countries with developed waste paper collecting systems. This does, however, require a well function infrastructure to enhance waste paper collection, including laws, legislation and information to the public to make it aware of the environmental importance in sorting waste material.

If it assumed that the consumption of 8 kg of corrugated board per capita and year is regained within five years of time and a recovery rate of 70% is achieved then about 30,000 tonnes of OCC could be made available for the Natron mill.

5.2.3 Cost of Waste Paper

The price of waste paper is normally fluctuating heavily on the international market. The reason is that while the demand for paper goes up and down, the collection is relatively stable. With the market economy principle that price is fixed in accordance to supply and demand, times from shortage to oversupply can change very quickly. This is particularly relevant for simpler paper grades such as mixed waste which sometimes has a negative value, customers are paid to accept deliveries. Higher qualities which act as pulp substitutes are much more stable in price and follow the world market price of virgin pulp.

Natron mill paid in February 1998 for OCC:

Imported: DM 58 plus freight DM 62, total DM 120/tonne

Domestic: DM100 plus freight DM 35, total DM 135/tonne

As seen from above the price of imported waste paper is realistic when taking transportation costs into consideration. It is also concluded that the domestic waste paper is very expensive despite the fact that the cost of labour is only a fraction of the cost of labour in western Europe. This indicates there is great potential to improve efficiency and reduce costs amongst the Bosnian waste paper collection organisations.

5.2.4 Conclusions and Recommendations

During 1998 it is assumed that only 12,000 tonnes can be collected from domestic sources. When the economy in B&H gradually recovers after the war greater quantities of waste paper will be made available. Based on data provided by IMF and World Bank together with expected future recovery rates of waste paper, 30,000 tonnes of domestic OCC is expected to be available by the middle of the next decade.

There are, however, two problems concerning the domestic waste paper when comparing with international standards; quality and price. The quality is poor and price is high.

The poor quality is primarily an attribute of the waste paper collecting companies who do not sort the material properly. The entire operation is very primitive and the companies do not have the system nor the proper equipment for adequate sorting. They merely unload the collected material on a yard and at best extract the most obvious contaminants. The system should be improved by minor investments in conveyor belts on which the waste paper is loaded and contaminants and inferior paper qualities extracted before the material is fed to the bale press.

6. PRESENT STATE OF NATRON

6.1 GENERAL

The Natron mill is located in Maglaj town in the northern part of Bosnia-Herzegovina in the territory of the Bosnia-Herzegovina Federation, close to the southern border of Srpska territory, around 100 km north or north-west from Sarajevo.

The existing facilities include two kraft pulping lines, five paper machines and two converting plants, designed for a capacity of 120,000 t/a unbleached kraft pulp, 150,000 t/a packaging paper grades and 80,000 t/a of converted products, mainly corrugated board, corrugated boxes and sacks. A major investment in the mill was made during the mid 1960's with a modernisation program executed in early 1980's. A new investment program was planned for prior the outbreak of the recent civil war.

Because of the war main part of the mill has been shut down several years due to lack of markets, lack of raw materials and lack of working capital. Part of the plant was damaged during the war, and the long shut down has caused severe corrosion in some structures and equipment. However, the mill is relatively well kept, considering the long shut down period and other unusual circumstances. Compared with world-class mills the capacity is small and old-fashioned, and in need of investment even irrespective of damages caused by war.

Transport facilities including roads and railway exist physically, but due to postwar confusion the access to neighbouring countries and harbour is currently still problematic. Some repairs to roads and bridges, damaged during the war, is required. Coal - unfortunately of low quality - is available in the mine in the proximity of the mill, and sufficient power supply from the public network is available. Water source and possibility to discharge effluent is available in the river Bosna near the mill site. Wood resources are available, however the political situation currently prevents the use of woodlands in the northern areas belonging now to Srpska territory close to the mill, and part of the woodlands within the territory of the Federation is contaminated by land mines. The town of Maglaj with a population of some 30,000 can provide qualified labour force, schools, hospitals, other facilities and social services to mill personnel and their families.

The layout of the existing mill site is not optimal, but sufficient to start the mill and continue production to the extent as before the war. Installing a modern, big pulp mill or paper machine in the existing mill site is not possible without removing most of the present equipment. However, the mill can be developed as a medium-size plant producing preferably brown packaging grades and converted products, for which it was originally designed. A mill site layout drawing is attached.