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Energy Saving and Pollution Abatement in Jiamusi Paper Mill, China

An investment project supported by a concessionary credit from Sweden

Karlis Goppers

Department for Infrastructure and Economic Cooperation

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ENERGY SAVING AND POLLUTION ABATEMENT IN JIAMUSI PAPER MILL IN CHINA: An Evaluation of an Investment Project Supported by a Concessionary Credit from Sweden

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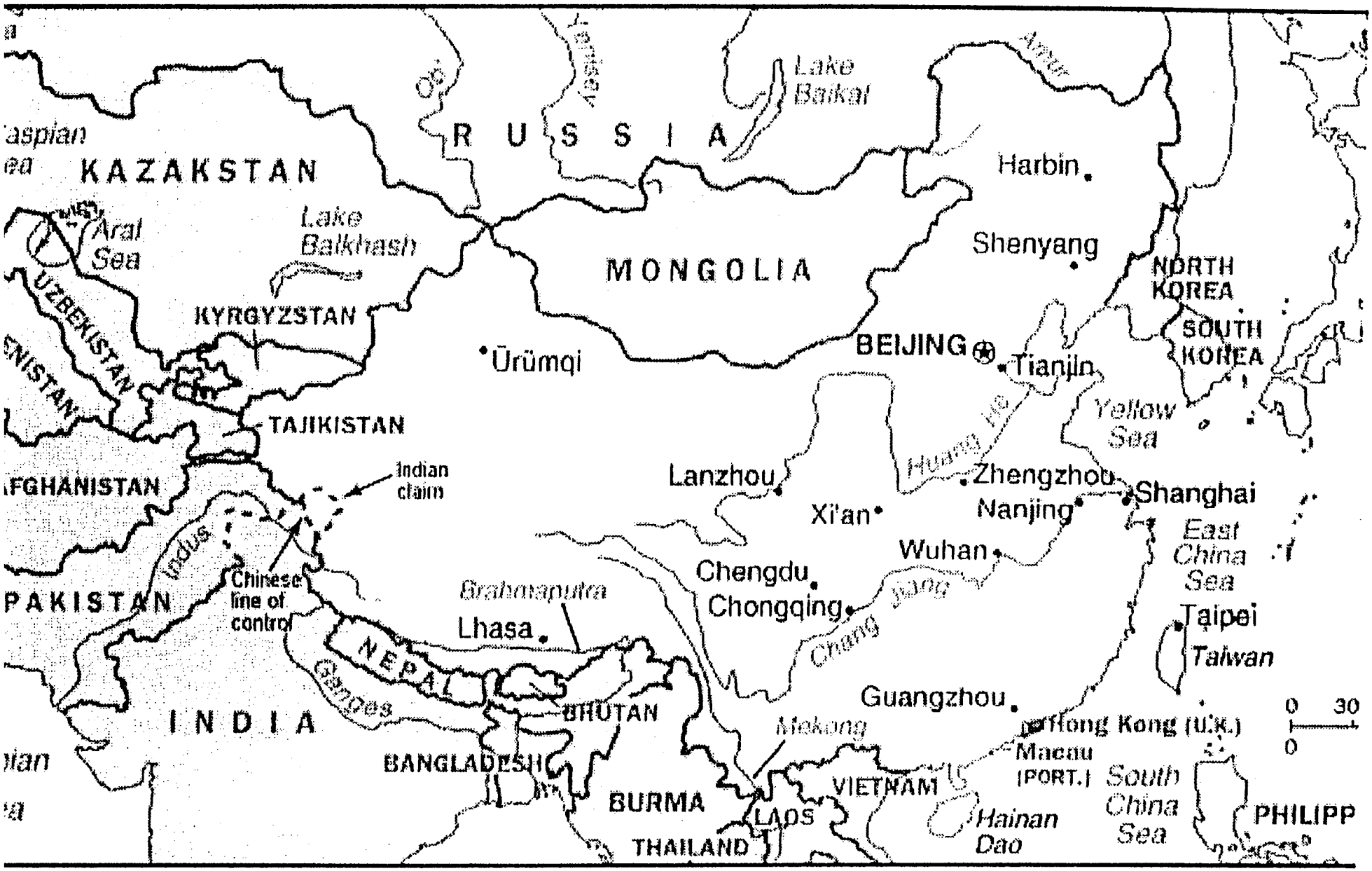
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ENERGY SAVING AND POLLUTION ABATEMENT IN JIAMUSI PAPER AND PULP MILL IN CHINA: An Evaluation of an Investment Project Supported by a Concessionary Credit from Sweden

EXECUTIVE SUMMARY

BACKGROUND

The project is an energy conservation and pollution abatement investment in the *Jiamusi paper and pulp mill* in northern China, supported by a Swedish concessionary, tied, credit of 28,7 MSEK for the importation of a *washing line (displacement press)* for pulp and a *refiner line* for kraft pulp. It was aimed, not at increasing the mills output, but to reduce effluents and pollution, save energy, and raise product quality.

Expected effects were savings in the consumption of coal, electricity, water, fibrous raw material, chemicals, and reduced emissions of toxic wastes. The washing line was not only the first in China, but, reportedly, the first in the world for pulp with *larch* as raw material. The mill had, before this projects, in a short time, without foreign help, successfully implemented about 20 other energy saving measures proposed in a Swedish study.

Large expectations were raised that the project would provide a show case how modern western technology can be used to enhance the efficiency and environmental friendliness of China´s paper industry. There was a total of 13 different actors, including banks and government agencies on both sides, that each had a defined role to play in this credit.

Energy, energy conservation and environment

There remains in China a tremendous scope for improvements in the technical efficiency of energy use. The, by far, largest potential is in the *industrial* sector, where potential energy savings for the next five years have been estimated to more than 500 million tons of coal equivalent per year, *or more than half of Chinas current annual total energy consumption.*

The paper and pulp industry is one of the largest industrial polluters both w.r.t. emission of nutritive salts and toxic substances. ”Black liquor” is emitted into the rivers without purification. Only some of the bigger mills have systems for recycling chemicals. *Deforestation* is, among other things, caused by over cutting of trees for lumber and paper production, and is the main cause of soil erosion which leads to loss of fertile top soil and sedimentation of rivers.

Economic and social development

The rise in economic wealth in China has been unequal. Even though the average standard of living has trebled since 1978, there are, according to the official poverty level, 80 million poor in China. Other sources say 200 million. Inequality between *men* and *women*. has increased as loss of traditional values has led to social problems where women are often the ones worst hit.

Sweden´s development cooperation with China started in 1979, and China is today the biggest recipient of Sweden´s concessionary credits and one of the biggest for technical assistance. An area of special interest is environment. Sweden´s experience from development cooperation with China is good. Planned objectives have generally been achieved.

THE EVALUATION AND METHODOLOGY

This is a *comprehensive* ex post evaluation which covers all levels of the project´s goal hierarchies - inputs, activities, outputs, effects and impacts, and addresses the aspects important for Sweden´s aid, among them the six main objectives of Sweden´s development cooperation. The *assignment* was for 12 person-days, of which 6 were spent in the field, visiting Jiamusi and the paper mill.

Methodology:

Firstly, all project information was arranged in a *logical framework* schedule, on the basis of which a *goal hierarchy* model was created. *Secondly,* project outcomes were assessed against *planned* targets at all five levels.

Lack of information: The language problem was a real obstacle: Since none of the responsible officers spoke English, all interviews had to be conducted through an interpreter. This, together with an acute lack of written documentation, was an important restriction on the possibility to gather information and insights. In the BIT/Sida files there is virtually no information regarding the project´s effects and impacts, or of socio-economic matters. All documentation seems to end when the credit agreement has been signed.

FINDINGS

Implementation

The displacement press delivered from Sweden at first did not perform satisfactorily. After several attempts to solve the problem and after two unsuccessful start up attempts, the parties agreed that the supplier would deliver a second washer at his own expense. After this, and after some subsequent modifications and improvements undertaken by the mill itself, the system has been functioning well and today reaches and even surpasses design requirements. The total delay in the project due to the drawn out installation process was almost two years.

There is a continuing problem of spare parts. Some of the needed parts can not be found in China, and are expensive to import

Output

The performance in terms quality of product, efficiency in raw material consumption, as well as output volume, has reached design capacity, and in some cases surpassed it. Today the whole system is working well. The equipment quality is considered by the company to be very good and still up to date.

Effects

All the beneficial effects hoped for have materialized. The installation and successful operation of the equipment, along with modifications made by the mill itself, have led to large savings in the consumption of *electricity, fibre raw material, coal, water, chemicals,* and in railway and other *transportation costs*. There is a dramatic decrease in emissions of pollutants, and the extraction rate of black liquor is 99 %, which is as high a level reached anywhere in the world. The washing line is now a compact, self-contained, process which is easy to control and regulate, and it has an advanced control system which makes for reliable operation.

The installation process with the modifications and improvements was a classical case of *learning-by - doing:* The company gained experience and its technicians learnt not only how the system works, but also how to improve on the system and even to manufacture some of the component parts.

Financial profitability
There are no data to permit calculation of the financial rate of return. Given the large savings in raw materials and electricity it is not ruled out that the project may be financially profitable, *in spite of* the two year delay in implementation.

Economic benefits
The total value of economic benefits has been estimated to almost 10 million RMB per year, which would give a pay-back period of the investment in economic terms of only three and a half years. There are no data to allow calculation of the project´s economic rate of return, but if the figures supplied by the company regarding the savings are correct, we can assume the economic profitability to be very high.

An inclusion of health factors as well as effects on the environment would increase economic profitability considerably. Other beneficial effects are reduced maintenance cost and improved pulp quality.

Environment
The project has been highly beneficial for the environment - reducing emission levels of pollutants and toxic wastes by between 40 and 70 %. As for water pollution there will be none at all with the new washing line since it is a sealed high-heat screening system. In addition there are the large savings in energy and raw materials.

Equality/ Poverty orientation
The project can not be said to favor or be biased against any particular group in society. By raising the level of gainful employment and incomes in the region it can reasonably be assumed that it will in general, and in the long run, benefit all the inhabitants in the region.

Gender, Democracy , Independence
It does not appear possible to detect any particular effects, direct nor indirect, on *gender, democracy* or *independence* emanating form this project..

Demonstration effect
Given the impressive savings in energy and raw material consumption, as well as reduction of pollution, one would expect that - in spite of the long delay in implementation - there has been, or will be, a positive demonstration effect of this investment, as other paper mills realize how beneficial both to company profits and to the national economy such investments may be.

Role of donor
The project would seem to be in conflict with one of the principles of Sida´s aid in the field of energy, namely that no aid should be given to countries that increase its coal dependency.

In this, as in most other projects in China, BITS has, successfully, held a rather high profile when it comes to carrying out its own analysis and forming its own opinion about the project.

Reporting commitment
None of the parties have complied with the requirement to provide BITS with a completion report, no later than six months after commissioning, and should be criticized for that.

Sustainability
While *technologically* sustainability is not guaranteed in the short term, there is little reason to worry about it in the long term. With present price structure the project is *financially* sustainable, and it is self-evident that an investment like this will be both *environmentally* and *economically* sustainable. China´s government is aware of the benefits, and there is no reason to fear that the sustainability of such projects would be jeopardized for lack of policy commitment. Nor is there any circumstance of *socio-cultural* nature which would question the sustainabilty of this project.

LESSONS LEARNED

Fallacy of financial analysis

The financial rate of return for a state firm operating in a regulated economy is of limited interest in an environment where taxes, subsidies and tariffs, are not set according to supply and demand, and can be changed at any moment by a mere administrative decision on part of the government. It then becomes unreliable as a measure of the strength and quality of a company´s operation, and one should be more concerned with the *economic* analysis of the project, because it is the project´s *economic* profitability which is the correct criterium whether or not a project is worth while and desirable. Economic viability is a *necessary* condition, whereas financial viability is not, because it can be changed at will by the government. The importance of financial analysis lies mainly in indicating whether a project can be financed in the commercial market, or if it needs subsidies by way of e. g. domestic or foreign soft credits.

Limited awareness of the economy of environmental effects: In negotiating for future projects to support foreign donors must be aware that the knowledge of Chinese authorities and state firms regarding the benefits to society of environmental investments are often limited. In the paper and pulp sector, because of coal subsidies and absence of pollution taxes, the very high economic profitability of energy conservation and pollution abatement investments is often hidden to Chinese decision makers.

RECOMMENDATIONS

Modification of Sida´s energy policy: Given our that finding that the project is beneficial for the country, and given the fact that coal, for many decades, will remain the only economical option for China, it is recommended that Sida modify the text of its energy policy so as to make it compatible with future Swedish aid to energy conservation and pollution abatement in China´s industry.

Reporting obligation: Given that none of the contracting parties have complied with their obligation to submit a completion report, and given that this seems to be the normal state of affairs in virtually every credit granted by BITS, it is recommended that Sida either abolish the rule *or* start to take it seriously by actually implementing it.

Multitude of agencies

It is no secret, that the multitude of different parties involved in Swedish concessionary credits by many recipients is seen as confusing and difficult to deal with. It is therefore reasonable to expect Sida to review it in order to see if there are any simplifications that might be introduced without loss of desired degree of security. Such a revision is therefore recommended.

ENERGY SAVING AND POLLUTION ABATEMENT IN JIAMUSI PAPER AND PULP MILL IN CHINA: An Evaluation of an Investment Project Supported by a Concessionary Credit from Sweden

I BACKGROUND and PROGRAM CONTEXT

1. The Project

Contents and purpose

In 1989 BITS decided to grant a concessionary credit in support of an energy conservation investment project in the *Jiamusi integrated paper and pulp mill*, at that time the biggest in China, situated in the northern Chinese province of *Heilongjiang*, producing mainly unbleached kraft pulp and paper.

The size of the credit was a 28,7 MSEK and its purpose was to finance 85 % of an import contract with the Swedish firm SUNDS DEFIBRATOR for the purchase of:

- a *washer* and *screening plant* (so called *displacement press*) for pulp,
- a *refiner line* (disk refiners) for kraft pulp connected to paper machine No1 for kraft sack paper, as well as
- corresponding instrumentation, documentation and spare parts.

The displacement press used for washing and screening of brown stock consists in all of 54 pieces of individual equipments or parts. The main components were supplied by Sunds, others were procured from domestic manufacturers. A complete listing of all the main components is given in *Chapter III.1: Goal Hierarchy and logical framework.*

The equipment was at the time the most modern available in the world, and was being used successfully both in Europe and in North America. According to one report issued by the company, this particular washing and screening line was not only the first in China, but also the first in the world used for pulp with larch as raw material. The capacity of the imported washing line is 350 tons per day, which should be compared to the 100 tons daily achieved by the now 40 year old soviet equipment

Also, the new displacement press is able to produce a final pulp product of 30 % consistency, compared to only 10 % in the old equipment.

The washing and screening line imported from Sweden was not only the first in China, but also the first in the world used for pulp with larch as raw material.

The direct *objective* of the investment was to conserve energy, but important benefits to the environment were also foreseen. According to the rules pertaining to Sweden´s concessionary credits, the project was required to be "in accordance with criteria adopted for Swedish official aid for development purposes" to permit BITS financing. After the resumption in 1989 of Swedish aid to China, which had been curtailed as a result of the *Tien An Mien* tragedy, the Swedish government had issued new guidelines with the following content: only those projects within the paper and pulp industry could be financed which have a strong emphasis on environmental aspects and on energy conservation.

More or less simultaneously to this investment BITS had granted similar support to three other paper and pulp companies in China, namely for the purchase of second hand paper machines by the paper mills in Yibin, Jilin and Dandong, and also other Swedish equipment to the paper mills in Xing Huo, Shanghai and Kaifeng.

The investments financed by Sweden were part of a larger investment programme undertaken by the company at the time. Its total size was some 112 million RMBs and included, apart from the Swedish funded equipments, also installation of a new batch digester with a computer control system, a lime kiln, a sack machine, a power turbine and a recovery boiler. All of these investment were aimed, not at increasing the mills output, but rather to increase product quality or to improve the production process with respect to use of energy and raw materials.

The project was aimed, not at increasing the mills output, but rather to increase product quality or to improve the production process with respect to use of energy and raw materials

Expected effects

The expected effects with respect to *energy saving* and *pollution abatement* of the project were the following:

Firstly: The washer and screening line being a closed system, implies large savings in water consumption, leading in turn to savings in energy and less emission of polluted water. Furthermore, because of an annual increased recycling of natriumsulfate in the washing process in the order of 1920 tons, and because less chemicals will be needed when the pulp arrives cleaner than before, the total consumption of chemicals will be reduced substantially.

Secondly: The investment in a new refiner line means more efficient grinding, which can save up to 2500 tons of coal each year, and also lead to a better quality paper being produced.

In the BITS decision document this investment was classified as profitable both from a financial and economic point of views.

Overall the planned effects of the investment were

- large savings in coal consumption
- large savings in electricity consumption
- decreased consumption of water
- decreased consumption of fibrous raw material
- decreased consumption of chemicals
- savings in railway and other transportation costs
- reduced emissions of toxic wastes

Expected demonstration effect: There are in China about 4000, mainly smaller, pulp and paper mills, many of them not only inefficient producers but also very big polluters of the environment. Since, at the time of the investment, this type of equipment did not exist anywhere in China, large expectations were therefore raised in connection with this investment in that it would provide a show case how modern western technology could be used to enhance the efficiency and environmental friendliness of the Chinese paper industry.

Cost structure

In addition to the cost of importing equipment from Sweden, there was a cost for domestic inputs of about RMB 4 million to cover labour as well as supplementary equipments and materials. The total cost structure of the project is shown in table 1.

Table 1: Cost structure of project

	Imported equipment: million SEK	Domestic equipment: million RMB
Refiner line	2,9	0,3
Washing and screening plant	30,9	3,4
Total	**33,8**	**3,7**

Of the imported equipment, a volume of MSEK 2,3 for the grinders came from a sub-contractor in Finland- the *Sunds-Jylhä Company*. Several other donors, among them Scandinavian, US and European, were at one time involved in various technical projects in the mill. The total number of such projects was reportedly 15.

The terms of the 28,7 MSEK credit given by the Swedish Bank to the Bank of China was ten year maturity with 0 % interest, repayable in 20 semiannual installments with the first one due six months after the plant was put into operation, but not later than October 31, 1991. The grant element of the credit was 11,8 MSEK or 37,31 % according to OECD consensus rules. The borrower Bank of China had to pay a commitment fee of 0,5 % per annum calculated on the un-disbursed portion of the credit, a flat "arrangement fee" of SEK 115,000, plus the premium for the guarantee issued by EKN for the due repayment of the loan.

Feasibility study

A feasibility study carried out by the company before the project (dated 25 February 1989) had shown the following:

Washing and screening plant

The existing washing efficiency was so low that 60 to 70 KG/ADTP dry solid matter contained in black liquor was lost. 60 % of the energy wasted could be recovered by a displacement press technology.

The dilution factor on the existing washing system was very high (3,5). With introduction of a displacement press washing line this factor could be decreased to 2,5 which would save a lot of water in the washing process and heat for evaporation. Introduction of a *displacement press* technology would also cut down the BOD and COD load in the effluent.

The expected effects of the planned investment would be

1. Savings of 10,000 tons coal a year
2. Savings of 1,920 tons of salt cake a year
3. Savings of fresh water of 9,600,000 cubic metres a year
4. Savings of raw material fibre of 1,6 tons a day

Refiner line:

Replacing the old type conical refiners with a new type of double disk refiner would greatly increase energy savings and enhance quality of sack kraft produced.

If three sets of disk refiners, each of 630 KW, thus were to replace the existing 10 sets of old conical refiners with effect 10 x 280 KW this could cut down electricity consumption by 55 %, from the present 380 KWH per ton to 170 KWH per ton. Since annual output in paper machine 1 (PM1) is 45,000 tons of sack kraft, total annual savings would be 9,450,000 KWH.

The economic value of energy conservation and other benefits were expected to be above 3 million RMB annually, using financial prices of all inputs. The value of environmental improvements were not included in the calculations. The figures arrived at are shown in table 2 below.

Table 2: Annual savings according to feasibility study 1989

	Volume per year	"other benefits"	Total benefit
Displacement press:			
- coal	10,000 tons		
- salt cake	1,920 tons		
- fresh water	9,600,000 cubic metres		
- raw material fibre	1,6 tons a day		
Total savings due to new displacement press		1,196,000	3,033,840
Disk refiner	9,450,000 KWH		670,500
- electricity power saved	(7,450,000 ?)		
Total			3,708,340[1]

Source: "Feasibility Study Report", produced by JPM, dated 25 February 1989

Comparing total economic benefits as above, id est realized savings, with total cost of investment it was found that annual savings would amount to some 14 % of the total investment needed (3.708,340/24,000,000 = 14,2 %9)

Taking the inverse of this ratio also gave the *pay off time* or recovery time of investment of about 7 years - (24,000,000/3.708,340 = 6,5)

The actors

As usual in all of Sweden´s concessionary financing a multitude of actors took part in the project. The following 13 each had a well defined role to play:

(1) *The Jiamusi Paper Company:* "End-user" and beneficiary of the 35 % grant element contained in the Swedish concessionary credit

(2) *China Light Industries Corporation for foreign Economic and Technical Cooperation, CLETC* in Beijing: Importer

(3) *Bank of China* in Beijing: Loan-taker of Swedish credit:

(4) *Ministry of Foreign Trade and Economic Cooperation, MOFTEC:* Government authority responsible for selecting end-user and loan-taker of Swedish credit

(5) *BITS,* subsequently replaced by *Sida:* Donor agency paying for the 35 % grant element contained in the concessionary credit, and issuer of "foreign aid guarantee"

(6) *Elof Hansson AB:* Exporter and "contractor"

(7) *Sunds Defibrator AB:* Supplier/manufacturer

(8) *Svenska Handelsbanken AB* in Gothenburg: Swedish Bank managing the credit:

(9) *AB Svensk Exportkredit,* or *SEK:* Swedish Authority procuring the funds which are offered as credit

(10) *Exportkreditnämnden, EKN* : Swedish agency issuing an export guarantee for the Swedish equipment

In addition the following Association and consultancy companies worked to prepare the project:

[1] This figure was later revised downward to 2,218,320 RMBs. No date is available for that revision.

(11) *Swedish Pulp and Paper manufacturers association, SCPF :* Industrial association commissioned by BITS to study the pulp and paper industry in China as well as to provide training for Chinese personnel

(12) *ÅF-IPK:* Swedish consultancy group responsible for analyzing investment needs and proposing outline of project

(13) *Swedish Development Consulting Partners AB:* Consulting company retained by BITS to carry out appraisal as well as follow-up of the project

The question whether it is meaningful and efficient to involve so many different actors in the process is not included in the term-of-reference for this evaluation. It is however not a secret that many recipients of the Swedish concessionary credits over the years have found the process very confusing and time-consuming to deal with. I may add that, even to an experienced evaluator of concessionary credits, the multitude of different actors may at times seem confusing.

> There was a total of 13 different actors that each had a defined role to play in connection with this concessionary credit. Many recipients of Swedish concessionary credits over the years have found the process very confusing and time consuming to deal with

The mill

The mill was founded in 1954 and started commercial operation in 1957 with a design capacity of 50,000 tons per year of paper and pulp. Originally the equipment was imported from the Soviet Union. Since then the mill has undergone several replacements, expansions and upgradings of equipment, some of which was imported from other countries. The mill currently operates six paper machines. The biggest one was imported from Valmet, Finland in 1960, but has since been expanded and modified using parts also from other countries. There was a major rebuilding phase in 1986 when *Voith* of Austria installed five new double-disc refiners. The mill today has some 2348 employees.

Since 1978 a total of 75 projects of technical modification and/or expansion, at a total cost of 320 million RMB, have been undertaken. 17 of these involved equipment from the west. In 1989 the company´s turnover was 443 million RMBs, its total capital assets were valued at 473 million RMBs and the profit realized in 1988 was 141 million RMB.

Apart from receiving technology and technical assistance from other countries, the company has also been in the position of extending aid to paper mills in developing countries. The mill is in operation during 340 days a year using the remaining 25 days for annual maintenance.

The company has passed the international *ISO 9002* quality certification. In China the company holds a high reputation for quality and has in the 1990s been among the 500

most profitable enterprises. The mill is capable of satisfying virtually all of its need for spare parts by its own manufacture, which explains the large number of maintenance staff - 800 persons.

The mill has an abundant supply of fibrous materials in the vicinity both in China and across the border in Russia. It owns and operates a plantation of some 23,000 hectares. Wood species with long fibers such as larch and pine are at present the only sources for the company´s pulp production. 90 % of the raw material arrives to the mill by river transport, the rest by railway. The larch wood is not debarked, as the pulp quality needed can be produced from unbarked wood. The pine and the spruce used are debarked by hand

Production

Having been previously the country´s largest manufacturer of paper and pulp it today remains as one of the largest. Its production of sack kraft paper accounts for 25 % of China´s national output, while cable paper accounts for fully 50 %. For some specialized paper types as impregnated insulation paper, ammunition paper, silkworm-egg paper and braille paper the company is in fact the country´s only producer. In all more than 20 grades of paper and board are produced mainly for packing needs in industry and agriculture.

In 1997 the total production of this fully integrated paper and pulp mill was as shown in table 3:

Table 3: Approximate output capacity of the Jiamusi Integrated paper and pulp mill

Product	**Volume**
Pulp	
Paper:	
- sack kraft paper	85 %
- kraft	5 %
- cable paper	2 %
- impregnated paper	
Total pulp and paper	260,000 tons
machine wire	180,000 sqm

It has around 1000 customers in 29 provinces and autonomuous regions, and some of the products have been exported to a total of 20 countries, including Western Europe and North America.

According to the company´s current plans output of paper and board will increase to some 350,000 tons by 2010. The company is today inviting and looking for foreign investors who are willing to invest on a joint-venture basis, and has worked out several detailed concrete proposals for this purpose.

Organization

The company today consists of a mother company - *the Jiamusi Paper Industry group Limited, JPIG* - and 15 different wholly owned subsidiary companies or factories, engaging in a separate branch of production, such as: paper and board making, wire manufacturing, paper products, construction works, installation works,, transport, trading companies etc.,

In all the group has 13,410 employees. Of the total employees about 1500 are specialist of various kinds, of which some 400 are senior staff or engineers. According to Chinese tradition, besides its production activity, the company also operates a kindergarten, a primary school a secondary school, a technical training college, a hospital, a theater, a sports center, and it provides subsidized residential housing for its employees and their families. It also supplies the surrounding community with its own district heating system, as well as hot water and electricity for lighting.

The main companies of the group are
1. Jiamusi Paper Company Ltd., which operates the paper and pulp mill, and is owned to 51,04 % by JPIG, 7,8 % by public legal owners and 28,6 % by private shareholders. The company´s stocks were introduced on the Shengzhen stock exchange in 1997
It employs about 2400 persons of which about 600 are women. Of the professional, administrative and technical staff about 50 % are women.
2. Wire manufacturer with 320 employees
3. Four different paper product manufacturers producing e.g. cement sacks
4. An engineering company engaged in design, construction, and installations
5. Company responsible for the groups woodlands and forest plantations
6. A machine manufacturing company with 318 employees, capable of producing equipment for the paper and pulp as well as for chemical industries.
7. A power station employing 28 persons.
8. A charcoal plant, producing charcoal from surplus saw-dust from the wood handling. The charcoal is exported mainly to Japan and to South Korea.

Corporatization and/ or privatization

The Jiamusi Paper Industry Group belongs to the group of 100 companies in China selected by the government to participate in a special reform program. The objective of the reforms is to achieve for these companies a clear definition of property ownership and obligations and rights, separation of ownership and management, as well as modern management methods. The company was therefore allowed to establish an independent, but state-owned, limited liability company, and to use its own capital to decide about its own investments.

Previous Swedish support

BITS has previously granted the following support to the Jiamusi mill:

- in 1986 it financed a visit to Jiamusi by a Swedish forestry expert from the Swedish Pulp and Paper manufacturers association, SCPF with the task to give advice on nursing of forestry, and on the supply of fibrous materials to the mill.
- in 1987 it financed an energy conservation study carried out by the Swedish consultancy firm ÅF-IPK.

- in 1986 and again in 1988 it provided grants for a total of 16 employees to attend an energy conservation training programme in Sweden, and
- in 1989 it financed an environmental improvement study carried out also by ÅF-IPK, whose task it was to describe the environmental status of the mill and to work out a proposal for environmental improvements in general and a effluent treatment plant in particular.

The 1987 energy conservation study is where the need for a new washing and screening plant as well as new disc refiners was identified, and the study thus constituted a basis for BITS decision in 1989 to approve a concessionary credit. BITS was quite impressed by the fact that the mill had in a short time, and without any foreign help, already successfully implemented the bulk of over 20 other energy saving measures proposed in the Swedish report. The Swedish consultants in 1987 estimated that the mill could save up to 41 % of tits coal consumption and 47 % of its fuel oil consumption if all the proposed measures were implemented.

Beside investments and other activities financed by foreign donors the mill has a number of other involvements with foreign companies. In 1995 experts from ABB visited the mill in connection with a control system which the company purchased using its own funds.

The mill had, before this projects, in a short time, and without any foreign help, successfully implemented about 20 other energy saving measures proposed in a Swedish energy conservation study

Jiamusi City and Heilongjiang province

Jiamusi is an industrial city with 2,3 million inhabitants, of which about 700,000 live in the city center. The town is the center of both river and land transport in the eastern part of the Heilongjiang province. Geographically the location is very favorable for a paper mill. Apart from proximity to the fibrous raw material, there are several coal fields situated near-by. The Daqing oil fields account for 46 % of China´s known petroleum reserves.

The province of Heilongjiang is a major producer of cereals and the country's largest producer of soy-beans. As a result of state investment the industrial sector today contributes about 58 % of provincial GDP, exceeding the national average of 48 %. According to a study carried out by the World Bank the per capita income from industry in Heilongjiang exceeds the national average by 37 %.

2. Paper and Pulp production in China

Restructuring

With the advent of market reforms in China a considerable restructuring has been taking place in China´s paper and pulp industry. According to the official industry survey in 1995 there were 9,000 mills in the country producing less than 5,000 tons a year. It is believed that, at the end of 1996, some 4,000 of those mills had been either closed down, integrated into other bigger mills, or modified to produce less pollutants.

The Chinese paper industry continues to reform and is today manufacturing paper grades to meet market demand in the middle and high quality grade bands. The sector is also adjusting mill capacities to more profitable levels and enforcing stricter environmental protection measures. The industry is today suffering some of the effects of rapid growth, as many new investments are necessary for environmental reasons without adding much additional output capacity.

Economies of scale are a very characteristic feature of the paper and pulp industry, which is very competitive internationally. But very few of the Chinese mills reach any economies of scale. Only about 20 of the mills have an annual capacity in excess of 40,000 tons. The less efficient mills survive because many of the inputs are being subsidized by the state.

In order for investments in energy conservation and pollution abatement techniques to be feasible (financially as well as economically) the investment must be of a very large scale. It therefore follows that only the largest mills can afford to undertake these investments. The reason why so many small inefficient mills have survived so long is that many of the input factors of production are being subsidized by the state.
Wood resources are therefore consumed today at a price that does not reflect the true economic cost to society including the cost of replanting forests and replacing equipment, nor to cover environmental damages. Coal is cheap and is therefore burnt in excessive quantities causing air pollution. Cheap toxic chemicals are not recovered after the cooking and the papermaking process, and instead dumped into the rivers.

According to analysis of the Chinese paper and pulp sector carried out in 1991 by a Swedish mission *(Report submitted by the Swedish Development Consulting Partners to BITS in July 1991)* the more important issues which limit future expansion of the pulp and paper industry is the relative scarcity of wood fibre resources, the declining condition of the environment, and the poor cost competitiveness of some segments of the industry. The ministry responsible for paper mills in China is the Economic and Trade Committee, through its Light Industry Bureau, situated in Beijing. Of the 5000 plus Chinese paper mills about 1500 are under the jurisdiction of this ministry.

Production

Since 1992 China has been the World´s third largest producer of pulp and paper. In the last few years China has been adding production capacity at a high rate, while at the same time being in the process of closing down many of its smaller mills.
In 1996 total output reached 24,8 million metric tons, and still could not meet domestic demand, as 4 million metric tons of paper products were imported. This huge potential explains why so many foreign investors and exporters attend trade exhibitions, especially in times when the European market is seen as fully tapped.

Even though the technique of paper making was invented by a Chinese, some 1800 years ago, the average consumption of paper per person is in China many times smaller than the rest of the world. After having gone up from 0,7 per capita in 1950 to 12 kgs in 1990 it is still way below the world average which stands at 44 kgs. In Sweden and Unite States the figures are 246 and 311 kgs respectively.

The volumes of production and international trade of paper and pulp respectively are given in the next two tables.

Table 4: ***Paper and board*** *production and trade (1,000 tons)*

	1995	1996	1997[2]
Production	24,000	25,000	26,000
Imports	3,029	4,000	4,100
Exports	530	300	500

Source: *Pulp and Paper International,* January 1997

Back in 1990 the official output volume was 14,4 million tons, but the figures are probably not comparable as it is unclear whether all the smaller producers are included.

Table 5: ***Pulp*** *production and trade (1,000 tons)*

	1995	1996	1997[1]
Production	16,800	18,900	19,200
Imports	824	1,000	1,100
Exports	39	15	15

Source: Pulp and Paper International, January 1997

After a substantial growth in the past decade, Chinas growth rate of paper and pulp production in 1996 slowed significantly - down to a 6 % yearly growth. But compared to the rest of the world this is very high as most other countries, in 1996 and 1997, did not even reach 1995 levels. According to the government ´s long term development plan total demand for packaging paper and board will reach 400,000 tons by 2010.

The Chinese government´s policy is to satisfy increased demand for pulp and paper from domestic production, not from imports. But, overall, there is a bottleneck for future

[2] Forecast

expansion by an overall lack of fibrous resources, of which only 20 % is derived from wood fibre while the rest is from straw, bamboo and bagasse etc.

Exports and imports

The decrease in international prices and the lowering of customs duty means that imports of paper and board to China is increasing. From January to September 1996 imports grew 43 % over the same period the previous year. Among the grades with highly increased imports is kraft paper - produced also by the Jiamusi Paper Mill - the import of which grew by 55 %.

Raw material

Production of paper and board has always been restrained by the much lower production of pulp. In 1990 it was estimated that pulp capacity was some 3 million metric tons lower than paper and board making capacity. This would seem to reflect the fact that that there is a relative shortage of fibrous raw material in some parts of the country.

It is therefore not surprising that about 30 % of the pulp production in China is based on agricultural residues such as bagasse, rice and wheat straw. A very important drawback with this raw material is its negative environmental impact, as straw, bagasse and bamboo pulp residues result in high levels of silica in the black liquor emission. Chemical recovery of these residues is not feasible or very difficult. In mills with no chemical recovery, the black liquor is dumped untreated into the rivers resulting in a high level of toxic pollution.

Using agriculture residue for pulp production will also produce a paper of inferior quality.

Utilization of waste paper in China in 1989 was at a rate of 25 %, which is lower than the world average which was 33,6%, and the average for Asia which was 39 %.

In Hong Kong, Taiwan and South Korea the corresponding utilization rates were 51, 54 and 41 % respectively.

In China the annual rate of wood cutting is 100 million cubic metres higher than the current rate of growth of wood. Observers of the industry have therefore reached the conclusion that the current mode of forestry exploitation in China is unsustainable in the long run.

Employment

Employment in the Chinese paper and pulp industry is very high by international comparison. While in China there are on the average 5,900 employees for every 100,000 tons paper and board produced, the corresponding figure in Sweden is today 478. This large difference reflects two factors:

Firstly, obviously the industry in Sweden is much more capital intensive because of high labour costs

Secondly, there is the extended responsibility that Chinese firms have over social and educational needs of their employees.

Foreign investment

The biannual China Paper and Forest Exhibition held in Beijing in October 1997 was, according to industry observers, an enormous success in that it attracted all major international companies from all over the world, who put on display their most advanced paper manufacturing equipment and products. In all, exhibitors represented 17 countries. This is seen as reflecting the enormous potential that the foreign investors see in the Chinese market, both in terms of selling machinery, and in terms of selling ready products. China today is the World´s second largest market for paper products.

Foreign private investors, mainly from the ASEAN countries have in recent years invested large sums of money in paper an pulp production in China, most of them in the southern part of China. Some are joint ventures, some are wholly owned. In some of the joint ventures the foreign share can be 70 % or higher. The foreign investors have found the Chinese paper and pulp industry to be a promising future industry. The motive would largely seem to be the vast potential for growth, given that present per capita consumption is now only 10 kgs per person which is one fifth of the world average or one twentieth of Europe´s consumption. Many of the new investments in the paper industry, foreign as well as domestic, are planning to make use of waste paper for raw material.

In February 1997 the trade journal *"Pulp and Paper International"* published a list of 20 new investment projects already under way or planned in China. If all those projects were completed China´s output capacity would grow by over 600,000 tons a year of pulp and 590,000 tons a year of paper and board. One notable project is the 1,5 billion USD recently invested by an Indonesian consortium, which will be based on the pulp being brought in from Indonesia.

3. Energy, energy conservation and environment

ENERGY

Coal is the most important source of energy, accounting for 75 % of all energy consumption, which makes China one of very few countries in the world relying on coal as its major source of energy. Oil accounts for 17%, hydroelectric power for 6 % and gas for almost 2 %.

China is the world´s largest producer of *coal* with an annual production of 1,2 billion tons, a figure which is estimated to grow to 1,5 billion by the year 2000.
Total recoverable deposits of coal in China amount to some 900 billion tons of which 30 % are proven.

China is rich in *water resources.* Of its total potential however only 9 % is developed, most of it located in the country´s southwestern part some 1500 kms away from the main demand centers in the north-east and east.

The country´s recoverable reserves of *oil* are estimated at some 80 billion tons. Production in 1995 amounted to 150 million tons. China´s refining capacity is the 6th largest in the world, but with today´s sharply increasing consumption the country will become a net importer in the near future.

Natural gas resources are estimated at 33 trillion tons of which 3-5 % are proven.

China is the second largest producer of *electricity* in the world. Its largest consumer of electricity is industry accounting for 2/3 of total consumption while households account for less than 10 %, services for 8 % and agriculture for 6 %.

Transmission and distribution losses are estimated to about 16 % of generation if one looks at the power supply as a whole from production to end user. Power generation has increased by an average or 8 % annually over the past 14 years. Despite this strong growth, however, most areas in China continue to suffer from severe power shortages.

Coal

China will continue to burn coal on a massive scale for many years to come. Even though its intensity of coal use, measured as per cent of GDP , has fallen by half over the last two decades, it is still between three and ten times higher than in major industrial countries. Alternative sources of energy cannot significantly reduce the country´s dependence on coal in the foreseeable future. According to a recent World Bank analysis even if ten new 600 megawatt nuclear facilities were installed each year, that would only make nuclear power contribute some 6 % of total energy consumption.

Most alternative sources to coal are today too expensive to be able to compete with coal. The only sizable and affordable alternatives to coal in the medium term would be oil and natural gas, primarily from imported sources. But the conclusion emanating from analyses of the country´s energy situation, carried out both by the Bank and by the Government, are clear on point, namely that all conceivable alternatives to coal will be too expensive, and that the only realistic source of energy for the country for many more decades to come is coal.

According to analysis carried out both by the World Bank all conceivable alternatives to coal will be too expensive, and the only realistic source of energy for the bulk of the country´s needs for many more decades to come is coal.

We must therefore conclude that, strictly speaking, the decision on part of BITS to finance an energy conservation project in China like the present one, does not

comply with one fundamental requirement of Sida´s policy on aid in the field of energy, which is that no aid should be given to countries that increase its coal dependency, or take no steps to reduce it. In the case of China it is clear that the country, even in the opinion of the World Bank, has no other choice than to increase its use of coal.

In a few Chinese cities nearby coal reserves have almost been depleted, and the cities find themselves in a situation where they need to consider their options for future energy supplies. However, even if individual cities were to resort to the option of switching to natural gas or some other new nervy source, it must be remembered that for the overall energy balance it would not be significant amounts. For compelling economic reasons coal will remain the only economical option for most of China´s cities.

ENERGY CONSERVATION

Although substantial progress has already been achieved in the field of energy conservation it is widely recognized that further future economic growth requires much bigger improvements in energy efficiency. All recent macroeconomic forecasting has shown convincingly that continued growth is not physically, financially or environmentally sustainable without dramatic further improvement in energy efficiency. Improving the country´s energy efficiency today stands out as the government´s main environmental protection strategy in its fight to reduce air pollution and stop increases in green houses gas emissions. Enormous potential for cost effective improvements in energy efficiency remains untapped in China, especially in the industrial sector, which is expected to continue to dominate energy consumption for decades. The strategic importance of and the huge remaining potential of energy conservation is well documented in many studies both by the World Bank and others.

During the 1980s China successfully developed a comprehensive energy conservation program including policy directives, and regulations. This system was quite effective under the centrally planned system. But with the present transition to a market economy it is judged, at least by the World Bank, as not being able to deliver results.

In 1990 Chinas economy was among the most energy intensive in the world, with an energy use per unit of GDP about 3 to 10 times higher than major developed countries, This was in spite of the fact that the country´s commercial energy intensity per unit GDP had fallen by over 30% between 1980 and 1990, which is in itself a remarkable achievement by international standards.

There remains today a tremendous scope for further improvements in the technical efficiency of energy use. The, by far, largest potential lies in the *industrial* sector, where

potential energy savings between today and 2002 have been estimated to be more than 500 million tons of coal equivalent per year, *or more than half of Chinas current annual total energy consumption.*

There remains today a tremendous scope for further improvements in the technical efficiency of energy use. The, by far, largest potential lies in the industrial sector, where potential energy savings between today and 2002 have been estimated to be more than 500 million tons of coal equivalent per year, or more than half of Chinas current annual total energy consumption.

There are many different obstacles to implementing energy conservation projects in China today. Some constraints are because of the current transition to market economy, while others are common in developed market economies as well. A draw-back with planned economy measures is that they are not automatic or built into the economic system. Administration of proper prices and incentives to achieve positive change becomes cumbersome and complicated. Pressures applied to different industries and to different firms becomes greatly uneven and therefore arbitrary from an economic point of view.

A variety of energy efficiency projects have been shown to result in substantial reductions in the emissions of both particulates and sulphur, principally through the reduction in energy consumption, but also through the introduction of more sophisticated technologies that are less pollution-intensive and that often embody pollution control technologies. Such projects also result in considerable health benefits for residents by reducing ambient concentrations, and thereby reducing human exposure and the incidence of respiratory illnesses. They also reduce the ill effects on crops, ecosystems and materials.

In a group of industrial energy conservation projects, recently analyzed by the World Bank, it was found that the *economic rate of return* ranged between 30 to 90 % (!) with an average *economic internal rate of return* of 47 % !!. (See *"Project appraisal document on a proposed loan in the amount of USD 63 million..... for an energy conservation Project"*, February 26, 1998, World Bank report no 17030-CHA)

THE ENVIRONMENT

(Parts of this section draws on a recent world bank report: *"China 2020: development challenges in the new Century"*, September 18, 1997, report No 17027-CHA")

Chinas´s air and water, particularly in urban areas are among the most polluted in the world. According to estimates of the World Bank as many as 289,000 deaths a year can be ascribed to the air pollution alone not reaching up to Chinese government standards. Overall, the economic *cost* of China´s air and water pollution has been estimated at 3 to 8 % of GDP per year.

A major factor is Chinas extreme dependence on coal for its use of energy, and in particular due to the many small individual boilers and stoves used in industry as well as in households. Environmental problems occur at every stage of the coal chain: mining and disposal of mine waste, coal washing, transport and handling, processing and combustion, and ultimately ash disposal. Coal accounts for almost 80, % of the current demand for energy, making the country the worlds largest consumer of coal.

Another factor is China´s booming cities. Between 1978 and 95 their populations swelled by 180 million residents plus some 50 million unregistered migrants from the countryside. Rising urbanization has not only been accompanied by increased use of cars and largely untreated emissions of municipal waste, it has also increased the proportion of the population exposed to the greater pollution found in the urban areas.

Over the last two decades urbanization, industrialization and motorization have seriously damaged air and water quality. Moreover, increasingly intensive Agricultural practices have led to a new generation of environmental threats, as run-offs from fertilized fields has contributed to water pollution. For, particularly, air and water pollution the benefits of investments into abatement measures so clearly outweigh the costs that they justify massive investments in pollution abatement.

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A major Swedish study of China´s environmental problems (*Environment and Development in China: a framework for Sino-Swedish Environmental Development cooperation*) , carried out in 1996, concluded that the country "is exploiting her natural resources far beyond what is sustainable... ..Already today the country is a dominating source of greenhouse gases and ozone depleting substances. In future years China´s environmental problems are likely to be felt increasingly around the world". The study linked the country´s dismal environment situation to three basic problems:

- an intensifying population pressure on already scarce resources,
- an economic development linked to yet higher per capita resource use, and
- a socio-economic climate yielding wasteful behavior and providing little incentive or guidance for reaching a sustainable situation

The paper and pulp industry

Like in the rest of the world the paper and pulp industry is one of the largest industrial polluters both w.r.t. emission of nutritive salts and toxic substances. In the town of Jinjan, which has four major paper mills, the paper and pulp industry emits 21 million cubic metres of waste water into the river each year. This constitutes some 60 % of industrial water pollution , and about 15 % of the overall pollution..

A large Chinese paper manufacturer will consume about 400 cubic metres of water per ton of paper produced, compared to only about 50 cubic metres in Western Europe. Pulp production uses methods based on alkaline which produces the so called ”black liquor”. In China this is emitted straight into the rivers without undergoing any purification. Only some of the bigger mills have today systems for recycling chemicals. The pollution created by the unpurified emissions of waste waters into China s rivers is therefore very large.

While the pulp and paper industry is by no means the only or the worst polluter its negative effects on the environment are no doubt significant. Each year the industry emits some 800,000 tons of alkali into China´s lakes and rivers, using up about 2000 million cubic metres of water.

Both for competitive reasons and because of the need to install pollution abating equipment China´s paper and pulp industry will be forced to undergo substantial restructuring. Most smaller producers, below 40, 000 tons of annual output, will likely be closed down or merged with bigger mills.

Deforestation in China is among other things being caused by over cutting of trees for lumber and paper production. This deforestation is the main cause of soil erosion which leads to loss of fertile top soil and over sedimentation of rivers. The river beds rise as a result of the siltification and massive flooding occurs at enormous cost to society. The siltification also reduces dam capacity, thereby harming electricity production which in its turn will lead to relatively more coal being consumed for electricity generation.

The paper and pulp industry is one of the largest industrial polluters both w.r.t. emission of nutritive salts and toxic substances. ”Black liquor” is emitted straight into the rivers without undergoing any purification. Only some of the bigger mills have today systems for recycling chemicals. *Deforestation* is among other things being caused by over cutting of trees for lumber and paper production, and is the main cause of soil erosion which leads to loss of fertile top soil and over sedimentation of rivers.

Air pollution

Air pollution in China´s cities is very high even by developing country standards. In relation to many European countries the allowable standards as determined by the Chinese government are much higher. as can be seen from the following table comparing China with Sweden. Although *particulate* emissions have remained app. constant since the 1980s, which in itself is extremely impressive considering the fact that coal consumption has more than doubled, *sulfur dioxide* emissions have risen sharply. Ambient *lead* levels also appear to be rising. Recent evidence suggests that as many as half the children in Shanghai suffer from elevated levels of lead in their blood.

Two of the main factors responsible for Chinas air pollution are:

- small and inefficient industrial boilers which often emit from low stacks account for between one third and one half of ground level particulates and sulfur dioxide.
- the residential use of coal. Although residential use accounts for only 15 % of total coal consumption, it is responsible for 1/3 of emissions of particulates and sulfur dioxides. It also harms the indoor air quality causing a health hazard about as serious as smoking.

Water pollution

Industrial and municipal waste and chemical and organic fertilizer runoff are the main sources of water pollution in China. The increasing pollution has considerably increased the cost of providing drinking water to growing population. In 1993 about 8 % of the agricultural lands received water so polluted that it was unfit for use, leading to an estimated loss in grain production of 1 million tons.
One study found that if waste water treatment were improved from the current 20 % to 50 %, total annual grain production could increase by 24 million tons by 2020.

Health

Mortality rates from chronic obstructive pulmonary disease, which is the main cause of death in China, are five times as high as in the United states. Reducing outdoor pollution level to the standard set by the Chinese Government would save 178,000 lives a year, and doing the same for indoor pollution would save another 110,000 lives.

Women and children who spend more time at home in closed rooms where coal briquettes are used on home stoves and for heating in winter, are being hit especially hard by indoor pollution. The coal used on home stoves is said to be the main cause of lung cancer in rural areas where women are disproportionately affected.

In Beijing researchers have found an association between air pollution and low birth weights. They also found a "significant exposure response relationship" between maternal exposures to sulfur dioxide and TSP during the third trimester of pregnancy and infant birth weight.

Acid rain is another by-product of air pollution which causes crop damage, deforestation, structural damage to buildings, and of course harm to human health. Emissions of sulfur dioxide and nitrous oxide react with atmospheric water and oxygen to form sulfuric acid and nitric acid, which can return to earth nearby or even thousands

of miles away. In a study 1993 it was found that as much as one quarter of the vegetable crops in a Southern province was damaged by acid rain.

Cost of pollution

Analysis carried out by the World Bank shows that the current annual cost of pollution is extremely high. Air pollution alone costs the economy 2 to 6 per cent of GDP per year. Water pollution costs another 1 per cent of GDP, and possibly much more.

Market forces introduced gradually in China over the past two decades have provided foundation for rapid economic growth, but, despite some reforms in natural resource pricing and taxation, the market forces have not been deployed so as to reflect the real economic cost of pollution, and thus contribute to altering the consumer behavior in ways that benefit the environment. Most prices are far away from reflecting the social and economic cost to society. With coal and other energy prices being subsidized there is little incentive to apply conservation measure or coal washing technologies that are economical at higher prices. If an environmental tax were introduced this would lead to a number of pollution abating investments.

The world bank has calculated the overall ratios of benefits to costs resulting from pollution abatement investments. The results are dramatic: investments in air pollution abatement will yield benefits 17 % higher than the investment if the cost of pollution is conservatively estimated, but if the same costs are more realistically estimated, the benefits will be 236 % higher than the investment. For water pollution the corresponding yields would be 136 % for both the conservative and the realistic estimate.

With coal and other energy prices being subsidized there is little incentive to apply conservation measure or coal washing technologies that are economical at higher prices. If an environmental tax were introduced this would lead to a number of pollution abating investments. The world bank has calculated the benefits from investment in water pollution abatement in China are well over 100 %.

Economic value of health and loss of life

The total economic cost to the China of premature deaths caused by air pollution has by the Bank been calculated to between 2 and 24 billion USD per year depending on which method is used. The cost to society as a result of illnesses, including hospital visits and lost work days, due to air pollution was by the world bank estimated to be as high as 20 billion USD each year. The total annual economic cost to China of air and water pollution including premature deaths, loss of health and also crop and forestry damage caused by acid rain was by the Bank estimated to be some 54 billion USD.

4. Economic Growth and Development in China

Economic growth

Since 1978, when market reforms began in China, the country has had an outstanding economic growth. During the 1990s the growth rate was over 10 % a year. The fastest growth took place in the more developed coastal provinces, partly explained by the fact that they received some 90 % of all of China´s foreign investments. From 1980 to 1990 GDP doubled and by 1995 it had doubled again. The country has, however, today reached a situation where various structural bottlenecks must be remedied in order for the growth to continue.

The economy´s growth rate for the first quarter of 1998 is reported to be 7,2 % with an inflation rate of zero per cent. Economic growth in China has been achieved largely by a capital deepening process especially in the state owned firms which has led to a significant rise in the capital intensity. Therefore, even during the years when China underwent its phenomenal economic growth, it was not able to achieve a corresponding employment increase. China´s industry has thus adopted production methods which may not always be the optimal ones in a country with abundant labor.

Construction activity has been and is still booming on an unprecedented scale even by international comparison. The annual volume of the construction industry has been estimated to some 600 billion SEK which would make it equal in size to the entire Swedish Government budget.

China is today the world´s largest recipient of foreign aid, as well as the seventh largest recipient of foreign direct investments. The total aid receipt in 1993 was some 3 billion USD of which 1,3 came from Japan alone. Japan accounts for 41 % of all the aid, three fourths of which is in the form of concessionary loans.

State-owned firms

A major problem is the 110,000 state owned companies, employing a total of about 110 million workers. A recent world bank report *(China´s Management of Enterprises Assets: The state as shareholder", World Bank June 5, 1997)* describes the problem thus:

"An emerging corporate governance vacuum, tax evasion, decapitalization through wage increases, and the private taking of assets and socialization of liabilities impair performance and threaten the validity of the system. More than marginal adjustment to current policies are necessary."

Among the needed changes mentioned are:

- diversification of ownership

- allowing for passive state minority shares
- a simplification of organizational structures and integrating cross-regional and cross-sectoral shareholding
- further developing of property right,
- elimination of policy induced barriers to entry and exit in inherently competitive sectors
- improved incentives for managers to meet debt service obligations
- creation of a market for managerial talent, and
- requirement of independent audits of financial accounts and making them publicly available.

While most other transition countries are trying to systematically privatize state companies, the Chinese government is today trying to maintain state ownership of key enterprises while attempting to introduce market-oriented incentives. The market reforms already introduced have substantially increased the total factor productivity of the state owned firms, but industrial profits have declined from 6 to 1 % as a share of the country´s gross domestic product. Furthermore, in the last two years the state owned firms´ share of total production has gone down from 80 to 40 %.

Many of the state owned firms continue to be technologically inefficient. According to Chinese law they are also obliged to provide ”cradle-to grave” social services to all of its employees and their families, and - mainly for social reasons - they keep large numbers of redundant employees and retirees on their payrolls. In 1996 50 % of the state owned companies incurred net losses amounting to 1,3 % of GDP. In 1994 only one third of the enterprises incurred losses.

Capacity utilization rates of major products have fallen below 60 %, but still the state companies continue to use up more than 75 % of domestic credit and their borrowing comprises some 60% of the total non-financial public sector deficit. This inevitably *crowds out* the investment needs of private firms, which have been the real engines of growth in the Chinese economic growth. It also undermines the weak state-dominated banking system. Because some 20 % of their portfolios are made up of non-performing loans to the state companies, several of the large banks today have a negative net worth.

Asian crisis

The financial crisis of Asia has not at all hit the Chinese economy so hard as some of the other countries, but it is inevitable that it will have negative repercussions on foreign investment in China as well as on country´s international trade. Fear of a possible future trade deficit is fueling rumors of a devaluation of the RMB, but such a possibility is categorically ruled out by the Chinese Government. Because of the country´s rapid growth over the last two decades and the government´s record of successful incremental economic reforms China today enjoys a solid credential in international financial markets, but even so the state owned industrial firms today find it increasingly more difficult to finance their investments.

Population growth

The two big problems facing the country are, as always, population growth and environment. In spite of strict family planning being enforced, demographers believe that the population growth curve will not even out before 2050, at a total population of 1,6 billion inhabitants.

The economic consequences of such a growth in population are, as is well known, staggering. In order to achieve a two per cent rise in consumption, while at the same time being able to feed the additional 125 million persons added from 1996 up to 2000, there will be a need for an additional amount of food equal to the total food produced in Africa.

Equality

The rise in economic wealth has by no means been equal. While the average standard of living has trebled since 1978, there are millions in the countryside who have not seen their standard rise. Many people, especially in the western provinces have a yearly income of 50 USD a year which is comparable to some of the poorest countries in Africa. According to the country´s official poverty level of USD 50 there are 80 million poor in China. Other sources however claim that the correct number is more like 200 million.

Many Millions of people have left their homes in poorer provinces to seek employment in the big cities, particularly in the east. The number of destitute are on the increase. In its wake has come prostitution, corruption and heavy criminality. Drug use and prostitution have returned to China after having been eradicated for nearly 30 years.

Due to worsening environment conditions deaths of nursing babies has gone up to 37 per 1000 births in 19991 from 34 in 1981.

The rise in economic wealth has been very unequal. While the average standard of living has trebled since 1978, there are according to the country´s official poverty level 80 million poor in China. Other sources claim that the correct number is more like 200 million.

Gender

There are reports indicating that the rapid economic growth with its accompanying structural reforms has in many areas led to increased inequality, not only between provinces in the east and those of the west between countryside and city, but also between *men* and *women*.. The liberalization and unsettling of traditional values has inevitably led to social problems where women are often the ones worst hit. Rapid, unplanned urbanization and break-up of families lead to insecurity especially for elderly women. Among young women out of work prostitution will rise. Violence against women is said to be widespread. Women employees are more exploited and enjoy worse labour conditions than their male colleges.

Even without the recent dramatic changes China is traditionally a male dominated society. The preference for male babies has led to an overall deficit of women. Boys

reportedly receive better care with respect to nourishing and health, which can explain why infant mortality is higher among girl babies.

There is a clear gap in education between sexes with ensuing differences in ability to compete in the labour market. 70 % of the illiterate population of China are women. Of all women 24 % are today illiterate but only 7 % of the men. Many women leave education prematurely. Nine out of ten women have manual occupations and most are employed in agriculture. Women have lower salaries and are less mobile geographically because of their responsibility to care for children and for the elderly.

There has been an increased inequality between *men* and *women*. as the unsettling of traditional values has led to social problems where women are often the ones worst hit. China is traditionally a male dominated society. Boys reportedly receive better care with respect to nourishing and health, which can explain why infant mortality is higher among girl babies. 70 % of the illiterate population are women. Of all women 24 % are today illiterate but only 7 % of the men. Women have lower salaries and are less mobile geographically because of their responsibility to care for children and for the elderly.

Heilongjiang province

After 1988 there was a sharp reduction in the amount of resources that the central government invested in the provinces. This led to a slow-down in the efficient operations of the province's large state-owned enterprises, and also had an important negative impact on other enterprises that supplied raw materials and intermediate products. The result has been a slow-down in economic growth over the past eight years, and a deterioration in economic performance relative to China´s coastal regions.

5. Swedish Aid in the field of Energy and energy conservation

Sweden´s development cooperation in the field of *energy* has as its overall objective *to improve the energy situation of the large proportion of people living in the world who do not have assess to reliable and efficient sources of energy.*

It shall also contribute to the development of efficient and sustainable energy systems. Long term support in the form of *grant aid* is today given to ten of the poorest countries of the world. In 1995 this support amounted to some 400 MSEK.

As for *concessionary loans* to energy development the total amount granted over the last 15 years is SEK 8 billion. Disbursements in 1995 amounted to some 350 million.

Major criteria for granting aid in the field of energy is that the aid should go to projects that are economically and environmentally sound, and it should be *catalytic* in its development role. Projects which imply *energy conservation* will be given high priority. These principles are stated in Sida Policy document on *"Environmentally sound energy support",* dated 23 April 1996.

One of the policy principles behind Sweden´s energy aid, stated in the above memorandum, is, if taken literally, inconsistent with the support given to the project evaluated here, namely that *"Sida´s support presupposes that the country implements a sound energy policy from an environmental, structural and economic point of view, or has taken initiatives that can be judged to result in such an energy policy."*

While Sweden´s policy seems to require that no support be given to projects which imply the continued or expanded use of coal as energy base, it is clear from analysis carried out by the World Bank that China has no other choice, than to rely on coal as its principal energy source yet for many decades to come. No observer of China´s development, nor internal nor external, has even suggested that China has any realistic possibility to get out of its heavy dependence on coal in the next half century or so.
One could therefore argue that Sweden's support to any energy conservation project in China, of the type evaluated here, is not in accordance with one of the main policy items of the Swedish aid policy w r t energy aid, namely that no support should go to countries that will expand its use of coal.
This conclusion, however, in no way implies any criticism against the present project since the said principle did not exist at the time the present support was decided upon by BITS.

> One of the policy principles behind Sweden´s energy aid, which says that no support should go to countries that will expand its use of coal, is, if taken literally, inconsistent with the support given to the project evaluated here.

6. Sweden´s Development Cooperation with China

Sweden´s development cooperation with China started already in 1974, and increased progressively in volume until 1989. By 1985 China had become the biggest recipient of BITS´ aid regarding technical assistance and one of the largest regarding concessionary credits. As a protest against the events in *Tien an Mien Square* in 1989, Sweden decided to freeze its aid in so far that no new projects were granted, but the ones already decided were continued. In 1992 a normal aid relationship between the two countries was resumed.

Policy

Sweden´s development cooperation with China is based on the realization that developments in China have a great importance for Sweden's future. Sweden, like other West European countries, has adopted a policy to support the on-going reform process in China and the development of a modern judicial system. Another important Swedish motive is that the development cooperation will enhance relations between the two countries. Increased personal contacts and exchange of expertise is therefore seen as an important element of the cooperation.

Sweden´s aid should focus on areas where Swedish experience, knowledge and technology can play an important role for development, innovation and reform in China. Areas of primary interest include environment, education , trade, technology transfer, research, and cooperation with Swedish NGOs. The sustainability of the contacts should be seen as a positive criterium when choosing projects. Apart form development cooperation Sweden is conducting an active dialogue with China regarding human rights, bilaterally as well as in cooperation with other countries, for instance within the European Union.

An area of special interest is environment. As also China wishes to cooperate in the area of environment this should be a priority area, as Sweden has considerable knowledge and advanced technology in this field. Sweden also has a self interest in this field given the global character of pollution problems. It also has a commercial interest to deliver suitable technology.

Swedish Aid to China´s paper and pulp industry

Overall BITS has granted concessionary credits for the delivery of equipment to eight projects in the paper and pulp industry in China. The total volume of these credits is 183,3 MSEK.

- In three of the projects the Swedish equipment imported were second hand paper making machines that had previously been used in Sweden. Two machines were sent to Dandong and one to Yibin.
- Two concessionary credits were used to finance equipment to increase output capacity in the paper mills of Jilin and Yibin.
- Two credits were given to finance the import of wire form Sweden.
- The latest credit was the credit to Jiamusi evaluated in this report.

In general BITS´ support to China´s paper and pulp sector has been followed up by visits of consultancy teams retained by the donor. The latest major mission was however as late as in 1991.

Under the heading of grant to technical cooperation (KTS) a total of 11 grants have been given by BITS/Sida to China at a total cost of 5,3 million SEK.

Eleven Chinese officers from the paper and pulp sector have participated in the courses *Pulp and paper technology* and *Environmental preservation Technology in Pulp and paper industries* at a total cost of one million SEK.

Except for the concessionary credit to Jiamusi paper mill, evaluated here, none of the above projects have so far been evaluated.

Experience

Sweden´s experience from development cooperation with China is quite good. In a number of project evaluations as well as in other documents conclusions have been reached that planned objectives were achieved in nearly all projects. The Chinese authorities have in these evaluations in general been found to be competent partners in the dialogue as well as in negotiations.

An important objective of Sweden´s aid to China, which according to these evaluations have been reached, is that it has helped Swedish commercial firms to open up and expand their business in the Chinese market.

Concessionary credits

Sweden´s concessionary credits to China started in 1982, and since then credits amounting to more than 5,500 MSEK have been approved, out of which almost 4,200 have led to commitments. At present the total volume of outstanding credits is 2,700 MSEK. The total grant element of these credits is almost 1,500 MSEK. China is by far the biggest recipient of Swedish concessionary credits, having received almost a quarter of the total volume.

As much as 65 % of the credits have been in the area of telecommunications. During later years there has been a focusing on *district heating* and on municipal sewage treatment (3 credits totaling 202 MSEK and water purification (7 credits totaling 174 MSEK). Ten different credits of a total volume of 184 MSEK have been granted to projects in paper and pulp production. There has been a marked trend towards more infrastructural, municipal or public services, and this trend is no doubt, at least partly, a result of the Helsinki accord which forbids concessionary credits to be given to commercially viable projects.

Of the concessionary credits, so far only the many telecommunication projects have been evaluated. The evaluation found a high degree of goal fulfillment. Administratively, financially and technologically these projects were seen as successful, and in the evaluators opinion they had also contributed to further commercial exploits in the Chinese market by the Swedish companies involved.

There has been a pronounced tendency for the Swedish concessionary credits to go to the richer provinces in China. Of the total 4, billion so far 17 credit of a total of 2,2 billion have been granted to the advanced provinces of the east coast, among them Beijing, and Shanghai. 20 credits at a total sum of 1,089 million SEK have gone to

middle economies provinces, among them Hebei, Liaoning, and HeilongJiang and Shanxi, while only 3 credits at a total credit sum of 45 million SEK have gone to the western regions and to poorer and more remote areas.

Contract financed technical assistance

Swedish *contract-financed technical assistance* was started in 1979 and covers to date 175 different projects at a total cost of 190 MSEK. The cooperation has been in a wide variety of fields, the most common ones being environment, research and education.. During the period from 1992 through 1995 18 projects were granted in the environmental area totaling some 21 MSEK, the volume of support to each project ranging from 15,000 SEK to 4 MSEK.

11 different grants, at a total volume of 5,3 MSEK have been given in the field of paper and pulp and to related forestry industries.

No comprehensive evaluation has been carried out of the Swedish *contract financed technical assistance* to China. But from various other reports it is possible to draw the conclusion that the aid is seen as having been largely successful. The same conclusion is reported by many other donors regarding their own development cooperation in *contract-financed technical assistance* in China.

The Chinese counterparts in this cooperation is seen as having made good use of the transfer of knowledge contained in these projects. Sida has concluded that this form of development cooperation is very suitable for China.

Swedish support to **industrial and commercial cooperation,** including trade promotion, was started in 1993, but was never a prioritized area by China. Today these projects are seen as having had little impact.

A large number of Chinese people have over the years participated in **training** and various *courses* offered by Sida and other Swedish aid agencies, primarily BITS. During the three last years 189 Chinese have participated. Among recent courses have been *human rights* for officers within the Chinese prison system, financed by Sida during 1996-98.

Several *Swedish NGOs* have received support for their programs in China. In the last three years 11 MSEK has been given in **disaster relief** aid following an earthquake and several floods.

Swedish commercial relations with China

Sweden's trade with China is increasing. It is however concentrated to only a few companies and types of goods. In 1994 the Swedish exports to Chinese made up only 1,9% of all of Sweden´s exports, while imports from China constituted only 2,1% of Sweden's overall imports.

After Sweden became a member of the European Union in 1995, Swedish imports from China have gone down, especially textiles and shoes, which declined by 9%.

EKN

The Swedish Export Credits Guarantee Board (EKN) in may 1996 decided to classify China according to tariff two for short term credits and tariff three for longer term ones. For loans over 100 million USD stretching over longer periods there will be a surcharge of 25 %.

EKN´s policy w.r.t. China is to opt for risk spreading together with the supplier , and to decline guaranteeing shipments of foreign goods. EKN´s total engagement in China was in may 1996 8,2 billion of which 5,8 with fixed guarantees (?). 75 % of this amount was Ericssons orders.

Aid to China from other countries

There is a general trend towards favoring environmental projects in most bi- and multilateral donors aid programs. The reason for this may, at least partly, be the Helsinki agreement which forbids grants or concessionary aid to be given to commercially viable investments.

Japan is by far the biggest donor to China, one reason perhaps being that Japan claims that acid rainfall in Japan is partly caused by emissions in China. other countries with ambitious environmental assistance programs are Germany, Canada, the UK, Australia, Finland , Sweden and Norway.

Future development cooperation

For its future development cooperation with China the Swedish government has decided that the six Swedish overall development objectives - *economic growth, environment, equality, gender, democratization and independence* - shall continue to be guiding principles. Special emphasis is to be laid on human rights, environment and equality objectives in the dialogue as well s in the choice of projects to support. The cooperation shall be characterized by mutual benefit to China and Sweden. In terms of volume the largest share of Sweden's aid is foreseen to go to environmental projects.

Whenever possible and practicable there should be a coordination between the two aid forms concessionary credits and contract based technical assistance.

7. Swedish concessionary credits to China: policies, negotiations, problems

Policies, procedures

Sida´s general criteria for granting concessionary credits to China are that the projects should

- have high priority in China and be in accordance with China´s own development plans
- be economically viable

- be within areas where Sweden is technologically and economically competitive, and
- be in accordance with the overall objectives of Sweden's development cooperation

The contracts financed by Swedish concessionary credits should be awarded in competition. The credits are tied to purchases of Swedish goods, and they normally finance 85 % of the total value of the contract. The typical terms are a 10 year credit period, interest rate 0 %, grace period 1 to 3 years and repayment period 5 to 9 years.

According to the OECD guidelines, as formulated in the so called *"Helsinki agreement",* projects which on the whole are considered commercially viable are not eligible for concessionary financing. Commercial viability is then defined according to the project´s ability to generate sufficient funds to cover operational costs and to service debts at market terms, as well as the availability of commercial financing for the investment.

A Chinese bank shall have appraised and approved the projects. When the proposals have been submitted to Sida, Sida will carry out a technical, financial as well as economic appraisal of the project. Partly based on this appraisal a decision will be taken to approve financing or not. Until now the Bank of China has been the only bank channeling the credit. Presently there are discussions going on to also involve the Export Import Bank of China. A discussion has also been held between Sida and MOFTEC to set up a line of credit that could be used for smaller projects which would require only a simpler appraisal procedure.

A *"memorandum of understanding"* regarding concessionary credits was signed between Sida and MOFTEC on June 13 1996, with the apparent purpose to focus on some of the main rules pertaining to the use of Swedish concessionary credits, namely
that

- concessionary credits may ordinarily finance up to 85 % of the a contract, but based on agreement between the two parties also 100 % can be financed especially in environmental and social projects.
- at least 70 % of the contract goods and services shall be of Swedish origin
- project proposals which have been appraised by MOFTEC and approved by the bank should together with a feasibility study be presented to sida
- when sida has appraised and approved a concessionary credit MOFTEC will ensure sida right to obtain insight into the project.

The stages of Sida´s handling of concessionary credits in
China are these:

1. Sida receives a credit proposal from MOFTEC
2. Sida makes a preliminary evaluation appraisal of the project proposal
3. If Sida thinks its OK w.r.t. its policy Sida give the Chinese applicant a go ahead to carry out a feasibility study

4. Upon receiving this feasibility study Sida will send an appraisal mission to analyze the project

5. Sida communicates its main conclusions from the appraisal to the end-user

6. If required the report is sent to OECD for consultations

7 Depending on go ahead received from OECD Sida informs the applicant that the procurement of a Swedish supplier can start

8. Sida analyses the commercial contract

9. Sida decision to finance

Negotiations

On several occasions MOFTEC has raised with Sida and the Swedish Embassy the issue whether or not Sweden would be willing to improve the conditions with which concessionary credits are given. In that context MOFTEC has also informed the Embassy that other bilateral donors are offering more attractive conditions on their loans, adding that Sida, otherwise, may find it hard in the future to receive attractive offers of projects to finance in China since the best projects available would naturally go to the other donors offering better credits. The threat of not being able to receive offers of worthwhile projects was by Sida seen as real because in China there is a scarcity of "good" projects in the sense that they have solved their local financing requirements and that they are ready to move ahead as soon as they receive a foreign concessionary loan.

According to reports also several of the other donor agencies providing concessionary credits have received similar suggestions/ requests from MOFTEC. Perhaps there was an implicit policy on part of MOFTEC to play out one aid agency against the other. Consultations between the different bilateral donors have usually revealed that, at least until recently, all the donors were in fact offering very similar conditions on their concessionary loans, which is natural since they all adhere to the recommendations given by OECD for concessionary loans.

In the beginning of 1998, however, some bilateral donors changed the share of the loans which must be used for imports from the donor country. Norway announced that in the future only 50 % of the total amount will have to be spent in Norway. Also, according to unconfirmed reports, Denmark is contemplating a similar decision. According to the Sida officer responsible in the Swedish Embassy in Beijing most likely Sweden will see itself forced to follow suit with the others, and abandon the current requirement that 70 % of the goods must be imported from Sweden. Otherwise Sida, in this officers opinion, may in the future experience a real difficulty to find worthwhile projects to finance.

Another aspect where MOFTEC has tried to "pressure" donors is regarding the financial terms contained in the concessionary credits. In one communication to SIDA, in 1996, MOFTEC insists that other bilateral donors, among them the other Nordic countries, are offering more flexible (read = more generous) conditions. The Chinese letter also pointed out that e.g the UK gives credits consisting of 35 % grant element and 65 % export credit, and Holland 45 % grant and 55 % export credit.

No revision of the share of grant element in the concessionary credits has, however, been decided by the Swedish side. But, in a meeting between MOFTEC and Sida in Stockholm December 1997, the head of Sida´s Credit Division informed of new possibilities opening up in the field of development loans offered by Sida. Among such new initiatives are so called "aid credits" (*Swedish = biståndskrediter*), which contain a grant element of about 80 %, the possibility of receiving untied credits, and the possibility of receiving independent loan guarantees. No formal decision has however yet been taken by the Swedish Government in this regard, and it is not clear at present to what extent China will be able to avail itself of these new facilities.

Degree of Sida involvement

In China, because the client is not always able to prepare appraisal reports of sufficiently high standard, sometimes Sida´s involvement in project planning and design becomes bigger than in other recipient countries. Sida´s aid officers see the degree of their intervention in the project as a balance act between being a contract financier and a regular project financier, which it is not supposed to be according to its own rules. In the opinion of this evaluation Sida has managed this balance act very well.

Insufficient training and supervision included in contracts

In many financing applications received from China Sida finds the training included in the contract to be insufficient or poorly specified. The same is often true regarding the amount of supervision as well as amount of spare parts provided for in the import contract. Chinese clients are, at least by Sida, generally known to be reluctant to include these items in the contract, preferring to spend the entire credit amount on hardware.

Often the Chinese borrower will try to make use of the advice and information which it can get for free from the various suppliers contending for the order during the negotiations conducted with each of the contenders in preparation for final selection of the successful bidder. Swedish suppliers are of the opinion that their Chinese clients are sometimes overly focusing on the hard-ware part of a contract and hesitant to use the funds to pay for soft-ware by way of supervision and training.

Because of this situation the donor Sida finds itself actively controlling that the required items like supervision, spare parts and training are always present in the contract and in sufficient amounts.

Procurement supervision

Also the procurement situation in China is different from other countries, and often involves Sida to a greater extent than elsewhere. Sida will often become involved, not only in analyzing and appraising the commercial contract signed between the Chinese importer and the Swedish supplier, but also in exercising a measure of control to ensure that the procurement procedure followed is satisfactory.

For Sida it is a delicate issue to decide in each case how much of control advice and active involvement is feasible both w.r.t. its administrative capacity, but, perhaps more importantly, w.r.t. Sidas principles regarding this aid form.

II THE EVALUATION and METHODOLOGY

1. Reason for, scope and objective of evaluation

Reasons for evaluation

Firstly, the project has been completed and, according to Sida´s evaluation policy, a final evaluation is therefore due.

Secondly, during project preparation the project was held out as a *demonstration case* for other paper and pulp factories in China, and large expectations have therefore been raised with respect to the outcome of the project.

Thirdly, Sida has today no information on the implementation and outcome of the project, or the extent to which the project´s objectives have been achieved.

Scope and objective

Following Sida´s normal level of ambition the investment projects financed by Sweden should be subjected to a *comprehensive* ex post evaluation, comprehensive meaning that it should cover not only all levels of the project´s goal hierarchies - inputs, activities, outputs, effects and impacts - but also all the usual aspects and criteria which are important for Swedish aid, among them the six main objectives of Sweden´s development cooperation.

The general *objective* of the evaluation is to assess the outcomes of the projects at the different relevant levels, as judged against the aid criteria of BITS and Sida, as well as against applicable development cooperation principles of Swedish aid, e.g. Sida´s *Policy for Support to Energy and Environment* established in April 1996.

The *scope* of the evaluation includes:

(1) to provide background information about:

- the development of the *pulp and paper* industry in China
- the financial status, operational results and institutional strength of the companies and institutions involved

(2) to assess the *implementation* of the project, i.e the delivery of the Swedish equipment and the efficiency of use of this equipment in the project.

- identify delays in project implementation and operational areas, if any
- analyze financial, economic and operational consequences of deviations from the implementation plan (if any)
- evaluate the Swedish supplier´s training efforts with regard to transfer of know-how
- assess follow up and maintenance routines etc. of the project
- assess the recipients capability to operate and maintain the system

- evaluate the performance of the Swedish supplier in interaction with the client

(3) evaluate the *effects* that the use of the Swedish deliveries have had
- ascertain whether the project objectives have been attained
- collect operational data and quantify results wherever possible

(4) evaluate the *impact* that the project has had, or is likely to have in the future, on relevant local, regional and national goals.
- investigate and report on environmental impacts from the project
- investigate and report on gender issues related to the project

(5) The outcomes should also be assessed against the stated project targets as well as the overall objectives of Swedish development cooperation, namely
- *Social and economic equality / poverty alleviation*
- *Economic growth*
- *Independence*
- *Democratization*
- *Gender equality*
- *Environment*

The terms-of-reference does not specify any particular *focus* of the evaluation, implying that the analysis should be - conventionally - distributed over the relevant topics given above at the different levels of the projects goal hierarchies.

2. The assignment[3]

The assignment was for 12 person-days, which were spent as follows:
- *two* days of preparatory work in Sweden, mainly reading file documents.
- *two* days in Beijing for discussions and interviews at the Ministry of Foreign Trade and Economic Cooperation, at the Swedish Embassy, and at the World Bank Regional Office.
- *three* days visit to Jiamusi and the Jiamusi Paper Mill
- *five* days of analysis and report writing in Sweden

3. Methodology

Firstly, I will analyze the entire contents of each project in terms of its component parts and its targets and objectives (explicit as well as implicit) at all levels of the goal hierarchy in the short, medium and the long run.

[3] See footnote comment in the Terms-of-Reference in Annex 4

This has not been done by BITS, but the most essential elements usually - if not always - follow from the texts of the relevant documents. The logical framework analysis - although sometimes under a different name - was widely used in most donor agencies already in the early 1950s, and BITS could therefore be criticized for having devoted too little effort in describing the goal structure of its projects in more explicit log-frame terms. However this is a criticism which it would then share with very many other aid agencies - also SIDA. For while most agencies at that time officially adhered to some kind of *logical framework analysis,* very few of them actually applied it in their regular project work.

Where possible we will identify an *intended* (again, explicit *or* implicit) *target group* for the project.

Based on this analysis the information will be systematically arranged in a *logical framework* schedule of the following fashion.

Targets and objectives at the following five levels: inputs, activities, outputs, effects, impacts	*Assumptions made; Restrictions*	*Criteria for measurement; indicators*	*Achieved*

This is done in section III "FINDINGS" chapter 1: "Goal hierarchy and logical framework"

A *goal hierarchy* model based on the logical framework analysis will also be shown for the projects. As is often the case, this goal hierarchy could not be based solely on the targets and objectives as stated explicitly in the available project documentation. Our analysis led us to include some elements which were overlooked (or at least not explicitly mentioned) in the project documents.

Secondly, I will analyze and assess all outcomes - as seen against *planned* targets at the following five levels:

- planning stage,
- implementation,
- outputs,
- effects, and
- impacts.

Under *effects* I will assess the project´s *financial* profitability, and under *impact* I will discuss the projects *economic* viability. Under impacts are also assessed the project´s performance with respect to

- Economic growth
- Social and economic equality/ Poverty orientation
- Environment
- Gender
- Sustainability
- Democratization
- Independence

4. Availability of information

Availability of written information for this project is uneven:

For the project preparation stage, i.e. during the period leading up the BITS´ decision to finance the availability is quite adequate, although by no means plentiful, and of generally high quality.

For the post-decision period, however, starting with the implementation of the project, there is virtually nothing. Mainly this lack of post-decision data is inherent in the aid form of concessionary credits. (See below). But it would seem that it is also to a large measure due to the language barrier and perhaps to the style of operation of Chinese public utilities.

The language problem

The language problem was a real obstacle: Since none of the responsible officers spoke English, all interviews had to be conducted through an interpreter. This in itself implies an important restriction on the possibility to gather information and insights. Even with the presence of a fully professional interpreter there is a lot of informal information which goes missing. In projects like the present one, where written information is very scant or actually non-existent, it is crucial to be able to soak up not only " hard facts", but , perhaps more importantly, all kinds of informal remarks, and perhaps even innuendoes and insinuations.

Evaluation experience shows that often weak points, hitherto unknown, are discovered by the evaluator only because of sometimes very small hints that are given either indirectly or even inadvertently by the person being interviewed. Such informal information is virtually ruled out when interviews are done through an interpreter. When the language barrier is so large as between a non-Chinese speaker like myself and public utility officials who only speak Chinese and with little experience from dealing with foreigners, it is also not possible to throw around questions, and to give and receive short comments as you move along during site visits. Such quick and unsystematic exchange of comments can sometimes lead to unexpected insights.

Individual interviews

Another possible limitation is that Chinese public officials are apparently unused, or unwilling, to agree to individual interviews. All interviews in this mission, even the ones made standing and moving around the plant of the paper mill, were in the presence of a group of people. In my opinion the presence of a group of people will usually not promote the disclosure or utterance of critical or sensitive issues. This is not a conclusion made only for China, with its tradition of a closed or even secretive administration, but is true for any country.

Little substantial data in BITS/Sida files

BITS´ mode of work differs from that of Sida and other aid agencies in that it is the contracting parties themselves, i. e. the supplier/contractor in Sweden and the credit user in China, who assume responsibility for the project, with BITS remaining an outside financier. Because of this it is also logical that the amount of documentation available in the BITS files is much smaller than there would have been in a regular project, financed by a Sida grant of comparable size. This does not mean that the actual physical volume of documentation in the BITS files is small. But most of it is formal documents - contracts, specifications of equipment, covering letters, etc., and very few of the documents are substantive or analytical.

Complete lack of ex-post data

The most striking feature of the documentation available in the BITS files is that there is virtually no information regarding the project´s effects and impacts, or of socio-economic matters. All documentation seems to end when the credit agreement has been signed and the actual project work starts. Also this can perhaps be seen as logical in the sense that once the financier BITS has satisfied itself that the project is sound, it is up to the contracting parties to do the job. During the months preceding the final signing of the credit there is an avalanche of documents, mostly dealing with formal documents regarding legal and financial matters, but also an abundance of covering letters and short notes. After that there is complete silence, which lasts until several years later when BITS sends a letter asking to receive a final report which it has been promised in the credit agreement. As concerns financial data the responsibility to follow-up project reporting rests with the Swedish bank issuing the credit.

The language problem was a real obstacle: Since none of the responsible officers spoke English, all interviews had to be conducted through an interpreter. This in itself implies an important restriction on the possibility to gather information and insights. In the BIT/Sida files is that there is virtually no information regarding the project´s effects and impacts, or of socio-economic matters. All documentation seems to end when the credit agreement has been signed and the actual project work starts.

III FINDINGS

1. Goal hierarchy and logical framework

The information on inputs and activities as well as the project´s expected outputs, effects and impacts - all described in Chapter I:1 above - can be systematically organized in the following outline of logical framework schedule.

Table 6: Outline of logical framework model of the ***Jiamusi paper and pulp investment*** *project*

TARGETS AND OBJECTIVES AT DIFFERENT LEVELS	*Criteria for measurement; indicators*	*ACHIEVED*	*Assumptions made; restrictions*
Inputs: IMPORTED FROM SWEDEN **1. Complete displacement press washing and screening line:** - pressure knotter (1) - primary screens (2) - pressure screen M800 (1) - pressure screen M400 (1) - vacuum washers (2) - displacement press (2) - MC(pulp) pump (2) - main pulp pump (5) - Instruments and valves (60) **2. Refiner line** - Disc Refiners (3) - pumps (2) - HD cleaners (3) - Instrumentation - Accessories EQUIPMENT PRODUCED IN CHINA: - pulp pump (5) - black liquor pump (20) - water pump (2) - blow tank (3) - pulp and liquor tanks(9)			

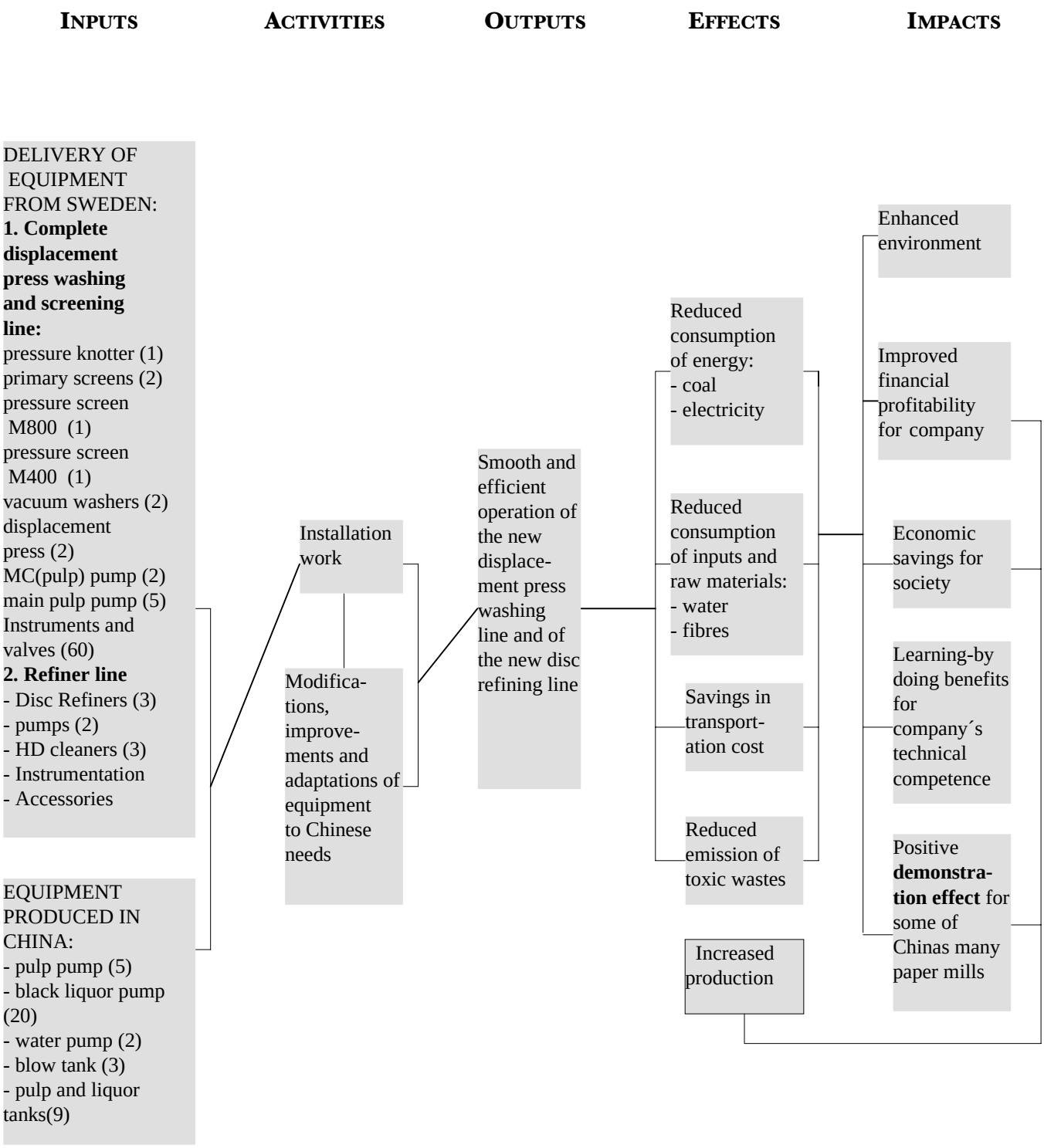
Activities: - Installation work - Design development and modifications, improvements and adaptations of equipment to Chinese needs			
Outputs: Smooth and efficient operation of the new displacement press washing line and of the new disc refining line. Improvements in the following aspects: - Production - Residual alkaline after washing (Na2o) - Dilution factor - Roughing knot consistency, - Accept pulp in knot, - Consistency at outlet of vacuum washer - Consistency at outlet of press washer			
Effects: *1. Reduced consumption of inputs and raw materials:* - Saving of water in the hot screening plant - Saving of dilution water after condensing - Saving of hot water for pulp washing - Reduction of fibre consumption - Reduced consumption of alkaline - Reduced consumption of steam - Reduced cost of effluent treatment *2. Reduced consumption of energy:* - coal - electricity *3. Savings in transportation cost* *4. Reduced emission of toxic wastes* *5. Increased output* (This was not a stated objective in this project!)[4]			
Impacts: - Enhanced environment - Improved financial profitability for company - Economic savings for society - Learning-by doing benefits for company´s technical competence - Positive demonstration effect for some of Chinas many paper mills			

[4] It should be noted that the increased output which resulted from the installation of the imported equipment in a logical framework context must be seen as an *effect* and not as an output. This is so for the simple reason that increased production was not a stated immediate purpose or target for the project. It was a welcome side-effect.

It should be noted that the increased output which resulted from the installation of the imported equipment in a logical framework context must be seen as an *effect* and not as an output. This is so for the simple reason that increased production was not a stated immediate purpose or target for the project. It was a, welcome, side-effect.

The *causal links* between the various factors of the logical framework table are shown in a goal hierarchy model in figure 3.

Figure 1: Goal Hierarchy of the ***Jiamusi paper and pulp investment*** *project*



2. Negotiations; Procurement

Competitive prices
According to analysis carried out by an industry expert contracted by BITS to examine the project and the import contract for the Swedish equipment, the prices offered for the equipment to be imported were competitive, and even on the low side for some of the components as compared to what the same equipment sells for in Sweden. This contention is also supported by the fact that the Swedish exporter received the order after very keen competition with the Austrian competing firm Voith. The experts opinion was that the equipment chosen by the Chinese were of the highest quality and capacity, and that it could be in production for many years with the lowest possible cost of operation and of maintenance.

3. Implementation

Displacement press washing system
The washing and screening system was installed in October 1990 and started up in November the same year. At first it did not perform satisfactorily and the Swedish supplier offered suggestions on how to rectify the situation, but to no avail. After several attempts to solve the problem and after two unsuccessful start up attempts, the parties agreed that the supplier would deliver a second washer. This was done in the autumn of 1992, after which the system has been functioning well. After several subsequent modifications and improvements the system today reaches and even surpasses design requirements.The company did experience a problem with *installing* the equipment, which in its view was because the Swedish supplier had not inspected the site well enough and there was not enough space available.
The total delay in the project due to the drawn out process before the displacement press was fully operational, was about two years.

The exact chronology of events was the following:
- *July-September 1990:* Equipment from Sunds arrived in Jiamusi. (However not all spare parts. According to a report issued by the company *"The equipment and its quality met the stipulations of the contract"*
- *October 5, 1990:* Old vacuum washing equipment was started to be dismantled
- *October 8, 1990:* Installation of new displacement press washing equipment was started
- *October 23, 1990:* A Swedish mechanical installation engineer arrived and after inspection approved the quality of the installation
- *October 29, 1990:* The electrical motor was given a trial run

- *16 November 1990:* After arrival of two of the supplier´s engineers the new washing system was commissioned with black liquor, and later with pulp. The start-up, was however not completely successful because:

1. There was a serious problem of foaming. The foaming of the black liquor affected the whole system adversely
2. Pulp consistency was very low
3. The volume of the black liquor tank was not large enough for the new washer
4. The diameter of the drop leg of the new washer was too large

The start-up continued until December 10, when it was "decided by both parties" that it was the design of the screening section which was causing some of the problems.

- *During January 1991:* The mill´s own personnel carried out some upgrading of the system, following guidelines given by the Swedish engineers:

1. The black liquor tank was enlarged, and a new separator was installed for soap in the tank
2. The diameter of the drop leg was reduced from 350 to 300 mm

- *23 February until march 15 1991:* New start up attempts in the presence of the Swedish engineers. There was good improvement in the screening section, but, due to high pressure in the vat, the press could not run normally, reaching an output of only 200-250 tons a day. The start up ended on 15 March without the guaranteed performance having been met, and the Swedish engineers left on march 19th.

- *September 11, 1991:* According to a protocol signed in Beijing Sunds agreed to supply JPM free of charge one filter drum. But the company, even though it had received a proposal from Sunds for the method of connection between two filters, still had difficulties connecting them.

- *November 8,1991:* A letter is sent to BITS, saying that an agreement was signed by the two parties according to which "Sunds has already implemented all the obligations stipulated in the contract except mechanical guarantee, but in fact modification and perfection for this plant are still going on. For this reason we have not worked out a report on completion of this project."

Main problems

The main problems concerning the vacuum washer were the following:
The pulp consistency in the flow tank could not be controlled during start-up and disequilibrium so that vacuum washer can not suck pulp from the drum. This led to overflows and an unstable production system. A contributing factor may have been inadequate quality of some of the domestic mechanical and electrical components as well as a relative inexperience of the installation personnel. Also, perhaps because the Swedish supplier had no previous experience with sulfate based on larch wood.

In the company´s opinion it was an experiment on part of Sunds to combine one stage of vacuum washing with two stages of displacement press, since this process had not been tried in Sweden. Another point raised by the JPM was that the dropleg of the washer was too big, causing too much air into the black liquor system, and also the functioning of some of the valves.

The company believes that the original design of the washing system was not entirely the appropriate one for China. Therefore the delivery did not correspond exactly to what was needed. Also because of low quality of domestic ancillary equipment and lack of domestic installation skills it took the company a long time to put the equipment into operation and reach commissioning.

After the two unsuccessful start-up attempts and after several rounds of discussion apparently both sides agreed that there had been a mistake in the design. In the company´s opinion this mistake was on part of the supplier Sunds, while Sunds thought that the requirements of the buyer had been poorly specified. In a letter to BITS on June 7 1991 the company states that "the actual technical plan proposed by SUNDS was inconsistent with the original feasibility study".

Agreement

In November 1991, both parties agreed however that an additional washer should be installed and that SUNDS would bear the entire expense - app. USD 800,000. In the written agreement to this effect, dated Beijing 27 July 1991, the mistake was defined thus:

"Due to insufficient in-depth exchange and communication during process design and contract execution, the delivered line is now running at a low load. Both parties hold different opinions for the solution to the existing situation. However both parties ascertain the good technical standard of the delivered equipment."

The solution which consisted in Sunds delivering an additional vacuum washer free of charge was one which was supported also by the independent adviser/appraiser retained by BITS. Even though he thought that this would actually be a bit on the advantageous side for SUNDS, he thought that it would nevertheless be a just solution to the problem and the most convenient way how to solve the impasse that had been in the relations between buyer and supplier. The BITS adviser had previously been rather critical towards SUNDS, claiming, in a letter to BITS dated 26 July 1991, that the company had

"had shown too little interest in the start-up processes of the washing and refining lines delivered.."

Other modifications

In the years following final commissioning in 1992, the company undertook a number of other, not insignificant modifications and improvements. The volume of the vacuum washer black liquor tank was expanded from 240 to 320 cubic metres, a soap/black liquor separating tank was added into the black liquor tank and the diameter of the vacuum dropleg was decreased from 350 mm to 300 mm, and the joint angle of the dropleg into the separator was adjusted. Also a number of mainly minor adjustments /modifications were undertaken in other parts of the system, such as changing some of the components of the interlocking system. Improvements were made in the control system when the company introduced a remote control valve so that the black liquor amount to pump can be adjusted easily in order to stabilize pulp consistency. This

improved the operation of the system. Similarly the company replaced the local manually controlled valve with a remote regulating valve which also contributed to more stable operation. The work of adding a new vacuum washer and making a number of other, mainly minor, adjustments, was completed by the summer of 1992, and in August 1992 the production line was started.
Now the system was running perfectly reaching a level even above design capacity. Pulp output had increased, and the residue of alkali after washing was decreased.

Due to the long period of inability of reaching guaranteed production level with the new equipment the company in a letter to BITS on June 7 1991 asked for deferment of the first re-payment of the loan for two years - from October 1991 until October 1993.

The displacement press delivered from Sweden at first did not perform satisfactorily. After several attempts to solve the problem and after two unsuccessful start up attempts, the parties agreed that the supplier would deliver a second washer at his own expense. After this, and after some subsequent modifications and improvements, undertaken by the mill itself, the system has been functioning well and today reaches and even surpasses design requirements.The total delay in the project due to the drawn out process before the displacement press was fully operational, was about two years.

Disk refiners
Delivery: The equipment arrived to the mill in January 1990.
Installation went on from July to October 1990
Start-up was carried out during October 1991, an in the process production was started
The equipment was running satisfactorily and delivered expected services. A problem was, however, that the high consistency cleaner dose was not working well, and there was virtually no purification taking place. The efficiency of purification was however not stipulated in the contract.

Domestically produced equipment
Some of the modifications and improvements introduced by the company were based on domestically produced equipment. In 1994 the company claimed that the following *imported* parts could now be manufactured, successfully by its own designers and, in half of the cases, in its own plant:

- Stock pump BA 250/250-32
- Stock pump BA 200/200-40
- Disk of pressure knotter
- Measuring equipment to pressure knotter

- Most parts of the mechanical sealings and bearings to the pressure screen
- Several other kinds of imported pumps
- A scraper conveyor

In the case of the disks for the pressure knotter the company claims that the component manufactured by it has a lifetime several times longer than that of imported parts.

It is not today nor was it at the time of the purchase possible to buy a washing and press system, like the one imported from Sweden, in the local Chinese market. In China there are many manufacturers of washing lines for much smaller systems. Also, most paper mills in China use bamboo or straw for raw material, while the Jiamusi paper mill uses only wood.

The reason for choosing the Swedish equipment over other foreign competitors was both quality/price considerations as well as the availability of a soft credit.

Remaining problems

Even though the system has now for several years been running to the satisfaction of the client, there are some possible improvements remaining in the current system: One disadvantage with the Swedish system is that it requires the use of a lot of foam, which was not the case with the old equipment. Because the foam is quite expensive in China the company intends to study if there is any technical solution which would allow them to cut down on the foam input.

Spare parts

There is a continuing problem of spare parts which has so far made itself felt mainly in the data control system. After having been in operation for about 7-8 years, there are some parts which are not working. These spare parts can not be found in the local market, and are quite expensive to import. One example of such a spare part is the instruments to measure the consistency of the pulp.

As for the spare parts needed for the washer line and disk refiners, e g bearings, sealings and pumps, these can always be found locally - at somewhat lesser quality but much cheaper in price. If for instance a foreign spare part may last for three years the corresponding Chinese one can last for two. But the price of the latter is usually one third of the former. An important aspect is that the local spare part you can usually get immediately. The problem with expensive spare parts is the same for all foreign suppliers.

There is a continuing problem of spare parts. Some of the needed parts can not be found in China, and are very expensive to import

4. Results/outputs

The work of adding a new vacuum washer and making a number of other, mainly minor, adjustments, was completed by the summer of 1992, and in August 1992 the production line was started. From then on the system was running perfectly, reaching levels even above design capacity with respect to both output as well as environmental targets. Pulp output had increased, and the residue of alkali after washing was decreased. The addition of the second stage vacuum washer had not only greatly improved the operation of the system, it also decreased the consumption of foam by 50 %.

A comparison of design capacity and capacity actually achieved, as measured by the company in 1994 showed results as in table 7:

Table 7: A comparison of design capacity and capacity actually achieved

	Design capacity	Actually achieved
Production, tons per hour	14,6	14,9
Residual alkaline after washing: kgs/ton (Na2o)	5,5	2,92
Dilution factor: cubic meters per ton	2,5	2,3-2,7
Roughing knot consistency, %	25	29
Accept pulp in knot, %	3	2,3
Consistency at outlet of vacuum washer, %	12	15
Consistency at outlet of press washer, %	30	30,7

Source: Information supplied by the Jiamusi Paper Mill

The figures confirm that the performance in terms of output volume, quality of product as well as efficiency in raw material consumption had at least reached design capacity, and in some cases clearly surpassed it. Even today, 5-6 years later, the whole system is working very well. The equipment quality is considered by the company to be very good and is still up to date.

A minor observation to note is that the control panel instructions, as delivered from Sweden, were all in English. Later some of the signs were translated into Chinese on a simple sheet of paper and fastened by scotch tape at the respective spots.

The performance in terms of output volume, quality of product as well as efficiency in raw material consumption has at least reached design capacity, and in some cases clearly surpassed it. Even today, 5-6 years later, the whole system is working very well. The equipment quality is considered by the company to be very good and still up to date.

5. Effects

The energy saving and pollution abatement effects of the project are the following:

Firstly: The washer and screening line is a closed system which means large savings in water consumption, leading in turn to savings in energy and less emission of polluted water. Furthermore, because of an annual increased recycling of natriumsulfate in the washing process in the order of 1920 tons, and because less chemicals will be needed when the pulp arrives cleaner than before, the total consumption of chemicals will be decreased substantially.

Secondly: The investment in a new refiner line means more efficient grinding, which can save up to 2500 tons of coal each year, and also lead to a better quality paper being produced.

All the beneficial effects hoped for have materialized. As a result of the installation and successful operation of the imported displacement washing and screening system, along with the timely modifications introduced by the company itself the following improvements have been achieved:

- decreased consumption of electricity
- decreased consumption of fibre raw material by 0,5-0,8 tons per hour.
- savings in coal consumption
- decreased consumption of water
- decreased consumption of chemicals
- savings in railway and other transportation costs
- less emissions of pollutants
- an extraction rate of black liquor is 99 %, which is comparable to the most advanced level reached anywhere in the world
- a compact, self-contained, process which is easy to control and to regulate
- an advanced instrument control system which makes for reliable operation.

The effects are summarized in the next table:

Table 8: Annual savings realized by the Jiamusi paper mill because of successful installment and operation of displacement washing and screening system

	Volume
Saving of water in the hot screening plant	4,7 million cubic metres
Saving of dilution water after condensing	2,9 million cubic metres
Saving of hot water for pulp washing	92,400 cubic metres
Reduction of fibre consumption	594 tons
Reduced consumption of alkaline	215 tons
Reduced consumption of steam	26,400 tons

Source: Information provided by the Jiamusi Paper mill in 1994

Saved energy due to new disk refiner

The disk refiner for paper machine 1, according to the company´s engineers led to a saving of 167 KWH per ton of pulp produced. Assuming that the amount of paper produced using the new disk refiners is 50,000 tons per annum the total savings is 8,350 Mwh, which is equal to about 6,830 tons of coal per year. The economic saving would then be 413,000 RMBs.

Previous savings in coal

The other investments, suggested in the Swedish report from 1987, which the company undertook on its own before the present investment supported by the Swedish concessionary credit, allowed the company to realize annual saving in coal consumption of 15,000 tons and 5,000 cubic meters of oil. The savings realized in coal consumption are shown in the following table:

Table 9: Annual savings of coal due to energy conservation measures undertaken at the Jiamusi Paper Mill

Year	kgs of coal per ton of paper produced
1986	1,537
1987	1,438
1988	1,306
1989	1,250

Increased production[5]

It is not possible to ascertain the effect of the project in the company´s production figures as output was restricted by an adverse market situation for the company. The increased production *capacity* brought about by the Swedish-supported investments is thus not manifested in higher production figures.

Output of paper fell sharply in 1996 and 1997 because of hard competition from imports and cheaper domestic paper, coming mainly from Chinese joint venture productions with foreign companies. The output during the last decade is seen in the following table:

Table 10: Output of the Jiamusi Paper Mill, 1000 tons

Maximum capacity	Product	1990	1991	1992	1993	1994	1995	1996	1997	1998 forecast
180	Paper	176	176	180	170	150	173	141	107	140
75	Board	-	-	-	-	-	0,6	1,1	11,3	20
180	Wire	180	135	127	84	91	100	103	101	90

Source: Data supplied by the company on April 20 1998

[5] It should be noted that the increased output which resulted from the installation of the imported equipment, in a logical framework context, must be seen as an *effect* and not as an output. This is so for the simple reason that increased production was not a stated immediate purpose or target for the project. It was a welcome side-effect.

The rather sharp fall in output started already in 1993 and is, according to the company, entirely due to a limited market for the company´s product, which started from about that time, and not due to any restriction in output capacity.

All the beneficial effects hoped for have materialized. The installation and successful operation of the equipment, along with modifications made by the mill itself have led to important savings in the consumption of *electricity, fibre raw material, coal, water, chemicals,* and in railway and other *transportation costs*. There is a dramatic decrease in emissions of pullutants, and the extraction rate of black liquor is 99 %, which is comparable to the most advanced level reached anywhere in the world. The washing line is now a compact, self-contained, process which is easy to control and to regulate, and it has an advanced control system which makes for reliable operation.

Technology transfer

During the two year installation period, the company believes it gained and accumulated a lot of experience and understanding of the technological process, and claims to have introduced practical and highly effective modifications to the original design of the imported equipment. In a report from 1994 the company states: *"..Defects in original design have been remedied, significant achievement is made and a whole set of new processes has been formed, which contains a great deal of new technology"*

From the evidence available one must conclude that the installation with subsequent modifications and improvements of the displacement press washing line by the company constituted a brilliant example of a classical case of *learning-by -doing*. The company learnt the hard way how to get the process to operate smoothly. It was forced to come up with a host of solutions to a large number of deficiencies and problems. And in the process the technicians learnt not only how the system works, but actually learnt how to improve on the system and also to manufacture some of the component parts of the system.

The installation with subsequent modifications and improvements of the displacement press was a classical case of *learning-by -doing:* The company gained experience and understanding of the technological process. Its technicians learnt not only how the system works, but also how to improve on the system and even to manufacture some of the component parts.

Financial analysis

The market situation

1995 was a very good year for paper - in China as well in the world market and the prices went up. In 1996 and 1997 however there has been sharp declines both in volumes and price. The company´s production in 1996 and 1997 was sharply reduced because of stiff competition from imports and local competitors. Today the mill does not run at full capacity as only 4 out of 6 paper machines are in operation.

The company´s main product is sack paper for cement sacks the second is liner board used for cartons and for packaging. Construction activity, and hence the demand for cement and for cement sacks, have gone down substantially compared to the situation a few years ago. A lot of the expensive housing and office space built in the last few years is today very difficult to find buyers for. It would appear that the demand of the relatively well off elite which has money, has already been satisfied. It is now time to start catering more to the lower income market segments.

However, according to information received by the company the government has recently decided to start a massive construction of low income housing. If that happens it would create additional demand for cement and thus a corresponding demand for the company´s cement sacks. Because of this the company has revised upward its forecast of the 1998 output to 140,000 tons - up from this years 100,000. In cement sacks there is not much competition for j, while for liner board the competition is very strong both from domestic producers and from imports.

In the market for paper for cement sacks the company has to compete with producers offering plastic sacks which are much cheaper but not at all as strong as paper sacks. The price of a plastic bag is today some 20-30 % cheaper than a paper sack.

Liner board could represent a very large potential for future growth, since China last year imported over 1 million tons. But in that market the company faces very strong competition. It has forecast its sales in 1998 to be only 90,000 as compared to the 100,000 sold in 1997.

Competition

The Jiamusi paper mill used to be the biggest producer in China, but this is no longer the case. It is now in third or fourth place. by volume produced. It would appear that the company today faces an important challenge from competitors both abroad and in China to increase its efficiency in order not to be forced out of the market. The management is trying to improve efficiency in order to be able to compete with the new investments which have newer more efficient machinery and, importantly, also a much smaller work force. Also the company wants to improve its marketing of the product.

Record of profitability

In China the Jiamusi paper and pulp company is seen as a very profitable enterprise. In a report issued by the company in 1997, the company´s total profits since its commissioning in 1957 up to 1996 was 25 times as much as the size of the original capital investment. This information is however not of much use since it does not say anything about the level of current costs nor of capital additions over the years. According to Chinese statistics, during 1989-1996, it occupied 224th place among the biggest revenue makers of the country´s top 500 firms. Among the category light industry firms it was number one. In 1994 it was awarded a prestigious prize - the Golden Horse- for best management.

The company´s profitability in the years 1989 and 1990 was very high. In 1989 the net profit after paying 117 million in tax, was 72,8 million. In 1990 the corresponding figure was 52 million after having paid 145 million in taxes.

The company´s annual report for 1997 gives the following picture regarding the company´s financial status:

Table 11: Profitability ratios for the Jiamusi Paper and pulp mill

Year	”net value per stock” =value of total capital/value of total shares	”asset-profit rate” = profits/assets	”net asset profit rate”	profit/stock
1994	1,4	7,1	18,4	0,3
1995	1,6	9,2	19,1	0,31
1996	2,0	9,6	19,5	0,32

Source: Company annual report for 1997

We have no information how the evaluation of ”assets”, ”profits”, and ”capital” has been done. So it is difficult to have any clear idea of the financial profitability of the firm. Assuming however that valuation standards have been constant over the years, one can at least conclude that the company´s financial situation has improved somewhat in recent years.

A BITS mission in 1991, visiting the four paper mills receiving support from Sweden, among them also Jiamusi, found that, at the existing prices, all four mills showed excellent profitability. However, when world market prices were used both for inputs and products then all four plants showed a financial loss. It should be mentioned however that the analysis was undertaken at a time with very low world market prices, when world market prices were in a slump.

Financial profitability of project

The economic value of energy conservation and savings in raw material consumption, according to feasibility study made in 1989, was expected to be about 3,7 million RMB

annually, using financial prices of all inputs. They are shown in table 12 below. The value of environmental improvements were not included in the calculations.

Table 12: Annual savings according to feasibility study: tons and million RMB

	Volume	Savings
Displacement press:		
- coal	10,000 tons	
- salt cake	1,920 tons	
- fresh water	9,600,000 cubic metres	
- raw material fibre	1,6 tons a day	
Total savings due to new displacement press		3,033,840
Disk refiner	9,450,000 KWH	670,500
- electricity power saved	(7,450,000 ?)	
Total		3,708,340[6]

Source: "Feasibility Study Report", produced by JPM, dated 25 February 1989

Comparing realized savings, with the cost of investment we have that annual savings would amount to some 14 % of the total investment needed (3.708,340/24,000,000 = 14,2 %9), and taking the inverse of this ratio gives a *pay off time* or recovery time of investment of about 7 years - (24,000,000/3.708,340 = 6,5

Profitability of investment in new disk refiner

The financial profitability of the investment in the new disk refiner was calculated by a BITS consultant in 1991 according to the following:

Table 13: financial profitability of new disk refiner:

	According to feasibility study	According to actual results achieved
Investment, RMB	2,700,000	3,000,000
Energy savings per ton produced, KWH	198	167
Assumed volume of production, tons	50,000	46,000
Total savings in MWH	9,900	7,682
Total savings in tons of coal	4,140	3,590
Assumed cost of coal per ton	128	130
Savings in cost of coal	530,000	466,000
Nominal return	19,6 %	15,5 %

Source: Mission report by BITS consultant dated July 1991

[6] This figure was later revised downward to 2,218,320 RMBs. No date is available for that revision.

When, instead of the local price of coal of around 130 Yuan per ton, we were to use the world market price of coal of 260 Yuan per ton, the rate of return dramatically increases - from 15,5% to 31, 1%.

We do not have access to ex post data to permit us to calculate the actual financial rate of return for the Swedish funded investment in a displacement press washing line and the disk refiners. Given the large savings realized with respect to consumption of raw materials and electricity, as shown above, it is however probable that the project is financially profitable, *in spite of* the fact that there was a two year delay in implementing the project and in spite of the sharp decline of output in the last two years.

There are no data available to permit calculation of the actual financial rate of return for the Swedish funded investment. Given the large savings realized with respect to consumption of raw materials and electricity, as shown above, it is however probable that the project is financially profitable, *in spite of* the fact that there was a two year delay in implementation.

Fallacy of financial analysis

Analysis of the financial rate of return for a state firm operating in a regulated economy is of limited interest, when taxes, subsidies and tariffs, which are not set according to supply and demand, can be changed at any moment by a mere administrative or political decision on part of the government. In such an environment, the financial rate of return becomes unreliable as a measure of the strength and quality of a company´s operation. One should then be more concerned with the *economic* analysis of the project, because it is the project´s *economic* profitability which is the correct criterium whether or not a project is worth while and desirable.

The financial rate of return in such an environment is important mainly because it will decide whether or not the project can be financed in the commercial market, or whether it needs subsidies by way of e. g. domestic or foreign concessionary credits. The donor agencies today devote a considerable effort to financial analysis because of the demands posed by the OECD. In order to determine that the Helsinki accord rules are being followed, and to make a concessionary credit legitimate the donor is obliged to carry out comprehensive analysis of a project´s financial viability and of its cash flow.

In today´s China, even though important steps have been taken towards a market economy, there are enough remaining regulations and subsidies both on the cost and revenue sides, and with enough distortions, due to hidden subsidies and tax payments structure to make it difficult to understand for the foreigner. This of course makes the

financial analysis of limited interest. From an economic point of view, i.e. in the perspective of the government, economic viability becomes a *necessary* condition, whereas financial viability is not, because it can be changed at will by the government.

If we can take for granted that taxes, subsidies and other relevant parameters will not be changed for the project, then the financial analysis, including the cash-flow analysis will provide a correct assessment of what kind of financing is needed for a project to be realized. But in a situation where e.g the financial outcome tells us that an investment cannot be financed at market terms, we also know that the government, by changing some of the parameters so as to create a cash-flow positive enough to allow the investment to happen even if no concessionary financing were available.

From an economic point of view the relevant decision procedure for the government is this: *Firstly*, an economic analysis should be made of different project alternatives using real opportunity costs. *Secondly*, the government decides on the degree of subsidy that it is willing to extend to the project - if tariffs cannot be raised enough to finance it. *Thirdly*, the government must find the most convenient way of bringing about a financial package which can make the project happen. This package can then include that the project is allowed to receive the whole grant element of a foreign concessionary credit and/or a combination of other direct and indirect subsidies. What is important is that the full subsidy be shown in the national budget. If it has been shown by economic analysis to be profitable for the country, then this subsidy will be a financial cost which will actually bring about revenues from the national economic point of view.

> The financial rate of return for a state firm operating in a regulated economy is of limited interest, when taxes, subsidies and tariffs, which are not set according to supply and demand, can be changed at any moment by a mere administrative or political decision on part of the government. In such an environment, the financial rate of return becomes unreliable as a measure of the strength and quality of a company´s operation. One should then be more concerned with the *economic* analysis of the project, because it is the project´s *economic* profitability which is the correct criterium whether or not a project is worth while and desirable.

6. IMPACTS: ATTAINMENT OF LONG-RUN OBJECTIVES

6.1 Economic benefits

The experts that carried out an environmental study of the Jiamusi paper mill, commissioned by BITS in 1990, reported that the levels of discharges were at that time so high that pollution abatement investments in many parts of the production process would be extremely profitable economically even without introducing any

environmental aspects into the analysis. In fact they found that the pay-back period of many of the investments was only 1 to 2 years.

The value of the savings realized by the mill because of the new displacement press is shown in the following table.

Table 14: Jiamusi paper mill: Annual savings envisaged as a result of successful installment and operation of a new washing and screening system

	Volume	**Value Million RMBs**
1. Saving of water in the hot screening plant	4,7 million cubic metres	
2. Saving of dilution water after condensing	2,9 million cubic metres	
3. Saving of hot water for pulp washing	92,400 cubic metres	1,33
4. Reduction of fibre consumption	594 tons	1,5
5. Reduced consumption of alkaline	215 tons	0,1
6. Reduced consumption of steam	26,400 tons	1,0
7. Reduced cost of effluent treatment		5,7
Total		9,4

Source: Data put out by the Jiamusi Paper mill in 1994

According to the table not all the savings realized by the plant are included in the calculation. The total value of those that are comes to almost 10 million RMB per year, which is a very impressive figure considering that the entire investment cost was only about 35 million RMB. This would give a pay-back period of the investment in economic terms of 3,5 years.

We do not have access to data which would allow us to calculate the actual economic profitability of the investment. But if the figures supplied by the company regarding the above savings are correct, and we have no reason to doubt that they are, it is obvious that the economic profitability of this investment must be very high, even without taking account of the economic benefits to society that come from reduced pollution.

Beneficial effects on health and environment

The large reductions in pollution and effluent can also be expected to have a considerable effect on the environment and on peoples´ healths. Such effects were not included in the economic analysis carried out at the appraisal. An inclusion of health factors as well as other beneficial effects on the environment in the economic analysis would increase economic profitability considerably.

Other beneficial effects, which have not been included are the considerably reduced maintenance costs and also improved pulp quality with the new machinery. If also those effects were to be included in a complete economic cost benefit analysis of this project, there can be little doubt that the project must be highly profitable from an economic point of view. This was also the opinion of the expert retained by BITS as an adviser for this project in 1989.

In many parts of the country coal is priced at about half the world market price. Because of this many energy conservation measures are not undertaken because the government does not realize how profitable they are for the national economy, i.e. when economic prices instead of financial are used. In recent years many prices affecting the paper and pulp industry have been liberalized, but the lack of adequate environmental or pollution taxes and other hidden subsidies and taxes still hide to the decision makers the real economic profitability of energy conservation and pollution abatement investments in the larger paper and pulp mills in China.

The total value of economic benefits has been estimated to almost 10 million RMB per year, which would give a pay-back period of the investment in economic terms of only 3,5 years. There are no data which would allow us to calculate the actual economic rate of return of the investment, but if the figures supplied by the company regarding the above savings are correct, the economic profitability is very high. An inclusion of health factors as well as other beneficial effects on the environment in the economic analysis would increase economic profitability considerably. Other beneficial effects, which have not been included are reduced maintenance costs and improved pulp quality. Because of the large coal subsidies and lack of pollution taxes the very high economic profitability of energy conservation and pollution abatement investments is hidden to decision makers.

6.2 Environment

Up until 1990 the company had paid to the state a total of 12 million RMB in fines for failing to live up to the province's emission standards. In 1985 several environmental measures were implemented which substantially reduced the level of these fines. However, subsequently it had been ordered by the Heilongjiang provincial government to purify its water emissions into the river, and also to conserve energy.

According to current rules investment in pollution abatement equipment can give the company a 75 % destitution of fines previously paid. And reportedly the company has already collected some 6 million of its paid fines as a result of the pollution abatement investments carried out up until 1990.

Before the project was undertaken, the average effluent discharge values for the company were the following, per ton paper produced:

Effluent (waste water)	275 cubic metres or 5,600 cubic metres/hour
Suspended solids	80 kgs, or 40 tons /day
COD	110 kgs, or 55 tons/day
BOD_5	34 kgs, or 17 tons/day

These levels were by experts deemed to be very high even by industry standards in China. Before the project the waste water was discharged directly, without undergoing any purification, into the Song Hua river.

An interesting point made in the 1990 BITS financed environmental study is that when previous very high levels of discharges are reduced, then the importance of other sources of pollution, which had earlier been hidden in the big discharges, will increase. Therefore it is important to introduce new types of measurements, and also to carry out the measurements more frequently.

Comparing the new displacement washing and screening system line with a conventional vacuum washer with respect to emission of pollutants the company shows results as in table 15 below.

Table 15: Reductions in pollutants due to Displacement washing and screening system, (kilograms per ton of pulp)

	COD pulp	Sulfide	Phenol
Vacuum washing	24,3	0,12	0,16
Displacement washing	15,0	0,06	0,04
reduced load, volume	9,31	0,06	0,12
reduced load, %	38,6	50	76,3
Load reduction, tons per year	868	5,5	11,3

Source: Information provided by the company in 1994 and confirmed again in 1998

We can see from the table that the investment in the new displacement press washing line has been highly beneficial for the environment - reducing emission levels of pollutants and toxic wastes by between 40 and 70 %. As for water pollution there will be none at all with the new washing line since it is a sealed high-heat screening system which does not drain effluent during the screening process.

We have no information on how much the decrease has been in the BOD_5. In 1990 the level was at least 150 mg/l as compared to the government limit which was set at 60 mg/l, but expected to be revised downward to 20 mg/l in the near future.

Adding to these important reductions of pollution the very large savings in energy and raw materials brought about by the investment in a new washing line and new disk refiners, we can be certain that the environmental benefits of this project are very large in deed.

The project has been highly beneficial for the environment - reducing emission levels of pollutants and toxic wastes by between 40 and 70 %. As for water pollution there will be none at all with the new washing line since it is a sealed high-heat screening system. Adding the very large savings in energy and raw materials brought about by the investment we can be certain that the environmental benefits of this project are very large in deed.

6.3 Equality/ Poverty orientation

The project can not be said to favor or be biased against any particular group in society. By raising the level of gainful employment and incomes in the region it can reasonably be assumed that it will in general, and in the long run, benefit all the inhabitants in the region.

Gender

Of the 2,485 employed in the mill today 680 are women. There are 252 persons which the company refers to as technical staff, which includes professionals, and administrative staff. About half of these are women.

According to my sources it is sometimes a little more difficult for a woman to find employmnet in a paper mill than for a man, probably simply because women are perceived to be less strong and less efficient workers. But there is no evidence available to back up such a contention.

6.4 Gender
6.5 Democracy
6.6 Independence

It does not appear possible to detect any particular effects, direct nor indirect, on *gender, democracy* or *independence* emanating form this project..

6.7 Demonstration effect

According to our information the displacement press washing system installed in Jiamusi was not only the first sealed high-heat washing screen used in China, but also the first one in the world used to wash pulp from *larch* wood.

Given the impressive achievements of the project with respect to both savings in energy and in raw material consumption, as well as reduction of pollution, it would seem reasonable to believe that - in spite of the long delay in implementation - there has been, or that there will, sooner or later, be a demonstration effect of this investment, as some of the other large or medium size companies of the four thousand paper mills that still exist in China, realize how beneficial both to company profits and to the national economy such investments may be.

Given the impressive achievements with respect to savings in energy and raw material consumption, as well as reduction of pollution, it would seem reasonable to believe that - in spite of the long delay in implementation - there has been, or will be, a positive demonstration effect of this investment, as other paper mills realize how beneficial both to company profits and to the national economy such investments may be.

7. BITS´s project preparation

Violation of Sida´s energy policy

As was already stated in Section I:3 above, the decision on part of Sweden to finance this energy conservation investment in China would seem to be in conflict with one of the principles laid down in Sida´s policy on aid in the field of energy, namely that no aid should be given to countries that increase its coal dependency. Improving the country´s energy efficiency today stands out as the government´s main environmental protection strategy in its fight to reduce air pollution and stop increases in green house gas emissions. And an enormous potential for cost effective improvements in energy efficiency remains untapped in China.

However, for compelling economic reasons, coal will remain the only economical option for most of China´s cities. Since this evaluation has found the present project to be beneficial for the recipient country, it follows that I must question the usefulness of this particular principle of Sida´s energy policy, at least in the form that it is now written.

> The support to this energy conservation investment in China would seem to be in conflict with one of the principles of Sida´s aid in the field of energy, namely that no aid should be given to countries that increase its coal dependency. However, coal stands out as the only economic option for China energy needs in the foreseeable future, and the appropriateness of this principle must therefore be questioned.

9. Reporting requirement

According to the conditions laid down in the credit agreement both the exporter Sunds Defibrator AB and the borrowing client should, within 6 months after the commissioning of the Swedish equipment, submit a project completion report to BITS. As is usually the case in concessionary credits financed by BITS, no such report has been sent in, and apparently no one at BITS or Sida has missed it. At least no reminder has been sent to the company although over five years have already passed since the commissioning of the equipment.

IV SUMMARY OF FINDINGS AND CONCLUSIONS

Implementation

- The displacement press delivered from Sweden at first did not perform satisfactorily. After several attempts to solve the problem and after two unsuccessful start up attempts, the parties agreed that the supplier would deliver a second washer at his own expense. After this, and with some subsequent modifications and improvements, undertaken by the mill itself, the system has been functioning well and today reaches and even surpasses design requirements.The total delay in the project due to the drawn out process before the displacement press was fully operational, was about two years.

- There is a continuing problem of spare parts. Some of the needed parts can not be found in China, and are very expensive to import

Output

The performance in terms of output volume, quality of product as well as efficiency in raw material consumption has at least reached design capacity, and in some cases clearly surpassed it. Even today, 5-6 years later, the whole system is working very well. The equipment quality is considered by the company to be very good and still up to date.

Effects

-All the beneficial effects hoped for have materialized. The installation and successful operation of the equipment, along with modifications made by the mill itself have led to important savings in the consumption of *electricity, fibre raw material, coal, water, chemicals,* and in railway and other *transportation costs*. There is a dramatic decrease in emissions of pullutants, and the extraction rate of black liquor is 99 %, which is comparable to the most advanced level reached anywhere in the world. The washing line is now a compact, self-contained, process which is easy to control and to regulate, and it has an advanced control system which makes for reliable operation.

- The installation with subsequent modifications and improvements of the displacement press was a classical case of *learning-by -doing:* The company gained experience and understanding of the technological process. Its technicians learnt not only how the system works, but also how to improve on the system and even to manufacture some of the component parts.

Financial profitability

There are no data available to permit calculation of the actual financial rate of return for the Swedish funded investment. Given the large savings realized with respect to consumption of raw materials and electricity, as shown above, it is possible that the project is financially profitable, *in spite of* the fact that there was a two year delay in implementation.

Fallacy of financial analysis

The financial rate of return for a state firm operating in a regulated economy is of limited interest, when taxes, subsidies and tariffs, which are not set according to supply and demand, can be changed at any moment by a mere administrative or political decision on part of the government. In such an environment, the financial rate of return becomes unreliable as a measure of the strength and quality of a company´s operation. One should then be more concerned with the *economic* analysis of the project, because it is the project´s *economic* profitability which is the correct criterium whether or not a project is worth while and desirable.

Economic benefits

- The total value of economic benefits has been estimated to almost 10 million RMB per year, which would give a pay-back period of the investment in economic terms of only 3,5 years. There are no data which would allow us to calculate the actual economic rate of return of the investment, but if the figures supplied by the company regarding the savings are correct, the economic profitability is very high. An inclusion of health factors as well as other beneficial effects on the environment in the economic analysis would increase economic profitability considerably. Other beneficial effects, which have not been included are reduced maintenance costs and improved pulp quality.

- Because of large coal subsidies and absence of pollution taxes, the very high economic profitability of energy conservation and pollution abatement investments is often hidden to Chinese decision makers.

Environment

The project has been highly beneficial for the environment - reducing emission levels of pollutants and toxic wastes by between 40 and 70 %. As for water pollution there will be none at all with the new washing line since it is a sealed high-heat screening system. Adding the very large savings in energy and raw materials brought about by the investment we can be certain that the environmental benefits of this project are very large in deed.

Equality/ Poverty orientation

The project can not be said to favor or be biased against any particular group in society. By raising the level of gainful employment and incomes in the region it can reasonably be assumed that it will in general, and in the long run, benefit all the inhabitants in the region.

Gender, Democracy and Independence

It does not appear possible to detect any particular effects, direct nor indirect, on *gender, democracy* or *independence* emanating form this project..

Demonstration effect
Given the impressive achievements with respect to savings in energy and raw material consumption, as well as reduction of pollution, it would seem reasonable to believe that - in spite of the long delay in implementation - there has been, or will be, a positive demonstration effect of this investment, as other paper mills realize how beneficial both to company profits and to the national economy such investments may be.

Role of donor
- The support to this energy conservation investment in China would seem to be in conflict with one of the principles of Sida´s aid in the field of energy, namely that no aid should be given to countries that increase its coal dependency. However, coal stands out as the only economic option for China energy needs in the foreseeable future, and the appropriateness of this Sida principle must therefore be questioned.

- In this, as in many projects in China, BITS has held a rather high profile when it comes to carrying out its own analysis and forming its own opinion about the project, and also to recommend or even request the loan-taker´s compliance on various points. In all important aspects it seems that the end-user actually heeded the advice forwarded by BITS

Reporting commitment
None of the parties have complied with the requirement to provide BITS with a completion report, no later than six months after commissioning, and should be criticized for that.

SCORING SYSTEM

The findings of this evaluation report can be summarized in the following scoring system, where performance with respect to each aspect evaluated is classified on a scale 0 to 5, where 0 is bad and 5 is excellent. n.a means that the aspect in question is not applicable or relevant in the project, and a dash (-) means that there is no information available.

Table 16: Swedish-financed investment in the Jiamusi Paper and Pulp Mill: *Scoring system for various aspects evaluated, score 0-5*

Aspect	*Score*
Procurement	4
Implementation	2
Results/outputs	4
Financial profitability	4
Economic profitability	5
Environment	5
Equality/ Poverty orientation	na
Gender	na
Democracy	na
Independence	na
BITS´s project preparation	3
Reporting requirement	0
Sustainability	5
Total score	32
Number of observations	9
Average score	**3,6**

V SUSTAINABILITY

Assessing the project´s *sustainability,* following guidelines published by the European Union, we can subdivide the concept into the following components: *technological, financial, economic, environmental, institutional* or *policy, and socio-cultural.*

Technologically
Even though there will likely be some problems with spare parts in the future, the Jiamusi paper mill has proven in action that it is not only able to operate and maintain the imported equipment, but even to modify it technically and build some of the spare parts in their own plant. We can therefore conclude that while technological sustainability is not guaranteed in the short or medium term, there is little reason to worry about it in the long term.

Financially
While the financial viability of future paper production in China can not be guaranteed, given the competitive pressure from imports, it seems quite clear from the above analysis that investment in energy conservation and pollution abatement in the larger Chinese paper mills are highly profitable from a financial point of view for the firms. There is no foreseeable circumstance, given the government´s proclaimed policies with respect to free prices ax well as environmental protection which would change this picture in the future. We can therefore conclude that the project evaluated here is financially sustainable.

Environmentally
It is self-evident that an investment, like the one analyzed here, in energy conservation and pollution abatement will be environmentally sustainable.

Economically
Given the large potential benefits in energy conservation and pollution abatement that follow from such investments in Chin s paper and pulp industry of today it is self evident that the investment is economically sustainable.

Policy-wise
China´s government is aware of the large benefits for the environment brought about by investments in energy conservation and pollution abatement in the paper and pulp sector. It is therefore unrealistic to imagine that something would happen on the policy level which could put in question the sustainability such projects from a policy point of view.

Socio-culturally
There is no circumstance of socio-cultural nature going on in Chinese cities which would in any way question the sustainabilty of this project.

VI LESSONS LEARNED

Fallacy of financial analysis

- In today´s China, even though important steps have been taken towards a market economy, there are enough remaining regulations and subsidies both on the cost and revenue sides, and with enough distortions, due to hidden subsidies and tax payments structure to make it difficult to understand for the foreigner. Financial analysis is therefore of limited interest. Its importance lies mainly in deciding if a project can be financed in the commercial market, or if it needs subsidies by way of e. g. domestic or foreign concessionary credits. It is the project´s *economic* profitability which should serve as the main criterium whether or not a project is worth while and desirable. Economic viability is a *necessary* condition, whereas financial viability is not, because it can be changed at will by the government.

Limited awareness of the economy of environmental effects

- In negotiating for future projects to support foreign donors must be aware that the knowledge of Chinese authorities and state firms regarding the benefits to society of environmental investments can often be limited. In the paper and pulp sector for instance because of large coal subsidies and absence of pollution taxes, the very high economic profitability of energy conservation and pollution abatement investments is often hidden to Chinese decision makers.

VII RECOMMENDATIONS

Modification of Sida´s energy policy

It was found above that Sweden´s decision to finance this energy conservation and pollution abatement project in China is incompatible with one requirement of Sida´s policy on aid in the field of energy, namely that no aid should be given to countries that increase its coal dependency.

Given the finding by this evaluation that this project is beneficial for the country, and given the fact that, for compelling economic reasons, coal will remain the only economical option for most of China´s cities, it is recommended that Sida modify the text of its energy policy so as to make it compatible with future Swedish aid to energy conservation and pollution abatement in China´s industry.

Reporting obligation

Given the fact that in none of the contracting parties have complied with their contractual obligation to provide Sida with a completion report six months after commissioning of the project, and given the fact that this seems to be the normal state of affairs in virtually every concessionary credit granted by BITS, it is recommended that Sida either abolish this rule *or* take it seriously by actually starting to implement it.

Multitude of agencies

There was a total of 13 different actors, including banks and government agencies on both sides, involved in this credit. Such a multitude of different parties, each with its own defined role and responsibility in contributing to the process of preparing a credit, is typical of all Swedish concessionary credits. It is no secret, that over the years, it has by many recipients been seen as confusing and time consuming to deal with.

The present evaluation is not the proper place to examine the usefulness of the present system. But given that it is by many donors seen as complicated and difficult to deal with, it would seem reasonable to expect Sida to review it in order to see if there are any simplifications that might be introduced without loss of desired degree of security. Such a revision is therefore recommended.

ANNEX 1

PERSONS MET AND ACKNOWLEDGMENT

Jiamusi Paper and Pulp Mill, HeilongJiang

Deng Feng You	Interpreter
Jin Yu Shu	General Engineer
Ma Ke	Senior Engineer

MOFTEC, Ministry of Foreign Trade and Economic Cooperation

Xing Xiao Ming	Foreign Financing Administration, Deputy Chief

Swedish Embassy in Beijing

Ericsson, Sofia	Programme Officer (Sida)
Anneling, Kjell	Ambassador

World Bank Beijing office

Vermilya, Dawn	Financial Analyst

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ANNEX 3

TERMS-OF-REFERENCE[7]

for the

EVALUATION OF AN ENERGY CONSERVATION INVESTMENT PROJECT IN JIAMUSI PAPER AND PULP MILL IN CHINA, PART-FINANCED BY A BITS CONCESSIONARY CREDIT

Background

In 1989 BITS decided to grant a concessionary credit in support of an energy conservation investment project in the *Jiamusi integrated paper and pulp mill*, one of the biggest paper plants in China, situated in the northern province of Heilongjiang.

The size of the credit was a 33,8 MSEK and its purpose was to finance the investment in a new *disk refiner* and a new *washer* and *screening plant*
The direct objective of the investment was to conserve energy, but important benefits to the environment were also foreseen. Among the planned effects of the investment were

- large savings in coal consumption
- large savings in electricity consumption
- decreased consumption of water
- savings in railway and other transportation costs
- less emissions of pullutants

There are in China about 4000, mainly smaller, pulp and paper mills, many of them not only inefficient producers but also very big polluters of the environment. Large expectations were raised in connection with this investment in that it would provide a show case how modern western technology could be used to enhance the efficiency and environmental friendliness of the Chinese paper industry.

[7] The terms-of-reference reproduced here does not correspond exactly to the terms-of-reference attached to the formal decision to evaluate taken by Sida. The reason is this: The Sida decision, was taken in two installments each covering parts of the total scope of work and also included projects from a different sector. Therefore, for the convenience of the reader, we have reconstructed a terms-of-reference applicable to this energy conservation project in the Jiamusi integrated Paper and Pulp Mill. In doing so, we are representing *exactly* and *fully* the contents and the purpose of the assignment as commissioned by Sida.

In the BITS decision document this investment was classified as profitable both from a financial and economic point of views, but no reference is made to a report which backs up that assumption.

According to a follow-up report dated 1991 the washing and screening plant failed to live up to contracted specifications, and a supplementary agreement was entered into by the Swedish supplier and the mill on how to solve the problem. The Sida files contain no information on if and how the question was solved.

Reasons for evaluation

Firstly, the project has been completed and, according to Sida´s evaluation policy, a final evaluation is therefore due.

Secondly, during project preparation the project was often held out as a *demonstration case* for other paper and pulp factories in China, and large expectations were therefore raised with respect to the outcome of the project.

Thirdly, Sida has today no information on the outcome of the project or the extent to which the project´s objectives have been achieved.

Type of evaluation

Following Sida´s normal level of ambition the investments financed by Sweden should be subjected to a *comprehensive* ex post evaluation, comprehensive meaning that it should cover not only all levels of the projects´s goal hierarchies - inputs, activities, outputs, effects and impacts - but also all the usual aspects and criteria which are important for Swedish aid, among them the 6 main objectives of Sweden´s development cooperation.

The objective and scope of the evaluation

The *objective* of the evaluation will be to assess the outcomes of the projects at the different relevant levels, as judged against the aid criteria of BITS and Sida, as well as against applicable development cooperation principles of Swedish aid, e.g. Sida´s *Policy for Support to Energy and Environment* established in April 1996.

The *scope* of the evaluation includes:

(1) to provide background information about:

- the development of the *pulp and paper* industry in China
- the financial status, operational results and institutional strength of the companies and institutions involved

(2) assess the *implementation* of the project, i.e the delivery of the Swedish equipment and the efficiency of use of this equipment in the project.

- identify delays in project implementation and operational areas, if any
- analyze financial, economic and operational consequences of deviations from the implementation plan (if any)

- evaluate the Swedish supplier´s training efforts with regard to transfer of know-how
- assess follow up and maintenance routines etc. of the respective projects
- assess the recipients capability to operate and maintain the systems
- evaluate the performance of the Swedish supplier in interaction with the client

(3) evaluate the *effects* that the use of the Swedish deliveries have had
- ascertain whether the project objectives have been attained
- collect operational data and quantify results wherever possible

(4) evaluate the *impact* that the project has had, or is likely to have in the future, on relevant local, regional and national goals.
- investigate and report on environmental impacts from the project
- investigate and report on gender issues related to the project

(5) The outcomes should be assessed against the stated project targets as well as the overall objectives of Swedish development cooperation, namely
- *Social and economic equality/ poverty alleviation*
- *Economic growth*
- *Independence*
- *Democratization*
- *Gender equality*
- *Environment*

ANNEX 4

Sweden's Program of Concessionary Development Credits

Karlis Goppers October 1997

Up until 1995 the Swedish concessionary credits were given by the Government´s agency BITS. In July 1995 BITS merged with four other organizations (among them "old" SIDA) to form "new" *Sida,* and from then on these credits are given under Sida´s name.

Sweden´s program of concessionary credits for development was introduced in 1980 with the following general purposes:

(1) a wish to support also other than the poorest LDCs, a support which must then be given on less than grant terms

(2) to give this group of developing countries a wider opportunity to choose Swedish suppliers

(3) to exploit the "multiplier effect" which consists in the grant element attracting additional commercial resources to be invested in the third world, and

(4) to facilitate the transition from grant aid to other (commercial) forms of financing

The main motive behind the concessionary credits was said to be developmental, and the credits would therefore be given only to countries whose development policy was in line with the overall goals of Sweden´s development aid. The Swedish exporter´s interests were obviously also an important motive, but - as emphasized in all official documents - always secondary to the developmental motive.

Even though the credits are tied to Swedish goods and services, it was assumed - given the sharp international competition between different suppliers - that the grant element would always accrue to the recipient country and not as a subsidy to the Swedish exporter.

After a revision in 1983 an even greater relative emphasis was laid on the developmental aspects, and also the initiative for applying for a concessional credit would to a higher degree be placed with the recipient country.

As the credit instrument was seen as being most suitable for productive investments yielding economic surplus, it was foreseen that the credits would be mainly used to satisfy the objectives of economic growth and economic independence, and not economic and social equality and democracy, which were then the other overall goals of Sweden´s development aid.

The rules and criteria for the Swedish concessionary credit scheme have evolved somewhat over the years. Currently they are as follows:

(1) The credits can be given only to countries that are credit-worthy, or which are judged to be able to become credit-worthy in the foreseeable future. Sida classifies countries according to whether they should be receiving only grants, only credits or if

they can receive both grants and (soft) credits. This is a question which is judged on the basis of the country's level of income, but also its macroeconomic performance. It was recently studied by a special task force at Sida.

(2) The projects must be highly prioritized by the recipient government

(3) The credits are normally directed to the economic sectors of the economy, particularly to projects run by public utilities or corporations. So far, priority has been given to infrastructure projects as energy, transport and telecommunications. These are often projects which, because of low regulated tariffs, can not attain financial viability, but which are seen as economically sound for the country.

(4) The projects must be technically and financially sound, as evidenced by a thorough feasibility study or the like.

(5) Projects must give a satisfactory economic rate of return or create conditions for other activities which would lead to such returns

(6) The projects should have a positive impact on the country´s ability to earn or save foreign exchange

(7) Projects for production for the domestic market should preferably be directed towards basic utilities which benefit a large section of the population

(8) Projects which on balance are deemed to have a negative environmental impact are *not* eligible for financing. This criteria seems to have been added sometime in the late 1980s.

(9) Due to the agreement reached in 1992 within OECD (the *Helsinki-agreement)* projects deemed to be "commercially viable" shall not be eligible for financing by concessionary credits which are tied, such as e.g. the Swedish concessionary credits. Commercial viability is tested according to two criteria. *firstly*, if the project´s net cash flow is high enough to service credits given on market terms. *Secondly*, if finance at market terms is available for the project.
The logical conclusion of the Helsinki accords is that concessionary credits can now only be given to projects which show a positive economic rate of return but which are *not* financially viable. The Helsinki agreement was signed in 1991 to take effect in 1992. However, there was a transition rule stating that old criteria could apply for another two years in those projects which had already been notified by 1992.

(10) The Sida-credit may finance only up to 85 % of the contract sum, while the rest must be covered by a cash payment. At least 70 % of the part financed by the Swedish credit must be used for products and services of Swedish origin.

(11) The credit is normally a bank-to-bank credit, i.e. from a bank in Sweden to one in Zimbabwe, but the borrower may also be ministry, a public utility or corporation or some other entity like for instance a town.

(12) The grant element of the credit is financed out of Sidas (formerly BITS´) aid budget.

(13) The grant element is at least 35 % which can be achieved by different constellations of the level of the interest rate, the length of grace period and the length of the repayment period. A standard constellation in the Swedish scheme seems to be a 10 year credit period at 0 % interest rate, with a grace period of 1 year and a repayment period of 9 years. The starting point of the credit period is normally the

time of commissioning, i.e. when the contract obligations of the Swedish supplier are officially finished.

(14) Sida does *not* avail itself of the right, given by the OECD consensus rules, to "match" higher grant elements offered by other competing countries.

(15) The concessionary credit terms may, if the government so wishes, be passed on to the end-user of the credit, *or* be retained by the government while other - often more commercial - terms are given to the user of the credit in an on-lending agreement. On this point there seems however to be an unsettled situation. While the position referred to here is stated in a memorandum from Sida of January 1996, there is another document (*Guidelines for the concessionary credit scheme* dated December 1995) which says that: "the grant element shall, where at all possible and practicable, be absorbed by a central government authority in order to avoid giving signals which distort efficiency and/or which distort competition in the local market.". We may comment here that BITS´s awareness of this aspect was not always very high, at least as evidenced from documentation in the files.

According to one interview the situation changed in the late 1980s when the question of *counter part fund payments* became important in development aid. Then also BITS started to pay attention to what conditions were passed on in the on-lending agreements, when such were at all made. When the grant element is given to an infrastructure public utility like e.g. electricity generation one may of course argue that it is the large mass of consumers who benefit, however at the exclusion of the poorest groups in the countryside who do not have electricity.
In all of the five district heating projects evaluated here the grant element is absorbed by the end-users, which are municipal public utility companies.

(16) The credits are guaranteed, for a fee, by the Swedish Export Credits Guarantee Board *(EKN)* on behalf of Sida.

(17) Procurement should normally be done through international competitive bidding. However, as no specific procedure has been laid down by BITS/Sida, it may also follow guidelines established by the recipient countries, provided that these guidelines are judged to be satisfactory BITS/Sida.

(18) The credit is to finance a *specific* contract won by a Swedish supplier in international competition.

(19) The initiative for Swedish concessionary credit financing may come from the prospective Swedish contractor or the user in the recipient country, but the formal request for credit must always be endorsed by the finance Ministry or the Ministry responsible for aid coordination. Inherent in a system where the initiative for concessionary credits comes from one of the two contracting parties - the supplier or the client - is the risk of limiting the choice to very few projects, thus risking to lose the view of other alternative uses of the funds.

(20) Regarding competition between the exporters of different countries an important element is that, according to the Helsinki accords, a soft credit - if it is offered at all - must always contain a grant element of at least 35 %. Also, the different donor countries offering concessionary credits are allowed to match each others´ offers with respect to the grant element. The purpose of this rule is that a contract should always be awarded on the merits of the technical quality and the

price offered by the exporters, and not on the grounds of a soft credit being available. As was noted above, however, Sweden´s policy has always been not to use this matching option.

(21) Sida may, according to its statutes, decide to grant a credit only *after* the Swedish contractor has already been awarded the contract, won through international competition or *after* bid closing. This is to safeguard that the knowledge of a prospective granting of a Swedish concessionary credit will not unduly influence the recipient of the credit in his choice of contractor.

If and when there is more than one country offering a subsidized credit there would not seem to be any problem to make sure that a contract is awarded purely on the basis of technical quality and on price. However, when there is only *one* offer it is hard to see how the prospect of a soft credit being available would *not* influence the decision. for obviously the Swedish contractor will have told the client that a credit is most likely forthcoming if and when a contract is awarded. So, in these cases the formality of deciding about the credit only after the contract has been awarded, would seem to be a mere formality with no practical meaning.

(22) According to BITS´s own rules it is very important to evaluate the projects which have been financed by a Swedish concessionary credit.

The current **volume of total Swedish concessionary credits** is about MSEK 1,200 to 1,500 a year, with a grant element of about SEK 400 million. Of the total x accumulated amount of credits since the start of the program in 1980, about 24 % has gone to China, making it the largest recipient of this type of aid from Sweden. On a per capita basis China has received SEK 4, which can be compared to about 50 in Zimbabwe and over 100 for small countries like Lesotho and Mauritius.

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