

Leather tanning in India: Environmental regulations and firms' compliance

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Preface

The F-I-L Working Paper Series aims at documenting the progress of the research programme *Location of pollution-intensive industry in a North/South perspective and sustainable development*. The series thus also contains articles, reports and seminar contributions made by team members but published elsewhere.

The objective of the F-I-L Research Programme is to identify and explain locational changes in pollution-intensive industries. The overall empirical question is whether the locational changes will amount to a shift in industrial pollution from North to South. The programme seeks to explain the location of pollution-intensive manufacturing through analyses of spatial differences and trends in technological, economic, social and political processes. It furthermore addresses a number of debates, for instance «the international division of labour», «pollution prevention pays» (firm level) and «the win-win view of pollution prevention and economic growth» (national level).

In this working paper Schjolden describes and analyses the leather tanning industry in India. She focuses on explanations of the lack of conformity between the relatively strict environmental regulations and the still high effluents from the tanning industry. The discussion is mainly based on the data that she collected in 42 tanneries in the state of Uttar Pradesh. She found that one of the most important reasons for lack of firms' compliance with the environmental regulations is that the enforcement of the regulations is poor and fraudulent.

Kari Bolstad Jensen

October 2000

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**Leather tanning in India: Environmental regulations and firms'
compliance**

Ane Schjolden

Introduction

Although India has had relatively stringent environmental regulations for the past 10-15 years, the country continues to encounter enormous environmental problems, many of these a result of industrial activity. This is also the case with the leather tanning industry¹. For this industry, regulations to reduce pollution have been in place since 1986, but measurements of the effluent from the industry still show that the concentrations of chemicals and organic matter are too high. What can explain this lack of conformity between regulations and reality?

To address this question, three research questions were formulated:

1. How have the environmental regulations for the tanning industry changed the environmental performance of the companies involved in such activity?
2. What can explain the variation in compliance between firms?
3. What needs to be done to improve tanners' compliance with environmental regulations?

The literature that looks at environmental regulations and consequences for firms or corporations suggests several variables to be important to explain firms' environmental performance. Among these are the existence and cost of complying with environmental regulations, the industry's scope for technological upgrading of the production process, what products the company produces, the relationship to their customers, the financial position of the company, the size of the firm, the firm's stakeholders, and the company's attitude towards the environment.

This study finds that while some of the tanneries in the Kanpur area are complying with the environmental regulations, the majority still leaves much to be desired. The most important explanations of firms' (non-)compliance with environmental regulations are that the enforcement of the regulations is poor and

¹ Leather tanning refers to the process where raw hides of animals are converted into leather, hereafter called tanning industry.

fraudulent, that many of the tanners believe their activity does no harm to the environment, that there is no customer or market demand for cleaner production, and that the opportunities for technological upgrading are few and costly, particularly for the many small tanneries in poor financial positions.

The tanning industry was selected for this case study because it is known to be a pollution intensive, technologically mature and a labor- and raw-material intensive industry that might show interesting disparities between firms in compliance with environmental regulations. The tanning industry was further chosen because it has been widely studied also in other countries (such as Italy, Germany, Portugal, Poland, the Czech Republic, Brazil, and Mexico) with focus on environmental regulations, firm's strategic adaptation to them and the effects on location, technology and international competitiveness². This study thus has a solid context of other case studies that it can be compared to, and among the other cases, the case of the Indian tanning industry was selected as a possible worst-case example from a developing country (Knutsen 1999).

Method

The data for this case study were gathered during a two-month research stay in India, mainly through semi-structured interviews with tanners. For the interviews, an interview guide with open-ended questions was used³, making it possible for the interviewees to answer in the manner they chose. In addition to interviews with firm managers and owners, interviews were carried out with people from the public administration and other relevant institutions such as the manager of the Central Effluent Treatment Plant (CETP) and the Central Leather Research Institute (CLRI). This was done to collect contextual information and to triangulate the answers given by the tanners on several descriptive questions. The interview data were combined with quantitative and qualitative information found in published literature, newspapers and political documents (laws, regulations and reports).

The empirical data collected for this study are from the area of Kanpur and Unnao in the north-central state of Uttar Pradesh. When choosing a site for the case study, three places where the tanning industry is concentrated were considered: Chennai

² For more details see Gjerdåker (1998); Gjerdåker (1999); Gjerdåker and Odegard (1999); Knutsen (1998); Knutsen and Wiik (1999); Odegard (1999).

(previously Madras) in Tamil Nadu, Calcutta in West-Bengal, and Kanpur in Uttar Pradesh (see map page 9). Kanpur was chosen because the place is known to be one of India's most polluted cities, and it is the third largest tanning center⁴ in India. Even though Kanpur is used as a case of the tanning industry in India, it must be mentioned that the variation between the different places in India is great and that the tanning industry in India is diverse. Therefore, the results from Kanpur may not be representative of all the tanneries in India.

Forty-two tanneries in Kanpur and Unnao were interviewed for this study. The tanneries were selected on the basis of location, size, what kind of hides they were processing, and what kind of leather tanning method they were using. Tanneries were selected from the two tanning areas with a CETP: Jajmau and Unnao, as well as from places outside of these areas, where the tanneries have to account for all effluent treatment themselves. Since Jajmau is the area where most of the tanneries are located, the majority of the firms were selected from this area. When it comes to size of firm, variation was sought by selecting both small, medium and large-scale units. Only tanneries that processed bovine hides (of cattle and buffalo) and not sheep and goat skins were selected so that the data could be comparable to the other case studies carried out among bovine tanners in the other countries, mentioned on page 3. Furthermore, tanneries using different tanning methods were selected to see whether there was a difference between traditional vegetable tanners and more "modern" chrome tanners in the way they were adapting to environmental regulations.

Of the 42 tanneries interviewed, 34 were located in Jajmau, 5 in the industrial area of Unnao, 2 on the road between Jajmau and Unnao and 1 in Kanpur City Center (see map page 23). In Jajmau, the total number of operational tanneries is estimated to be 305 and all are connected to the CETP. Fifty-five percent of the tanneries in Jajmau are chrome tanning units, 11% vegetable tanning units, 18% mixed chrome and vegetable

³ The interview guide was almost the same as the guide used in the other studies of the tanning industry, only with adaptations to the Indian context.

⁴ Even though Chennai and Calcutta have more tanneries than Kanpur, they were not prioritized because; 1) Chennai has been selected for many other studies of tanning activities in India, (see Kjellberg and Banik (2000) and Kennedy (1999)), and 2) in Calcutta, the industry is currently experiencing uncertainties because of plans for shifting the tanneries out of the city center to a separate leather complex or industrial area 14 km east of central Calcutta.

and 16% are engaged only in ‘leather splitting jobs’⁵ (CPCB 1999). This study’s sample represents in total 14% of the Jajmau tanneries and includes tanneries from all these categories, except those who are only engaged in leather splitting jobs. In the Unnao industrial area, there are 20-25 tanneries. The CETP in Unnao is at the moment fully occupied with its 22 members, even though only 18 of these were operating at the time the fieldwork was carried out. All the five tanneries interviewed were members of the CETP. Of the five, one was engaged merely in vegetable tanning while the rest were doing chrome tanning. There are only a few tanneries that are located outside of Jajmau and the Unnao industrial area, maybe only 10. Of the three interviewed for this study, all do chrome tanning and all have their own individual effluent treatment plant (IETP), doing both primary and secondary treatment of the effluent. One of these tanneries was located in the city center and does only finishing⁶ of leather, because in this central location, it is not allowed to do the tanning itself, the part of the tanning process that produces most effluent and water pollution.

As for the data analysis, qualitative techniques, such as content analysis of documents and reports and categorization of interview data were used. Coherent themes and patterns in documents and reports were identified and compared with the content of evidence gathered from firm interviews and firm reports. The interview data were compiled in a spreadsheet and analyzed by grouping and comparing the data obtained from different firms. The data from the interviews were grouped by different variables, such as size, what parts of the production process that were carried out, which products the tannery made, which markets they sold to, as well as different measures indicating environmental performance. By doing this it was possible to see trends in the difference between firms’ environmental performance and arrive at explanations for the firms reaction to environmental regulations. The analysis also depends heavily upon the tanners’ own expressions and citations.

This paper is divided in 4 sections followed by concluding remarks. First, some empirical background information on the tanning industry in general, and in India and

⁵ In the source it is not defined what this category includes. It could either be counting the number of units only having the splitting machine and splitting the leather for other tanners (this kind of specialization is seen in Italy), or it could be counting all the tanneries processing the splits for the production of cheap and very poor quality leather. The latter is a normal undertaking for the smallest and least well off among the tanneries.

Kanpur more specifically, is given. Next, there is a brief discussion of literature that suggests various explanations to firms' (non-)compliance with environmental regulations. Then follows the discussion of Kanpur tanneries' environmental performance and the reasons for their behavior. Finally, the last section discusses some measures that can be taken to improve the tanners' compliance with environmental regulations.

⁶ Finishing includes the mechanical treatment of grain and flesh, followed by application of surface finish, such as dyes or pigments (UNEP 1991).

The tanning industry in India and Kanpur

It has already been mentioned that the tanning industry is a polluting industry, but a further description of the characteristics of the industry is necessary in order to understand how and why that is. This section will first describe the tanning industry and its potential impact on the environment, and second discuss the specificities of the tanning industry in India and Kanpur.

Tanning and the environment

Tanning is the process by which raw animal hides are converted into leather. During this process, the leather is made resistant to biological decay by stabilizing the collagen structure of the hide, using natural or synthetic chemicals (UNEP 1991). The tanning process is constituted by several stages. The hides that arrive at the tannery are often salted (to preserve the hides during the transportation and storage) and they need to be washed to remove the salt, and dirt, as well as residue and blood from the slaughtering. Next, the hides are put in large baths with lime and sodium sulfide in order to remove the hair from the hide and open the fiber structure or pores of the hide. After liming, the hides are taken through a fleshing machine that removes the flesh from the flesh side of the leather. Then, they are washed, and before they are ready for the tanning process itself, the hides are treated with enzymes and the pH is adjusted. The tanning can be done either with vegetable tanning agents such as bark from the quebracho (Argentina) or babul (Indian) trees or wattle extract, or chemically with chrome. After tanning, the hides are split horizontally into an upper layer called the grain, and a layer from the flesh side called the split⁷. These layers are separately processed further, sometimes retanned and then pressed for water, stretched and dried. During the finishing part of the tanning process, the leather is dyed and treated with fats, cut and given surface treatment to give texture, look and shape to the finished leather (for more details on the tanning process, see figure 7 in Appendix A).

The pollution load from the tanning activity has been estimated to be 50% more in weight than the weight of the hides processed (Gjerdåker 1998). Pollution comes from several of the sub-processes, and is both organic and chemical. The *water pollution* generated by the wet-processes of soaking, liming and tanning has been

⁷ The grain has a smooth surface and is the most valuable, while the split with its rough surface is used for suede leather.

subject to most attention. Since hides are organic material, large amounts of organic compounds are released when hides are processed. In addition, around 175 different chemicals⁸ are in use for the tanning process in total. From the soak water, large quantities of salt are released. From the liming process, lime and sodium sulfate are the primary by-products. Then from tanning there is either chrome in the effluent or solid waste from the vegetable tanning material. One problem with chrome tanning is that all the chemicals are dissolved in the water, but not all are absorbed by the hide. This means that the effluent from the tanning process itself contains a lot of chrome and other fixing chemicals. A technology to recapture chrome from the tanning water is available, a so-called chrome recovery plant, but not all tanneries have this equipment. Another problem with the chrome tanning is that the hexavalent form of the chemical, Chrome VI, is known to be carcinogenic. Even though most tanneries use Chrome III, this can transform into Chrome VI when reacting with oxygen under higher temperatures (UNEP 1991).

In addition to the water pollution, there is also *air pollution* from the release of dust from the buffing of the leather, and from the finishing, solvents from dyes that can be toxic are released. To an increasing extent, *solid waste* is also a problem, because it requires special storage and a lot of space. There are raw hide cuttings, flesh, chrome-containing cuttings and shavings, and also sludge that has settled from the effluent. To some extent these are by-products that can be used, for example, to make glue or dog-bones. In India, they have also tried to make chicken feed of the fleshings, (protein-rich) or fertilizer of some of the organic material. Shavings, dust and smaller cuttings have been used for the production of leather board, a stiff board used for heel-caps in shoes. Larger cuttings are used by street-cobblers and people use the shavings for to stuff toys, softballs and pillows. The problem, however, is that supply far outreaches demand for these by-products. Also, for the sludge, there are yet no uses that are economically viable, and the sludge thus needs to be dumped on special grounds to prevent the leaking of chemicals into the groundwater.

⁸ This estimate is based on interview with Mr. Awasthi, environmental engineer and project manager of the central effluent treatment plant in Unnao.

The tanning industry in India and Kanpur

Tanning in India has a long history and has been a traditional occupation for subdued groups of people. According to Dixit (1995), the Indian tanning industry currently employs 80,200 people. Estimates of total production in a year ranges between 600 and 1500 million square feet⁹ of leather (Varadarajan and Krishnamoorthy 1993 and Thyagarajan et al. 1994¹⁰, respectively). Geographically, the industry is concentrated in three regions, namely the states of Tamil Nadu, West Bengal (mainly Calcutta) and Uttar Pradesh (mainly Kanpur), see map below. In Kanpur, leather tanning particularly blossomed during British colonial rule, when many cantonments were located in this area, and the need for boots, saddlery and harness equipment was high (Dixit 1995).



Figure 1: Map of India showing where the tanning industry is concentrated (Δ)

Source: CPCB 1991

⁹ Measured in number of hides, estimates from CLRI in 1988 range from 62 to 161 million (Dixit 1995).

¹⁰ Thyagarajan et al. (1994) point out that the potential production capacity is higher: 2250 million square feet per year.

Counting tanneries in India is problematic because there are so many small-scale units that are widely dispersed in villages and remote areas, and many that might not be constantly operational, only processing hides when they have access to hides, or when income from this source is needed. One can thus expect that all numbers underestimate the reality. According to the CLRI, there are close to 1600 tanneries in India (Chandramouli 1998). In this study the CLRI counts around 170 tanneries in the Kanpur area. For this study, more than twice this number was found only in one of the tanning clusters in Kanpur. Thus, one can expect that the number of 1600 might represent only half of the total number of tanneries in India, so 3000 tanneries are probably closer to the true figure. The vast majority of the Indian tanneries (80%) are small-scale, only 20% are medium or large scale (Thyagarajan et al. 1994, Varadarajan and Krishnamoorthy 1993). In the 1990s, Uttar Pradesh (UP) accounted for around 15% of the gross output of the production of Indian leather and leather products (CSO 1990/91-1997/98).

The Indian tanning industry has a solid basis in the country's large livestock population. As can be seen in the table below, India has around 16% of the cattle and 59% of the buffalo in the world. Of the Indian stock, UP has 22% of the buffalo and 12% of the cattle.

Table 1: India and UP's livestock

Species	India (million)	India (global share %)	UP (million)	UP (national share %)
Cattle	207	16	25	12
Buffalo	90	59	20	22
Goat	130	19	13	11
Sheep	52	5	2	5

Source: Data from CLRI, economic research division and (CLRI 1996). Data for India from 1996, data for UP from 1993.

India produces annually about 21 million cattle hides and 15 million buffalo hides that can be processed to leather and leather products. For UP there are 2,3 million cattle hides and 4,4 million buffalo hides. About 50% of the cattle hides come from fallen (naturally dead) animals rather than slaughter because the cow is considered sacred in many parts of India. Cow slaughter is banned in UP and some other states. For the buffalo, around 60% come from slaughter, but still many of the hides come from fallen

animals due to lack of slaughtering facilities in the remote areas where much of cattle raising takes place (CLRI 1996, data from 1987). The distinction between fallen and slaughtered animals is significant because it has substantial implications for the quality, and therefore also the price of the rawhides. Among the tanneries in Kanpur, the processing of buffalo hides is most common and many tanners report using hides from both fallen and slaughtered animals. Normally they prefer the hides from slaughtered animals because of the better quality, but sometimes there is a lack of this kind of hide, or the price is too high, so they have to resort to hides from fallen animals. After having made the distinction between hides from fallen animals and slaughter, it must be said that compared to hides from the US, Australia and many European countries, the quality of all hides from Indian animals is very low. Hence, Indian leather is associated with poor quality in the international market.

The tanning industry in India has experienced a growth in production during the past ten years. Data from the Annual Survey of Industries show that the number of production units in the tanning sector¹¹ has grown with 17% and the net value added with 84% in the period 1990/91 to 1997/98 (CSO 1990/91-1997/98). In Kanpur, the tanners reported that the number of tanneries had doubled over the past 15 years. Of the tanneries in this study's sample, 71% started their business after 1984, and 45% during the 1990s. In addition, as stated by one of the tanners: "Everybody (i.e. all the tanners) here in Jajmau has expanded their production capacity. Allah Dad, for example, has increased its capacity ten times over the past five years."

In addition to increasing the production of leather, more tanneries are now also making leather components and products, for example, shoe uppers or shoes, bags, saddlery and harness goods. Of those tanneries in the sample that started only with leather tanning, almost 50% have expanded to produce some type of leather goods. This forward integration is a recent phenomenon as all, except one (the largest shoe producer), have gone through this change only in the past decade. The diversification of production is also more common amongst the medium and large firms. Here, 100% have engaged in the production of leather products of some kind, either directly in the same company as the tannery, or as a separate unit owned by the same family or group.

¹¹ Refers to industry code 29 and division group 290 in the Annual Survey of Industries and includes "tanning, curing, finishing, embossing and japanning of leather" (CSO 1997/98, p. 83).

Among the small tanneries, only 25% are producing leather products in addition to finished leather.

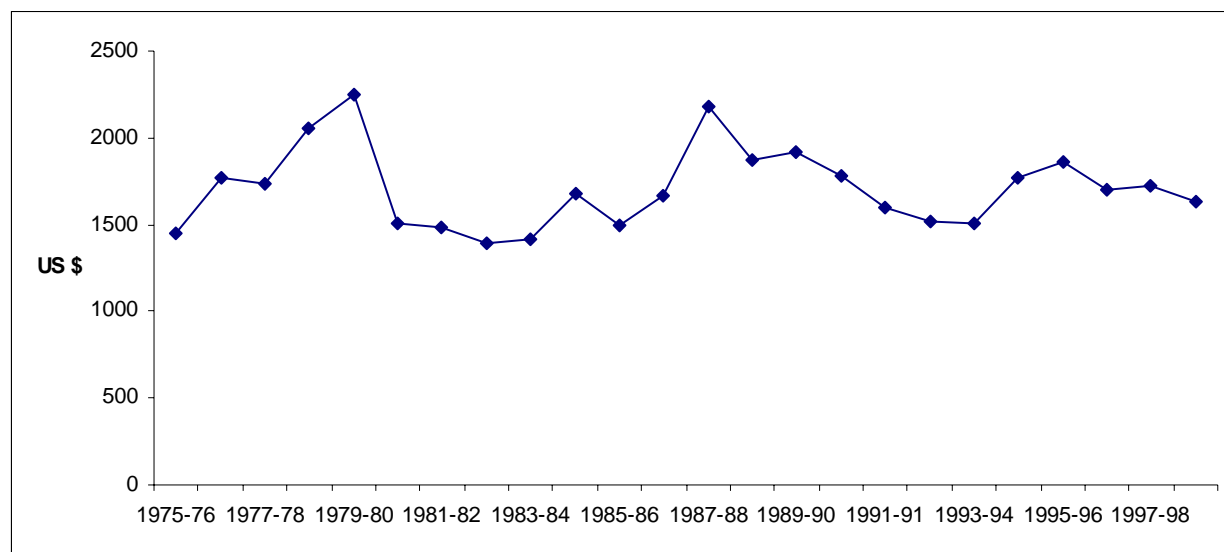


Figure 2: India's export of leather and leather products, 1975/76 to 1998/99, in US \$, constant 1999 prices¹²

Source: data from CLRI, 2000.

While it is sometimes hard to find data about production in India, the collection of export data is extensive. The Indian leather sector is considered the fourth largest foreign exchange earner (Thyagarajan et al. 1994). The data on exports found in Indian sources, shows that there has been an incredible growth in the value of leather export for the past three decades. However, one must be cautious to adjust the data of value of exports for inflation. When that is done, (see figure 2 above), one can see that the export of leather and leather products have been fairly stable for the past 25 years, with a couple of short peaks in 1979/80 and 1987/88.

Of this total export, it is interesting to see how much of this is leather, either semi-finished or finished, and how much is leather products. As can be seen in figure 3 below, the export has gradually shifted from semi-finished leather to finished leather and later to leather products.

¹² The data were calculated from numbers in Indian Rupees with the exchange rate from #139] and adjusted for inflation using the wholesale price index (WPI) for leather and leather products from RBI (1990). Half of the indexes used 1970-71=100 and the other half 1980-81=100. The two series were made comparable by multiplying the values of the second series with the relative number of the index for 1980-81 divided by 100 (its value in the second series).

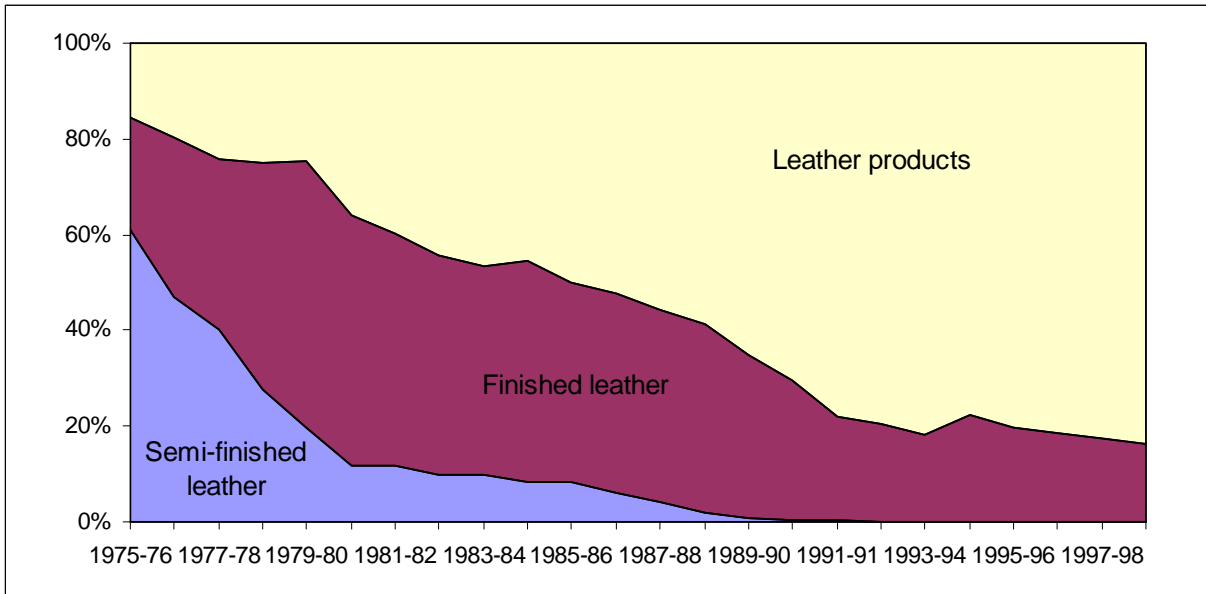


Figure 3: Changing shares of export of leather vs. leather products

Source: data from CLRI, 2000.

The Indian government banned the export of semi-finished leather in 1991 in order to stimulate further industrial processing of leather products in India (Gopalakrishnan 1999). Finished leather continued to be the most important export item until the late 1980s, but gradually lost importance to leather products. Figure 4 below shows the different categories of leather products and their relative shares of exports from 1975/76 to 1998/99.

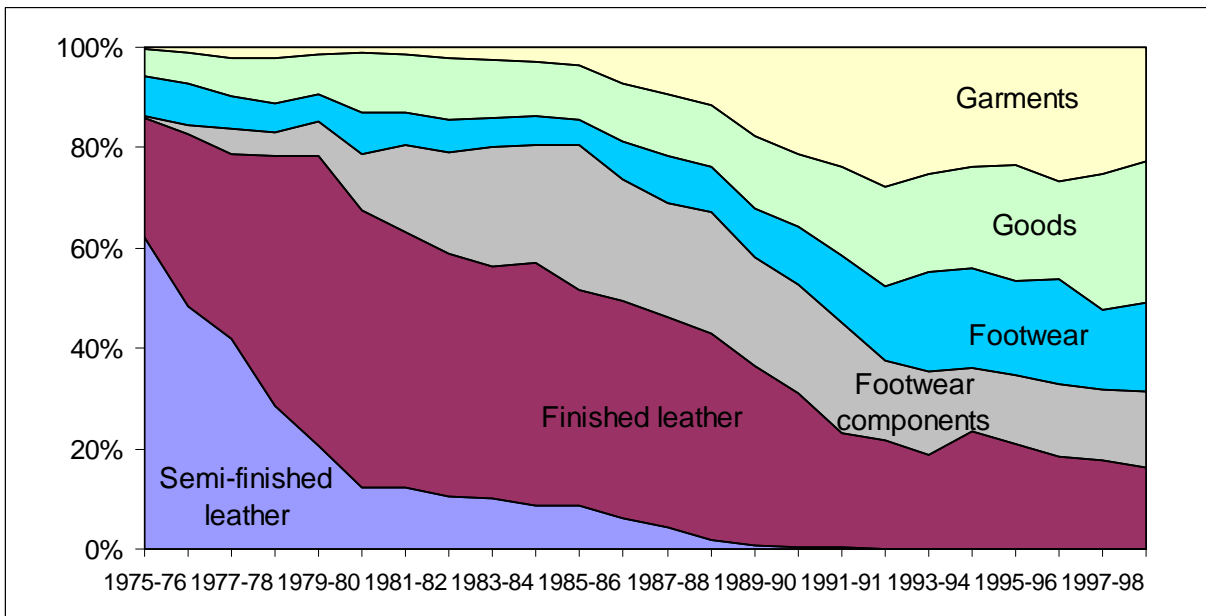


Figure 4: Percentage share of export of different product segments

Source: data from CLRI, 2000.

Today, footwear and footwear components together account for the largest share of the exports from the leather sector, followed by leather goods and garments. It is important to note this diversification in exports because it reflects a change towards the production of higher value-added in India, as well as increased sophistication of the Indian leather industry.

However, this growth in value of export is not reflected in international statistics measuring production and trade in quantity (square feet). When looking at the FAO's statistical yearbooks for leather and leather products, the data show that India's share of the world trade has stayed relatively the same for the past ten years. In 1998, India had approximately 5% of the world's *production* of light leather and 10% of the production of heavy leather¹³. In the production of light leather, India's share of the world's production has remained stable between 5% and 6% since the beginning of the 1980s. In the production of heavy leather, India's share of the global production increased from 10% to 12% in the 1990s, but is now back towards 10%. Looking at the data for global leather *exports*, India's share is negligible, and has been reduced to less than 1% for heavy leather and around 2% for light leather. This indicates that the domestic market is still the major market for Indian leather producers (FAO 1998).

When it comes to the *production of shoes* for the same period, India's share of the world's production has been stable at around 7-8%. However, India's share of the world's *shoe exports* has doubled from 0.8% to 1.6%, and the growth rate of India's shoe export for the period 1980-1996 has been higher than for the world in total over the same period (FAO 1998). These data are confirmed in (Gopalakrishnan 1999). Still, India is not a very large player in the global export market for neither leather, nor shoes, with shares of only 0-2%.

¹³ Light leather refers to split leather (the 'grain', or upper side of the leather) and heavy leather to unsplit leather, for example sole leather and industrial leather. These numbers are supported by Varadarjan and Krishnamoorthy (1993) who estimate that India's production equals about 8 % of the world's output.

What can explain firms' reaction to environmental regulations?

Scholars from several different disciplines and backgrounds have looked into the issues of environmental regulations and how firms react to these. Several explanatory variables have been presented, and those believed to have the most relevance for this case study of India are discussed below. When trying to explain the varying degree of compliance with environmental regulations it is important to look at the existence and the enforcement of regulations, the cost of complying with these, the technological opportunities to change the production process and the products, the markets or customers for the product, and the size, attitude and financial position of the company. General literature on these issues will be discussed together with more specific literature from other studies of the tanning industry.

Environmental regulations and enforcement

Since pollution is considered an externality, i.e. a cost of production that is not included in a product's market price, it is also considered a market inefficiency that the government could (or should) regulate to correct. According to empirical studies undertaken by Henriques and Sadorsky (1996) and Hutchinson (1996), environmental regulation is the single most important factor to influence firms to consider environmental issues. But do regulations automatically result in implementation? Or what needs to be in place for the firms to take the regulations into action? Henriques and Sadorsky (1996) indicate that a firm's decision to comply with regulation is connected to the cost of non-compliance, meaning that the regulations need to be enforced by some controlling authority capable of presenting real negative threats (such as a fine or a penalty) for the industry in question. This issue is also addressed by Rugman and Verbeke (1998b), pointing out that for firms, the decision of how to respond to environmental regulations is based on a consideration of the potential economic benefits or disadvantages of complying and not complying. For the firms to choose to comply, the economic sanctions associated with non-compliance must be more expensive than the cost of compliance. In addition, the regulators must have the administrative capacity to enforce the regulations. Heyes (1998) supports both these arguments and says that the cost of non-compliance must be larger than the cost of compliance before the firms will choose to comply. Included in the measurement of the

cost of not complying is a consideration of the *risk* of being caught in non-compliance. Hence, the enforcement capacity of the regulators is an important element.

Studies of the tanning industry show that environmental regulations vary across countries and that Germany was the country to first introduce regulations. Italy and Spain today have nearly as stringent regulations as in Germany, but in Portugal, regulations introduced in the 1990s are not so stringent. According to Knutsen (1999), regulations have led to only smaller adjustments to the tanners' environmental practice. In Europe, the tanners have responded by outsourcing the more polluting parts of the production process to countries in Eastern Europe, Latin America or Asia, rather than by making the production cleaner to meet the regulations. Evidence from Brazil and Mexico show that regulation is in place, but that enforcement is very poor, with some few exceptions (Knutsen 1999, Odegard 1999). A study of the tanning industry in South India also documents the failing enforcement of environmental regulations (Kjellberg and Banik 2000).

Cost of cleaning

If the firms' cost of complying with the regulations is high, this might be another reason why firms try to avoid implementing these. Rugman and Verbeke (1998a) have looked at how low cost of regulation leads to a much more immediate compliance. They state that most firms today spend between 1% and 2% of their revenue as a response to environmental concerns. In addition to solely considering the cost of compliance, Henriques and Sadorsky (1996) and Reinhardt (1998) argue that we must look at the financial position of the firms, as well as the nature of competition in the industry in question. Firms that are more restricted financially (often smaller firms) are less likely to formulate an environmental plan than firms that are better off. This corresponds with Hesselberg (1998) when he says that firms see environmental problems as something they can deal with only when business is going well. Hence, less profitable firms are more likely to have a lower environmental performance. Also Rugman and Verbeke (1998a) make the point that firms' existing resources and capabilities will create a 'path-dependency' that conditions their response to environmental regulations. The nature of competition will be discussed in the next

section, together with Porter and Van der Linde's ideas on the relationship between environmental regulations and competitiveness.

In the tanning industry, the cost of complying with environmental regulations has been estimated to be approximately 5% of the production cost or 2-4% of the turnover (Knutsen 1999). Even though this may not be a very large cost, evidence from the studies of the tanning industry shows that many tanners feel they cannot afford to implement the regulations. This may be because, in several countries, the introduction of environmental regulations has happened at the same time as economic liberalization and restructuring, bringing the firms under considerable economic pressure (Gjerdåker and Odegard 1999, Odegard 1999).

Cleaner technology, products, markets and customers

Traditionally, environmental regulation has been seen as something that would have negative effects on firms' competitiveness. For firms, taking environmental issues into consideration was a mere cost. Then, Porter and Van der Linde (1995) argued the opposite, that stringent domestic environmental regulations can be positive for the domestic industry's competitiveness in the world market because it stimulates firms to *develop new technology to ensure a more environmentally sound production*. This change in technology may give firms a better use of resources in the production or a better quality of the product and thus give the company a competitive advantage over other firms. To be able to obtain a competitive advantage from achieving a higher quality of their products, firms must be in industrial segments where the main competitive element is not price, but quality or product sophistication. Porter (1990) makes this distinction by calling price competition 'lower order' competition and the other 'higher order' competition. The idea of environmental regulations being positive for competition is particularly valid if the company is selling in international markets and competing with firms from countries with more lenient environmental regulations. Firms from countries with stricter environmental regulations will enjoy a "first-mover" advantage in the international market, already having done what the other companies need to do to become just as competitive (Porter and Van der Linde 1995). From the tanning industry there are examples that show how tanneries in Northern Europe have

switched to produce high-quality leather to avoid price competition, and thus afford or even regain the cost of more environmentally benign production (Gjerdåker 1999).

It is important to make another distinction here, between ‘cleaning’ and ‘cleaner’ technology, where the first means end-of-pipe solutions and the latter changes in the production process. Only the latter has the potential of functioning the way Porter and Van der Linde (1995) describe. Only technological changes in the production process can reduce the amount of resources used or waste generated. In the tanning industry the opportunities for technological change in the production process are restricted due to characteristics of the raw material being a living and non-standardized material (Gjerdåker 1998, Knutsen 1999). Although there have been few substantial changes to the tanning process after chrome tanning was implemented, there have been some changes in chemicals and machinery.

“Green” products and demanding customers

Also what *kind of products* firms make can influence how firms act according to existing environmental regulations. Firms can create new products, so-called “green products” that impose smaller costs to the environment. The development and marketing of green products can be used as part of a company’s competitive strategy to increase their market share. For example has Body Shop invested and specialized in the development of environmentally safe products and enjoys increased market share as the demand for the competitors’ goods fall (Polonsky 1995). Changes in product and production process will most times increase the cost, and the success of this strategy is based on customers’ willingness to pay for less damage to the environment. Lately, there has been much focus on the “demanding customer” as a trigger to develop new and more environmentally benign products. But, as Henriques and Sadorsky (1996) point out, this is limited to firms that are susceptible to *direct* consumer pressure. Reinhardt (1998) also moderates the power of consumers by saying that only in cases where the consumer is directly affected by the close proximity of the negative environmental effects, will the consumer be willing to pay more for a more expensive but less damaging product. In addition, there is often also incomplete information about the consequences to the environment of every single product, thus weakening the power of the demanding consumer. Along with this incomplete information, it is also

difficult to ‘mark’ a green product, or show in the product that it is different from similar products that are not so benign to the environment. Products can look the same and be produced differently. Also, the look or design of “green products” can easily be copied by other firms, although they do not qualify for a “green” mark. Finally, Reinhardt (1998) makes a distinction between industrial and consumer markets and finds that the original thesis of demanding customers is more likely for consumer markets only. In industrial markets, the willingness to pay is in place only if the product is changed so that the customer experiences lower costs. This is because image is less important here than in consumer markets.

Several of the case studies of the tanning industry report that there are no market demands for “cleaner” leather, neither in domestic, nor in international markets (Knutsen and Wiik 1999, Odegard 1999). Only in the higher market segments, such as up-holstry leather, there was some willingness to pay for “cleaner” leather.

“Green strategy”; stakeholders, size and visibility

When looking at the relationship between environmental regulations and firms’ behavior on environmental issues, many scholars have explored firms’ development of an environmental marketing strategy, or “green strategy”, and focused on environmental firm policies as a competitive advantage. Hesselberg (1998) points out that the nature of the competition of industrial segments will determine whether firms are likely to develop green strategies or not as part of gaining competitive advantage. This is more likely to happen in industries where competition is based on other factors than price. McGee et al. (1998) review what other scholars have written on green strategies as competitive advantage and they find that the development of such strategies needs to be a long-term project, not an isolated big decision. The latter does not lead to competitive advantage because duplication and imitation is too easy. Rather, to gain competitive advantage, firms need to let many small decisions cumulate over time. Their strategy may then be difficult to copy.

When firms choose to develop an environmental marketing strategy, they often do so because of pressure from firms’ *stakeholders* such as customers, employees, shareholders, and the general public. Firms might choose to give in to the demands of the public, or any pressure group, if they are afraid of creating a negative image of the company and its activities, that can cause economic losses later, for example by

reduced customer preference and thereby a reduced market share. However, there are always many stakeholders wanting to influence a company's strategy, and their views are often conflicting, both with the company's interest and with other stakeholders' interest. Thus, the company is forced to choose, after identifying the different stakeholders involved, whose interests they are going to prioritize. In making this decision they will consider which group is more important, so the stakeholders need to have power to get their concerns addressed (Polonsky 1995).

In addition to time perspective and stakeholders' power to influence the company, the size of the company is also important to explain why some firms take up an environmental strategy and others do not. Henriques and Sadosky (1996) point out that larger firms are more visible and more susceptible to public scrutiny, and hence more likely to improve their environmental performance.

None of the studies of the tanning industry has really focused on firms' environmental marketing strategies, nor stakeholders or the visibility of larger tanneries.

Attitude to the environment

As the last potential explanation to be discussed here of why firms act differently in response to environmental regulations, the attitude of the firms to environmental issues is an important element. Henriques and Sadosky (1996) found that firms that consider environmental issues to be important, are more likely to implement actions that will reduce the environmental impact of their activities.

When it comes to the tanning industry, this view has been supported by Odegard (1999) in his study of Brazil. He states that: "The extent to which the tanners comply with the environmental regulations depends heavily on the attitudes of the company directors." These variations in attitude are related to the economic situation of the tanneries, their size, their markets and the environmental practice of the region where they are located.

How do Kanpur tanneries react to environmental regulations?

Before entering the discussion of what the tanneries in Kanpur do to meet the environmental regulations and the reasons for their actions or non-action, a short description of the tanning industry in the area follows.

The context of the tanning industry in Kanpur

The tanning industry of UP has since the beginning of this century been concentrating in the Kanpur area, with a sharp growth in the number of tanneries especially since 1985. Most of the tanners in Kanpur are Muslim, and the tanneries are family owned and family run. Sons take over after their father, and the tanning industry is thus a traditional occupation in the area. After the massive closing down of textile mills in the area during the 1980s and 1990s, people that were not traditionally in tanning have changed to this activity, as it represented the primary source of livelihood in Kanpur.

Most of the tanneries are located in Jajmau, an area south-east of the city, close to the military cantonment area, and on the southern bank of the river Ganges. This location was optimal in the early days, because the tanning activity was kept outside of the city area (so that stench and waste would not be a problem for the city dwellers). Also, to have access to water was important because the tanning industry has a high consumption of water.

Today, the area of Jajmau is crowded, not only with tanneries, but also with the houses of the people living there. Jajmau is no longer separate from the city, and most of the people living there are workers in the tanneries. Many of the tannery owners also live there, even though Jajmau is considered a very poor area. The area has narrow dirt roads with no drainage and no light, and litter and waste from the tanneries are everywhere. Several tanners pointed out that it was hard to make connections with foreign buyers because they felt they could not bring them to their tannery as “the infrastructure of Jajmau was so bad.” (interview with a medium-sized tannery in Jajmau). Since 1994, Jajmau has had a CETP taking the effluents from 354 tanneries in the area. Jajmau is now considered “full” by the government who decides where new tanneries are allowed to locate, and no more tanneries are being put up there. In one year, Jajmau tanneries process close to 100.000 tons of buffalo and cattle hides, and 1500 tons of chromium sulfate is discharged as waste (CPCB 1999 and CLRI 1996).

According to a study from 1998, Jajmau tanneries generate about 400 tons of solid waste per day, including hair, trimmings and fleshings, sludge, salts, shavings, and vegetable tannins like bark and nuts (Yadav 1998).

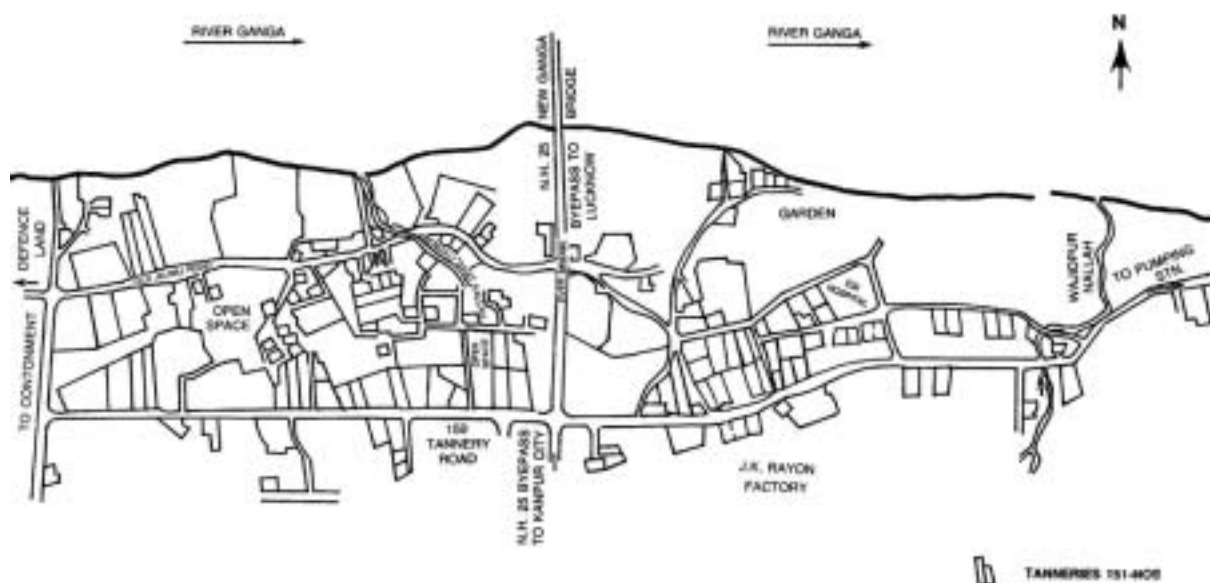


Figure 5: Map of Jajmau

The other concentration of tanning industries is in Unnao industrial area, approximately 20 km east of Kanpur, towards Lucknow. This is a much smaller area than Jajmau, and there are only around 20 tanneries, in addition to some other industries. The industrial area was established during the 1980s, and it is still an area with only industries, no residential areas.

Unnao has since 1995 had its own CETP. Earlier the tanneries located here were responsible for their own effluent. Since the CETP does not have the capacity for processing more effluent than from today's number of tanneries, the government is planning a new site for the tanning and leather sector. This will be a so-called 'leather complex', on the road between Jajmau and Unnao, 8 km from the bridge crossing Ganges from Jajmau. Here there will be room for 22 tanneries, a CETP and some additional leather product industries, such as shoe factories. Some of the land has already been purchased by the government, and the plan was that the area would be ready for the tanneries to start building in June 2000 (UPSIDC 1999).

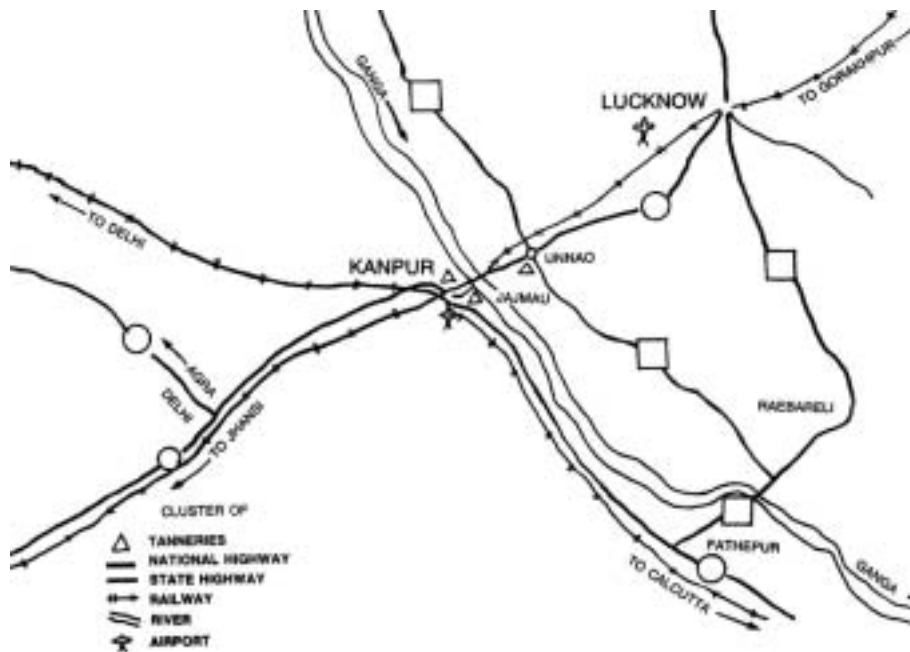


Figure 6: Map showing the concentration of tanneries in the Kanpur area (Δ)

Environmental regulations, enforcement and practice

What do the tanners in Kanpur do to meet the environmental regulations for the tanning industry, and what can explain the firms' different actions? These are the questions to be discussed on the sections to follow. First of all, since other empirical studies also have shown that environmental regulations are very important to force firms to deal with pollution matters, it is important to look at the regulations relevant for the tanning industry in India. It is also necessary to discuss how these regulations are being enforced.

For the tanning industry, there are no international regulations, only domestic. However, the want to increase exports may induce governments and firms to let regulation other than the domestic influence production activities. For the tanning industry in India, the main focus of the regulations has been on water pollution rather than problems related to air pollution and solid waste. In Kanpur, water pollution issues came into focus with the Ganga Action Plan (GAP), established by the Central and the UP governments in 1985. The GAP required that the water quality should be monitored and primary treatment of effluents should be undertaken. Under the GAP, another project, aided by the Dutch development agency, operated from 1987 to 1994 with the mission to prevent pollution of the river Ganges and improve living conditions for

people in Jajmau (Yadav 1998). Among other things, this project included the construction of the CETP to treat tannery effluent.

The regulations that the tanneries have to meet today are all related to water pollution, and the regulations have remained unchanged during the 1990s. There are certain standards for pH, total suspended solids, sulfides and chrome that the tannery effluent shall not exceed. Hence, all tanneries are required to treat their effluent before letting it out either to the sewer system or to a river. Different standards apply according to whether the tanneries are connected to a CETP or not. For tanneries that are connected to a conveyance system that goes to the CETP, either in Jajmau or in Unnao, it suffices to have a primary treatment plant (PTP) where sludge in the effluent can settle and where the pH is adjusted¹⁴. This means that the water they let out of their plant should contain no more than 600 mg per liter of suspended solids, 45 mg per liter of chrome and the pH should be in the range of 6,5 to 9,0. The purpose of this cleaning is mostly to avoid clogging of the conveyance system before the effluent reaches the CETP where most of the treatment is supposed to take place. The tanneries that are not connected to a CETP, have to meet the more stringent standards equal to those that apply to the CETPs. These are the standards that are listed in table 2. To achieve this, they need to have their own individual effluent treatment plants (IETP) that takes care of both primary and secondary treatment, it is not enough to only have a primary treatment plant to settle and take out the sludge.

Table 2: International standards for discharge of tannery effluent to the surface

Country	pH	COD mg/l	Suspended solids mg/l	Sulfide, (S ₂ -) mg/l	Chromium, total mg/l
Argentina	5.5-10	250	na	1	0.5
Brazil	5.0-9.0	na	na	0.2	2.5
China	6.0-9.0	300	200	1	1.5
Denmark	6.5-8.5	na	30	2	0.2
Germany	6.5-10	250	na	1-2	0.5-1
India	6.5-9.0	250	100	2	2
Italy	5.5-9.5	160	40-80	1	2
Poland	5.5-9.0	150	35	0.2	Na

na: not available, mg/l: milligram per liter

Source: UNIDO 1999

¹⁴ Normally, the PTP consists of coarse screens, equalization/settling tanks and sludge drying beds.

Compared to other countries' environmental regulations of the tanning industry, India's regulations are almost at par, even though they are slightly less strict than Germany's for the amount of total chrome, and Italy's for the amount of sulfide.

Enforcement of regulations

To enforce these regulations, the state pollution control board (SPCB, in this case the UPPCB) is the authority. They have the right to go for inspections in all tanneries, at any time and without warning, to check that they have a PTP and that it is being run properly. They may also take water samples from the water that is let out from the PTP. If the values of the test results exceed the standards, the tannery is given a warning, but no fine, and if they do not comply properly with the regulations, the SPCB can shut the tannery down. The regulations are backed by the Supreme Court (SC), and if closed down, the tannery will have to wait for a long time before their case can be processed by the court. The SPCB is also supposed to monitor the operation of the CETP, but since the SPCB is the government, and the CETP is run by the government, the control function is less than towards the tanneries which are private sector.

To see how successful the enforcement of the regulations is, both towards the tanners and the CETP, one can look at a test of the water coming out after treatment in the CETP in Jajmau¹⁵. As is shown in the table below, the water that was sampled has a COD concentration more than 3 times higher than allowed, and a concentration of total chromium more than 5 times higher than allowed. In addition, the concentration of sulfur is also alarmingly high, even though the numbers for sulfide (S₂⁻) and total sulfur (total S) cannot be compared directly.

Table 3: Contents of water sample collected from canal south of the Jajmau CETP

	pH	COD mg/l	Suspended solids mg/l	Sulfide/Sulfur mg/l	Chromium total mg/l
Standard	6.5- 9.0	250	100	2 (S ₂ ⁻)	2
Actual	8.0	800	na	620 (total S)	10,9

Source: Sample taken by the author, analysis by Norwegian Institute for Water Research (NIVA)

¹⁵ Test sample taken March 7, 2000, south of the CETP in Jajmau, from the canal leading water from the CETP.

In addition to letting these numbers speak for themselves, the researcher that undertook the analysis of the water sample said the following: “This water is strongly polluted. Compared to *untreated* public sewer in Norway, the concentrations of COD are two times higher, and the concentrations of chrome a thousand times higher. The concentrations of sulfur are also very high, and would have been even higher if the sampled water had been tested immediately after collection. Following western standards, this water should *not* be led out in nature without thorough cleaning.” (Personal communication with the researcher at NIVA, 12.5.00).

Evidently, the environmental regulations are not being implemented the way they should. This was also confirmed both in interviews with tanners, and in interviews with people from the central pollution control board (CPCB) in Kanpur and the UP directorate of industries. What are the reasons for this? One likely explanation is that either the tanneries or the CETP, or both, are not complying with the regulations. According to Yadav (1998), many of the tanneries have equipment for cleaning but do not use it. Several of the tanners in this study’s sample confirmed this, one by saying: “All operate their PTPs on paper, but in reality no, particularly the small, of which there are many in this area.” (Interview with a small tannery in Jajmau). Also non-tanners admitted to the lack of enforcement. The CPCB has seen that “there are some problems with the running of the primary treatment plants.” The person interviewed at the directorate of industries in UP said that the Indian regulations were as good as anywhere else in the world, but that there were still some enforcement problems. When this is said, it must be noted that there are some tanneries that are doing their best to reduce the negative effects of tanning on the environment. These tend to be larger and more recently established tanneries where the owners are more educated and where their attitude towards regulations is positive.

Firms’ attitude to environmental regulation and corruption

Why do not the tanners follow the regulations? The attitude of the tanners to the environmental regulations can be one explanation to this question. Of the total sample of 42 tanneries, only 10 expressed agreement and understanding of the need for regulations to protect the environment. More common were sayings like:

“The government here has cut our leg and then asked us to walk. The supreme court is moving too fast on decisions. They force you to do things without giving you the necessary infrastructure to comply with it. That makes it worse.” (Interview with a medium-sized tannery in Jajmau).

The fact that the tanners do not want to comply because they do not agree with the regulations, is not the only reason why they are not complying. It also needs to be possible to not do so. As pointed out by Heyes (1998), this might be because the economic loss of not complying or the risk of being caught in non-compliance is not big enough. To solve the problem, one could then just raise the penalties for non-compliance or increase the probability of being caught in non-compliance by having more frequent inspections. While this sounds logical, there is particularly one obstacle for this to succeed in the case of the tanning industry in Kanpur - corruption. In one case the tanner agreed to having regulations, but criticized the implementation by saying:

“Regulation is fine as long as it is fair and equal for everybody. Should be implemented in a ‘proper way’. It should not be corrupt. “ (Interview with a medium-sized tannery in Jajmau).

From the interviews with the tanners and others, it is clear that the tanners are not the only ones who are not doing things the way they are supposed to. In several statements, the tanners conveyed the message that the SPCB is corrupt. For example:

“The primary treatment plants are just for fake, no one here uses them, really. We have them just to show the government, they only come for money, you pay them and it’s fine. They come all the time, when they need money, especially before holidays.” (Interview with a small tannery in Jajmau).

It was also common for the tanners to use formulations like “we are doing what the law abides us to”, without specifying what exactly those requisites were. Or they would use the expression “on paper”, for example: “Regulations on water pollution they have been making stricter, but mostly on paper, they are still open to bribes.” Or, “On paper everybody is connected to the CETP and everybody has a primary treatment plant.” (Interview with a medium-sized tannery in Jajmau). Another tanner said directly that: “The biggest problem is corruption.” (Interview with a medium-sized tannery in Jajmau).

When the people from the SPCB come to monitor the tanneries’ operation of the PTPs, everybody knows they are coming to collect bribes.

“The people from the PCB are the *least* concerned about the pollution and the standards, they only come because they want money. Monthly. Once, when a man from the PCB came to do water sampling, I gave him 100Rs and water from a bottle of mineral water. When the report came back it showed really bad results, high levels of BOD and COD etc. (obviously not a result of testing the mineral water), saying my primary treatment plant was not working well, only because 100 Rs was considered a too small amount! Now I have sorted it out, and I pay enough to the right people and they are not giving me more trouble. It is the same way for everybody. Here in India 2-3 hours per day are spent on bureaucracy and corruption.” (Interview with a medium-sized tannery in Jajmau).

The problem of corruption is not only in Jajmau, but in Unnao as well. One tannery stated there: “I don’t think any tannery is at present meeting the norms identified.” (Interview with a small tannery in Unnao). In Unnao, the relationship between the tanners and the CETP is different. Here, there are fewer tanneries and the project manager at the CETP in Unnao closely monitors the tanneries to see that they do the primary cleaning properly. Otherwise, the CETP will not function as intended, and that is his responsibility.

Corruption is not only a problem *per se*, but also because the SPCB officials are more interested in making money than implementing regulations, the tanners have to pay them, even when they operate their PTP and the test results are fine. This way, the tanners who wish to do the cleaning for either moral or market reasons (discussed later) have to pay double: both the cost of cleaning and the cost of bribes. This is illustrated in the following statements:

“50% of the cost of the primary treatment is the bribery to the PCB. Every month or three months they demand some money.” (Interview with a medium-sized tannery in Jajmau).

“Even though I am doing everything right, the SPCB is still demanding bribes. They can take anything against you! I would have been much 'happier' if I had made a fake IETP and bribed the politicians. Now I’m paying for cleaning but still I face the problem of bribery.” (Interview with a small tannery in Unnao).

In addition to being corrupt, the SPCB officials are also criticized for not having the necessary skills to implement the regulations properly. According to a tanner:

“The main problem isn't the regulation, but the SPCB who is so corrupt and creates so many problems. The government officials who are supposed to implement the regulations are the least committed, they only want money. And they have no skill. They only provide the norms and standards without any knowledge of how to achieve them. They should also be responsible for teaching us how to achieve the standards, not only to control if we do.”(Interview with a small tannery in Unnao).

Cost of cleaning and competitiveness

In addition to the tanners' attitudes towards regulations and the enforcement of these, the cost of complying with the regulations is an important determinant of the firms' decisions and actions. The literature also suggests that the question of cost will be addressed differently in different companies, according to industrial segment, the nature of competition in that industry and the internal organizational capabilities of the firm.

When one looks at how much it costs for the tanneries in Kanpur to implement the environmental regulations that the state of UP requires, the results varies, particularly according to membership of CETP and according to scale of production.¹⁶ To control water pollution, there are 4 components in the cost of cleaning: 1) The cost of constructing a PTP; 2) the cost of operating a PTP; 3) the share of construction cost of the CETP; and 4) the cost of operation of the CETP.

Cost of primary treatment plants

All tanneries that are connected to a CETP need to have a PTP where primary treatment is undertaken before sending the effluent in the drainage system. The cost of constructing a PTP depends on the size of the plant and hence also on the processing capacity of the tannery. For a smaller tannery, the cost is normally in the scale of Rs 100,000 –150,000 (equal to US \$ 2300-3500). For larger tanneries the cost can reach Rs 500,000 (US \$ 11,500), and even beyond, depending on size. To operate the PTPs, there are costs associated with power for operation, work force to look after the operation and chemicals such as acidic sulfur and others to adjust the pH. Seventeen of the 42 tanners interviewed did not have a clear idea of how much it cost them to operate their PTPs. This can be either because they did not operate the plants or because they do not separate the accounting for the operation of the cleaning process. But general statements such as “the operation cost of the treatment plants is low when compared to the turnover” (Interview with a small tannery in Jajmau), “cheap” and “not much”, indicated that the operation of the PTPs was not expensive. Of the tanners who were able to estimate the cost of PTP–operation, the information was usually

¹⁶ For solid waste the cost also varies according to the size of the lot of the tannery, whether they can store the solid waste on their own premises or not.

given in monthly cost, and ranged from Rs 2,000 to 25,000 (US \$ 46-580) per month depending on the size of the tannery.¹⁷ Some tanners also gave the information in cost per hide or per square feet. After calculating and comparing the different measures, it seems that the cost of operating a primary treatment plant varies between Rs 0,02 and 0,1 per square feet, and from Rs 0,7 to 3,5 per buffalo hide. The cost is higher per unit of leather for the smaller tanneries, while the larger tanneries benefit from economies of scale. Of the total production cost, the operation of the PTP only accounts for 0,1 to 0,5%¹⁸.

The CETP: Membership and operation

In addition to paying for the primary treatment at their own site, tanners that are part of a CETP also have to pay their share of the costs for construction and operation of the CETP. Here, there is great variation in the sample according to which of the CETPs they are part of, either the one in Jajmau or the one in Unnao. Looking first at the construction cost, the cost is less for the smaller tanneries in Jajmau. Most of them have paid a fixed amount of Rs 40,000 (equal to US \$ 930) for the construction of the CETP.

When the CETP in Jajmau was built in 1994, it was after a joint initiative of the Indian government, the state government and the Indo-Dutch development program.¹⁹ These institutions should bear the largest share of the cost, and the tanneries were ordered to contribute with altogether 17,5% of the cost. This cost was then divided among the tanneries according to production capacity. All tanneries in Jajmau are supposed to be member of the CETP and according to the CPCB's evaluation report of the CETP from 1999, there are 354 member tanneries to the CETP in Jajmau, but out of which only 305 are currently operational.²⁰ When the program was initiated, the construction cost of the CETP was estimated at Rs 70 million. After its completion,

¹⁷ This great variation is not only due to the varying size of the tanneries, but also due to the tanners' faulty estimation of the operation cost of the PTP. Many times their cost estimation was based not on practical experience from operating it, but on their ideas of how much this operation would or should cost.

¹⁸ The production cost varies between Rs 12- 40 per square feet (excluding the cost of the raw hide).

¹⁹ This program also assisted in building up primary treatment plants and chrome recovery plants in some tanneries to be demonstrated to others. The Dutch development agency is now backing out of the whole area of Kanpur and environmental issues because they have not seen any improved effort by neither tanners nor government.

construction costs have gone up to Rs 215 million. In addition, the tanners alone had to account for the cost of building the conveyance system leading the effluent to the CETP, a cost of Rs 1,6 million (CPCB 1999). The tanneries, particularly the smaller one, are now protesting because they had agreed to share the initial cost (of Rs 12 million) and claim they cannot afford the excess costs of the project (their total share was increased to Rs 37,6 million). In their view, the increased cost is a result of bad project administration by the government that the tanners should not be made to pay for (Interview with head of Jajmau tanners association). This case has been taken to court by the small tanners associations. Many of the tanners referred to this court case when they were asked about the cost of membership to the CETP. Answers like “It has yet to be determined”, were common and many tanneries have held back even their initial contribution, eyeing an opportunity to get away with less costs, or at least to postpone them. "Some don't pay and some people pay only a share of what they should have paid." (Interview with a medium-sized tannery in Jajmau).

In Unnao, the organization of the tanneries paying for construction and operation of the CETP is different. Here, the tanneries-members are the owners of the CETP, also called Unnao Pollution Control Company, which is a private company where 21 different tanneries are the shareholders. So, of the total construction cost of Rs 19,5 million, 20% is covered under the company's value on shares, and each tannery holds shares according to the size of their production capacity. For example, one tannery has paid Rs 700.000 for membership in the Unnao CETP for using 90.000 liter/day, corresponding to 4,1% of the CETP's processing capacity (interview with a recently established tannery in Unnao). Already in the construction cost of the CETP, the cost of cleaning is much larger for the tanneries in Unnao than for the tanneries in Jajmau.

Looking at the operation cost, there is this same difference. In Jajmau, the tanneries are together supposed to bear 60% of the CETP's operational costs (equals close to Rs 400,000 per month) and the state government the rest. The tanners reported paying 2-3 Rs per hide. The total monthly payment was calculated based on their monthly production capacity (in number of hides per day) as identified in their no objection certificates (NOC) issued by the SPCB. One problem with this measure is

²⁰ According to the 1996 project report by the CLRI, the CETP in Jajmau is designed to serve only 150

that there is no relationship between what the tanneries are actually processing, nor how much effluent they are sending to the CETP, and how much they are paying. Also, there are again bureaucratic obstacles to the paying for the CETP's operation. Since the CETP in Jajmau is a joint tannery waste and city sewer treatment facility, many of the tannery-owners are critical to the fact that the tanning industry is the only industry that has to pay. They claim that many other industries are letting their waste into the general city sewer, and therefore should also pay. "Not only the tanneries should pay because so many other industries are also discharging their effluent into the same city sewer channel." (interview with a small tannery in Jajmau). Since the tanneries only contribute 9 of the 36 million liters per day (33%) sent to the CETP, they feel it is unfair that they have to bear a large burden of the cost when they have to pay for 50% of the total operational cost of the CETP. Hence, many of the tanneries are trying to avoid paying. "For the operation cost, we are fighting with the government. We think all the other industries that also send effluent should be made to pay for the operation, not only the tanning industries." (interview with a tiny tannery in Jajmau).

In addition to this obstacle, the tanners also claim that the municipal authorities are not operating the CETP properly, therefore the tanners should not pay for the operation costs.

"Here, only 25% of the people are paying. Many people are not honest. And the people in the industry started complaining about paying because the government is not doing their share of the work, the CETP is not cleaning well, then why should we pay?" (Interview with a medium-sized tannery in Jajmau).

"The CETP is not running well, sometimes they overrun the supply, i.e. let the water pass through without any treatment. This is not good. The government should do this job properly so the industry could be relieved of this burden. The CETP should be run and administered well so that this doesn't affect the industry negatively." (interview with a small tannery in Jajmau).

Also, on top of these attitude problems, there are misunderstandings on part of the tanners' either because of lack of information or because as one tanner said: "Policies change the whole time, it is hard to know what you are supposed to be doing." One tanner was very angry because he thought the tanners had been asked to pay Rs 50 per hide for the operation of the CETP. He said that he had not paid anything yet, awaiting the decision (Interview with a tiny tannery in Jajmau). Many of the tanners also think

tanneries (CLRI 1996).

that since they are obliged to have PTPs, they are already doing enough of cleaning (Yadav 1998).

In Unnao, the operation costs are covered fully by the members on a month-to-month basis. The distribution of the operation cost between the tanners is calculated on the basis of water consumption. Because, as the project manager of the CETP says: “No one can let out more effluent than they use water”, and the water consumption is already measured by the municipal waterworks that provides the water. Hence, no extra measuring equipment was needed. The 21 tanneries pay together Rs 586,000 per month according to their shares of the CETP’s processing capacity. Compared to the Rs 400,000 the Jajmau-tanners have to account for monthly, this is already a larger cost, and to be shared by only 21 instead of 300 tanneries. The one tannery quoted before, using 4,1% of the capacity has a monthly cost of Rs 25.000 (Interview with a recently established tannery in Unnao). The tannery that has 40% of the Unnao CETP processing capacity pays Rs 200,000 per month for the operation of the CETP. Compared to the per hide price that Jajmau tanners are paying, the tanneries in Unnao are paying two to four times more (between Rs 5 and 10 per hide), depending on their production every month.

The tanneries that are not part of a CETP have to account for all the cleaning themselves, to the same standards as the CETPs. The three tanneries of the sample that had their own IETPs, were all either medium or large scale, and they had an estimated construction costs around Rs 2-3 million, and operational cost of around Rs 200,000 per month.

Competitiveness

As was already pointed out in the previous discussion, the cost of primary treatment only accounts for 0,1 to 0,5% of the total processing cost of leather, excluding the cost of the raw material. This is definitely not a big cost, and even adding the cost of operation of the CETP, it only sums up to maximum 1,4% for Jajmau and 2,5% for Unnao. This maximum refers to the production of the lowest quality leather, when the least money is spent on chemicals (only Rs 12 per square feet) in the actual processing of the raw hide. When more money is spent on the processing to make higher quality leather, the share of the cost for cleaning diminishes to 0,4% for Jajmau and 0,75% for

Unnao. In money terms, the tanners spend approximately Rs 0,17 (or US cents 0,4) per square feet in Jajmau, and Rs 0,3 (or US cents 0,6) in Unnao on cleaning their effluent.

Table 4: India, operation cost of effluent cleaning, in Rs (US cents) per square feet

Item	Jajmau	Unnao
Operation of PTP	0,1	0,1
Operation of CETP	0,07	0,2
Total	0,17 (0,4)	0,3 (0,6)

Source: Field work

Cleaning is thus a very marginal cost for the tanners, and some of them admitted to this in the interviews. But the small tanners argued that it was expensive to do as the environmental regulations instructed. Comparing the results from India with numbers from Italy and Brazil in the table below, one can see that the costs in India are marginal.

Table 5: Cost of effluent treatment, India compared with Italy and Brazil

Country	US cents/square feet	% of total processing cost
Brazil ²¹	3,28	4,0
Italy	8,50	9,4
India ²²	0,5	2,1

Source: Data from Brazil and Italy (Odegard 1999)

The 2,1% result for India is confirmed in an interview with a tanner who said that: “The cost of production of finished leather has gone up by 2% because of cleaning. But this is the same for all so it doesn’t affect the competitiveness.” (Interview with a small tannery in Unnao). Looking at table 5, it is obvious that India’s international competitiveness is not hampered by implementing the environmental regulations. Many tanners agree to this and one said: “It [the cleaning of effluent] doesn’t affect competitiveness, because operation costs of the treatment plants is low when compared to turnover.” (Interview with a small tannery in Jajmau). But the tanners are aware that for the smaller tanneries the cost is larger, because part of the cost (for construction) is

²¹ The figures for both Brazil and Italy also include the cost of sludge disposal. However, this cost is not so large that it would substantially alter the cost per square feet.

²² Average for Unnao and Jajmau, for high leather quality, Rs 40 per square feet processing cost.

not fully elastic to size of production. “Maybe for small tanners it would affect competitiveness.” (Interview with a medium-sized tannery in Jajmau).

One tanner said that 10% of his total project cost of setting up a new tanning unit in Unnao was for water pollution prevention (including setting up a PTP and the membership fee to the CETP). In total this amounted to Rs 1 million (Interview with a recently established tannery in Unnao). When compared to similar data from Poland, this is still not high. There, the cost of complying with environmental regulations amounts to 20-60% of the cost of setting up a new tannery (Gjerdåker and Odegard 1999).

Except for one “cleaning device”, the chrome recovery plant, (not yet ruled mandatory by the Indian authorities but the tanners have recently been asked to provide it voluntarily), the cleaning is only a cost. However, as mentioned by Rugman and Verbeke (1998a), complying with regulations can still be considered an economic benefit when the tanners can account for increased sales or market share or improved productivity as a result of a “cleaner production”. This will be discussed further below.

The financial position of the tannery

Also Henriques and Sadorsky (1996) and Rugman and Verbeke’s (1998a) hypothesis about the financial position of the company being an important factor to explain the (non-) compliance seems to hold in this case of the Kanpur tanneries. The smallest tanneries, and the tanneries that are operating with very small profit margins, feel that they cannot afford the cost of the cleaning. This can to some extent be explained by the fact that the cost is indeed larger for the smaller tanneries, because they cannot benefit from economies of scale. For the small tanners, an additional cost of Rs 6 per buffalo hide can seem high, when the profit margin is often less than Rs 100. Also, the small tanners are likely to perceive amounts like Rs 150,000 for a PTP as a more substantial amount than larger tanners that more often deal with large orders and monetary amounts.

That the cost of cleaning is perceived as large among the small tanners became very evident in an interview with the leader of one of Jajmau’s small tanners associations who said that:

“It is too expensive to do all the cleaning that the government has asked for, the government should pay for this, not the tanners. As a result of installing primary treatment plants, which we all did because otherwise we would be shut down, we used all our capital in investing in this equipment, meaning we went bankrupt, we did not have enough capital to continue processing. All the tanneries had to reduce their production, and 30% of the small tanners are now doing only job work for others because they cannot afford to complete the whole process themselves. To run a tannery you need a lot of free capital to always be able to purchase raw hides, and survive a time period before you actually get paid for them.” (Interview).

Hence, even though the cost of cleaning is generally low in India compared to other countries, it is relatively higher for the small tanneries, and these tannery owners are more likely to perceive the cost as larger than owners of larger tanneries. The small tanners’ arguments about the high cost might also be part of a discourse to gain goodwill from the politicians who decide about the cost-share for the CETP in Jajmau.

Cleaner technology, products, markets and customers

So far, the implementation of environmental regulation has been considered a cost for the tanneries. What about Porter and Van der Linde’s (1995) hypothesis that strict environmental regulations will force firms to undertake technological changes in the production process (cleaner technology), that will reduce the negative environmental consequences and at the same time give positive economic benefits to the firm?

When the tanners were asked about how they had changed the production process over the past ten years, their answers revealed that not much had been done. Answers like “we are doing it the way we have always done it”, or “the process is pretty much the same, only chemicals change”, were very common. The tanning industry is a technologically mature industry where the process-technology has not been substantially altered since the introduction of chrome as a tanning agent almost a century ago (Gjerdåker 1998). The tanning industry’s technological opportunities are restricted because the raw material is a biological material, which is very expensive to experiment with. Industries with few technological opportunities are most times forced to compete on price, rather than product sophistication and quality. This former kind of competition is “harder” and it is at the moment pushing the tanning industry towards the outer limit of profit squeeze. For the most standardized kinds of leather, the tanners sometimes have to accept a selling price that only barely covers the production cost.

Products

Within the product-specter of the tanning industry, there are different kinds of leather, based on different raw material, different processes (vegetable or chrome tanned) and for different uses. The better the quality of raw hide, chemicals, and machinery, the better the quality of the finished leather. Only in the higher quality product segment, there is potential for getting a better price for “environment-friendly” leather. The problem with high quality products is that they require high expenditures in all parts of the process. Most of the tanneries in Kanpur that use buffalo hides or hides from fallen cows are automatically bound to produce lower quality leather. In addition, the fact that many of them cannot afford to use the higher quality chemicals and the newer machines further forces many Indian tanneries in to the *low quality trap* for standardized products where price competition is stiff. This has implications for the implementation of environmental regulations because only when the tanneries manage to compete in the higher quality product segment, do they find that they can regain some of the costs for improved environmental performance. On the other hand, “if it’s a game of price, then we loose.” (Interview with a medium sized tannery in Jajmau). When competing in the low-quality end of the product segment, price is the determinant factor in the market, and the tanners have no opportunities to cover the cost of cleaning from a more expensive, “environmentally sound” product.

Process

Of cleaner process-technology, Porter and Van der Linde (1995) discuss technology that limits resource inefficiencies, and technology that can give payback. The only example of the first in Kanpur was the case of an automatic feeding system of chemicals into the drums, securing a reduced consumption of chemicals. Normally, the tanners in Kanpur measure water quantity and the corresponding quantity of chemicals in the drums by the eye only. And since it is better to use too much than too little of chrome, chemicals are wasted and the pollution load is increased. However, only two tanneries had this automatic feeding system. They had installed this system because it was part of a collaboration project with the UNIDO, hence the expenses for this equipment was at least partly covered by the UNIDO. The system is very expensive. In India, where the cost of capital is high (interest rates at 12-15%), it is not an option for most tanners. Another issue is that the regulations offer no incentives for using less

chemicals or water because the tanners are paying for cleaning on the basis of processing capacity, independent from the quantity of chemicals or effluent they let out. Only in Unnao, where the two automatic feeding systems are installed, is the payment based on the consumption of water. In Unnao, it would be in the interest of tanners to limit water use, also limiting the amount of effluent generated.

Cleaner technology gives a payback to the firm through energy saving, and reuse or use of wastage. One example of this is chrome recovery, a machine where the water with chrome used for the tanning is run through and the unabsorbed chrome is precipitated from the water and reused. Thus, with such a machine, the demand for new chrome decrease and the tannery saves money. At the same time, less chrome is let out in the effluent. However, there are some limitations to this 'recovered chrome', it can only be used together with new chrome. It is necessary to use a maximum of 15 % of recovered chrome (with 85% new chrome). If you use more recovered chrome, the quality of the tanned leather decreases (Interview with a small tannery in Unnao).

Even though this technology can bring paybacks to the tannery, less than 25% of the tanneries using chrome have installed it. Again, the tanneries in Unnao and the larger tanneries are more likely to be the ones that have this equipment. The tanners said that it cost between Rs 200,000 and 500,000 to install a chrome recovery machine. The reported savings vary according to the scale of production. One tannery, producing 100,000 square feet per month, saves 40-45% of the cost of chrome by having the recovery machine. A larger tannery, producing 500,000 square feet per month, says they can recover 7,5% of total chrome used, but that they do not gain much from using it because the recovered chrome could only be used when they were making cheap, lower quality leather. In real savings, one of the largest tanneries of the sample with a production capacity of 1 million square feet finished leather per month, reported they were saving Rs 40.000 per month (interview with a medium sized tannery in Jajmau). As is evident, the potential of experiencing a payback from using this technology is better the larger the scale of production. Therefore, the chrome recovery plant is not a viable cleaner technology for most tanneries in India. Another issue is the time that it takes before the investment in the chrome recovery machine starts to pay back. One tannery estimated it to be 5 to 6 years. This is too long for most of the tanneries because capital is scarce and expensive and profit margins are low.

Something else that has been tried by UNIDO to make the tanning process cleaner is the use of enzymes during the tanning process. This increases the uptake of chrome and therefore reduces the outlet of chrome in the effluent. By using enzymes and magnesium oxide for basification instead of soda, the chrome uptake can go up from around 40% to reach 80-85%. UNIDO's efforts in Kanpur are direly needed, but have unfortunately only directly covered six tanneries. These six are all large or medium scale, while 80% of India's tanneries are small. Even though UNIDO has only been working in Kanpur for the past 6 months, the tanners that have been included in the program are benefiting both technically and financially.

“Green” products, markets and demanding customers

Based on the literature concerning “demanding customers”, there should be a potential for the tanners to gain market shares by making sure they clean their effluents properly, and thus sell “clean leather”. Even though this leather will be more expensive, conscious customers might be willing to pay the price difference. When the tanneries in Kanpur were asked about the marketing opportunities for being clean producers, all but two tanners answered there were no such opportunity. This can be explained by several factors. For the tanneries producing leather for export, most of them are only making components of leather goods. This means that their markets are not consumer markets, but industrial markets. As mentioned previously, the willingness to pay more for a product in this market is only in place if the product has changed so that the customer will experience lower costs, not solely if the product is less damaging to the environment (Reinhardt 1998). In consumer markets, however, the image of the firm is more important. Again, most of the tanneries in Kanpur are not experiencing the effects of this. For the tanneries selling purely in the domestic market, there is a lack of demanding customers. Most Indian customers cannot afford to prefer something else but the cheapest product available. When it comes to the tanneries selling in international markets, the consumers are often too far away to be interested in the way the product was made, particularly if the environmental effects are contained in the geographical area of production. The only evidence of the customers influencing the tanneries' environmental practice in Kanpur was found in two of the larger and most modern tanneries, both having their own sales office or agent abroad. For example, one

tanner in Jajmau said: “We would not be able to sell with high pollution because of consumer awareness in export markets and company image. Especially in Germany, we automatically apply German standards, what they do, we do.” Also, according to this tanner, it was customer demand and government pressure that had been the most important factors leading the firm to implement environmental practices.

To improve the link between demanding customers and firms’ environmental performance, the idea of eco-labeling has been introduced. Eco-labeling schemes are developed to make it possible for the consumer to identify what products are less harmful to the environment than other competing goods within the same product category. “Eco-products” can be identified on the basis of what they are made of or the way in which they were made (Staffin 1996). There are all sorts of obstacles for the success of such a scheme. One problem with eco-labeling of leather is that it is often impossible to determine how the leather or the material of a leather product has been made. It is hard to secure that the label is only used when appropriate, and it is difficult to develop international standards that all producers can agree on. Also problematic for international rules is who should control the products, at what stage should there be control and who is supposed to be responsible for compliance. For example in a shoe, should all components or only the finished shoes be controlled, and is the component producer or the shoe assembler responsible if the shoe is rejected as “green” or “eco-friendly”?

Some of the tanners in Kanpur who export leather had knowledge of eco-labeling. These were the larger and more recently established tanneries that were already doing a relatively good job in following environmental regulations. Many had positive expectations about the future opportunities of achieving an environmental standard for the leather or the leather products. They expressed hope that this would give them an advantage over the smaller tanneries in India that are not cleaning their effluents properly, or competitors from other Asian countries where environmental regulations are even less stringent or less implemented than in India. When asked about the future prospects of his tannery, one tanner said: “I want us to grow more in the shoe business. Move towards the use of chrome-free/ vegetable tanned leather, and start labeling with bio-degradable and recyclable. Labels are possible for shoes, but not for

leather, the market isn't asking for it. Only some German shoe makers are asking if they use azo-dyes for example." (Interview with a medium-sized tannery in Jajmau).

Porter's idea of companies gaining a competitive advantage from stringent environmental regulations by being "the first mover" is not valid in India because most of the countries Indian tanners export to have already implemented equally or more stringent regulations for their own tanning industry. Thus, Porter's idea will normally not hold in any developing country that is exporting to developed countries. These findings are supported by Rugman and Verbeke (1998b) who are skeptical about the potential for firms in "small, open economies" (meaning outside of Europe, USA and Japan) to benefit from "early mover advantage" in greening their production.

Green strategy, stakeholders, size and visibility

Among the tanners in the Kanpur area, only one or two can be said to have developed an environmental strategy by consciously investing in both cleaning and to some extent also cleaner technology, and using these features actively in the marketing of the company's goods. One reason for this lack of strategic thinking is that the creation of a "green image" is not important as competitive advantage for the tanners. This is because, as pointed out above, the competition in the market segment where most of the Indian tanneries compete is based only on price. There are two exceptions to this. Both are medium or large tanneries located in Unnao. One of them is a vegetable tannery that makes saddlery and harness goods in addition to finished leather. It has a large and well-organized tannery with high standards for safety, and it is the only tannery to have ISO certification (9000, currently applying for the 14000). The manager said that: "Our competitive advantage is the standard of the tannery." They deliberately invite customers to come and see the tannery, so that they can get a positive impression and "prioritize the company for their environmental effort." (Interview with a medium-sized tannery in Unnao). Thus, they use environmental spending to gain market opportunities. The other tannery reported that environmental awareness was part of their competitive advantage, especially when selling in the German market. "We include our environmental efforts and improvement in our brochures, talk about them when we participate in fairs etc." (Interview with a large tannery in Unnao). One reason why these tanneries are using their environmental

performance as a factor in competition is that both of them are making leather products, not only finished leather. This means they are selling directly in consumer markets. In addition, they are making more sophisticated products of higher quality, the latter tannery is for example making leather for fashion shoes, where price is no longer the only factor of competition. A third reason is that these tanneries are larger, and thus more visible. Henriques and Sadorsky's (1996) argument that larger firms are more susceptible to public scrutiny therefore seems to hold in this case. Interestingly, both are also in Unnao, and it is likely that the joint effort of effluent cleaning here has stimulated the tanneries to include environmental practices in their every-day work of running a tannery business.

To look at reasons why most of the tanneries in the Kanpur area do not have a green strategy, McGee et al.'s (1998) argument about time perspective seems to be valid. Most of the tanneries have a very short-time perspective for their business, for some the survival is from year to year, for even smaller tanneries the operations is on and off on a monthly basis. With these short time frames, no one is thinking of spending time and effort to develop a 5 or 10-year strategy on any issue. Because environmental problems are very often cumulative, or a result of several years of polluting behavior, it will take some time before the tanners can see the consequences of their (lack of) effluent treatment. Also the idea of the powerful stakeholder influencing the firms to undertake an environmental effort falls through in the case of the tanning industry in Kanpur. The people that would have an interest in cleaner production from the tanneries are poor workers or farmers with no time, education, money or other resources to waste talking to big industries that are unlikely to listen because of the difference in power in their relationship. The only voice that is now starting to speak in Kanpur is the effort of "Eco-friends", an NGO that has for the past 7 years worked to make the tanners reduce the pollution load coming from their production. Recently, the NGO got attention through the newspapers and addressed issues of skin-problems for the villagers south of Jajmau using the water from the CETP for agriculture (Times of India 26.2 2000). It also addressed the problem of pollution of river Ganges which for many Indians is considered a holy river (Times of India 23.2). Even though these stakeholders are not yet very strong, tanners are starting to be aware of the importance of these people's voices. As said by one tanner

about why he chose to locate in Unnao instead of Kanpur: “Things are starting to stir in Jajmau, in the future there might be some problems with the environmental issues there.”

Attitude to the environment

Of the 42 tanners interviewed, only 10 were positive to the environmental regulations and many of these tanners are the sample’s “best performers” when it comes to implementing measures to limit the pollution load from the tanning activity. Again there is a trend that these are the larger tanneries and that they are located in Unnao. But there are exceptions. For example, one tanner with a small tannery in Jajmau said that: “For our health and our children’s health it is necessary with stricter regulation. We need that the government isn’t careless, the industry needs to be forced to better practice.” The owner of a recently established tannery said:

“When the environmental regulations started to be enforced, the people in the industry were mostly uneducated and not interested, they did install primary treatment plants but only because they had to. They went for it with a broken heart. The awareness has only come later, maybe the past 5 or 8 years. New people are moving into the business with more education and different attitudes. We go for cleaning voluntarily.”

His views are supported by an Unnao tanner saying:

“The attitude in the industry is changing, we now think in a long-term perspective. People have seen the drawbacks in South India, (where they are now lacking clean water for processing of the hides), we care more about the water, we want it to be available in the future also.”

Then there are the majority of the tanners who still think tanning has no consequences for the environment. “The government says that our waste is hazardous, but tannery waste is not harmful, tanning chemicals are used on animal hides and skin, and we touch it, how can it be harmful to nature?” And they believe that the government is making unnecessary trouble for the tanners. “The government always creates problems, they want to squeeze us.” (Interview with a small tannery in Jajmau). On pollution control, a small tanner that had been in business since the 1940s claimed: “It’s an unnecessary thing!” When asked about the environmental regulations another tanner replied: “The environmental policies are bad, they [the government] want to close down our factories all the time!”

Summary

As has been discussed above, there is a wide gap between the environmental regulations for the tanning industry and the environmental performance among the tanneries in the Kanpur area. Almost all of the 42 tanneries have the prescribed equipment to do primary treatment but most still fail to operate them properly or at all. Much of the reason for this is the problem of corruption and the bribery that the PCB officers demand. The poor financial position and the small size of many tanneries are also important factors. Furthermore, the negative attitude of many of the tanners towards environmental issues can explain the lack of compliance with regulations. Even though the cost of doing primary treatment is very low in India, the organization of the payment for secondary treatment has led to a lot of confusion, mal-information and mistrust between the tanners and the state bureaucracy administering the CETP in Jajmau. Many tanners have failed to contribute their share of the cost. An exception to this is found in Unnao where a good management of the CETP secures that 100% of the tanners are paying their share. Also the fact that most of the tanneries in India are supplying the world market with low quality products or intermediaries, limits the opportunities to benefit from technological upgrading towards cleaner technology. Finally, “demanding customers” are too far away to be able to influence the environmental performance of the tanneries. All these factors contribute to explain the tanners’ environmental performance.

Suggestions to improve the tanneries' environmental performance

The third question of this study addresses how compliance with the environmental regulations can be improved. First, there is an immediate need to stop the corruption that is making it possible for the tanners to get away with not cleaning their effluents as the regulations abide them to. Second, there should be an increased reciprocity between the tanners and the CETP in Jajmau so that the tanners would feel more responsible for the effluent let out by them to the CETP. Third, there needs to be a continued effort from UNIDO and CLRI to increase the knowledge and change the attitude of the tanners about both cleaning and cleaner production. Of changes at the larger scale, one could wish for the tanneries to get out of price-based competition in the lower quality product segment. Rather, they should enter higher quality markets where there would be incentives to upgrade the production process so that less resources would be wasted and less pollution created. Also, one could wish for increased market incentives for cleaner production and more demanding customers.

The focus on corruption is extremely important because it gives the tanners not only an *opportunity* to escape from cleaning their effluents as they should, but an actual *encouragement* to not do so, because non-compliance with regulations is the only way of having only one cost (for corruption) rather than two (for corruption and cleaning). Hence there are not only no incentives to clean, but the corruption is an actual impediment to clean. No matter how well the tanners do in cleaning, they still have to pay bribes. The need to end this corruption is therefore urgent. It is also important to make sure that the PCB officers that are responsible for the control of the tanneries have enough skills to do the control properly, and that they have the knowledge to teach the tanners *how* to achieve the standards if they are not meeting the norms at the moment of control.

The pollution control situation in Jajmau needs to be similar to that of Unnao, where the tanners to a larger extent are responsible for what they send to the CETP. The question is how to achieve this with 350 tanneries, as compared to 20 in Unnao. What could be done is to charge each tanner for the cleaning on the basis of how much effluent the tannery emits. This would be possible by establishing a measuring unit at the end of each tanner's pipe, measuring the amount of effluent it creates before it goes in to the common conveyance system. This would force the tanners to be more careful

about their water consumption, and reduced water use could reduce the quantity of chemicals used. An even better option would be to have a measuring equipment that could monitor the quantity of chrome and other chemicals contained in the effluent, and that each tanner would pay according to these measures. This would further encourage the tanners to reduce their use of chemicals as well as it would be another incentive to install recycling options such as chrome recovery plants. This has been done in Santa Croce, a tanning area in Italy (Interview UNIDO). One obstacle is that the installment of these measuring equipments could be expensive. Instead, one could invent a system of discounts for tanneries that had for example chrome recovery plants, so that they would pay some percentages less for their effluent treatment at the CETP than other tanneries sending heavier pollution loads to the CETP. The way in which the CETPs function today (based on quantity of hides or water consumption), they are “anti-cleaner technology” (Interview UNIDO).

A less technical alternative is to improve the environmental performance of the Jajmau tanners by so-called “noisy monitoring” (Heyes 1998). This means that the tanneries should monitor and report on each other. This is possible because already today the tanners in Jajmau are closely related and well informed about each other’s activities. One would have to find a way to ensure reporting and avoid “brotherhood” tendencies between the different tanners. As of today, especially the smaller tanners are to some extent solidary to each other. Another thing suggested by Heyes (1998) to increase the implementation of the regulations is to give the tanneries caught in non-compliance a fine or economic penalty in addition to today’s threat to be closed down.

But these are all negative control and punishing mechanisms. What about some positive efforts to improve the tanners’ environmental performance? Since many of the tanners believe that the tanning activity is not so damaging to the environment, and since they are lacking knowledge about cleaner production, UNIDO and CLRI have important roles to play in teaching the tanners that it is important to improve environmental performance and show them how it can be done. CLRI in Kanpur should expand from being only a testing institution and a laboratory, to maybe have a demonstration site of cleaner production technologies. This should be further backed by UNIDO’s programme for pollution control in the tanning industry in South East Asia where a lot of competency has been achieved, but only recently reached Kanpur.

Of larger changes, maybe less controllable for the Kanpur tanneries and local institutions, are the suggestions to move into products and markets where competition is based less on price and more on quality, and where there are “demanding customers” willing to pay for “cleaner” leather. Market-based incentives are deemed successful by Rugman and Verbeke (1998a). For the leather industry, there have already been suggestions to market vegetable tanned leather as environmental friendly or give the leather an eco-label. According to Gjerdåker (1998), this is problematic both because it is not so certain that the vegetable tanned leather is any more environmentally sound than the chrome tanned leather and anyway, there is not a demand for such “clean” leather among the customers. Frendrup (1997) discusses various efforts at eco-labelling and points out that it is hard to find good standards that take into consideration both the product itself as well as the production process, that suit all countries. Even though there are many challenges to the development of such labeling, the efforts should be continued. Only by market response would tanners be forced to improve their environmental performance. There are financial obstacles both to join eco-labelling schemes as well as to switch to production of more fancy leather, such as leather for upholstery or furniture. Large amounts of capital are needed for purchasing higher quality raw material, machines and chemicals. The availability of high quality hides is a problem in India.

Changes in the financial and in the insurance markets could be effective tools to improve the environmental performance of the tanning industry (Hesselberg 1998). If better interest rates on loans were given to tanneries with a good performance, or maybe a discount in the insurance premium, tanners would strive to achieve environmental standards. One obstacle here is that many of the small tanneries in Kanpur neither have loans, nor insurance. Another suggestion is to plan for better environmental performance at the early stage of drawing or designing the physical bearings for a tannery. This entails creating the infrastructure of a tannery so that it would have a “life-cycle” approach. This means that at the one end of the tannery, and at the beginning of the process, there would be a set up where excess salt can be removed from the raw hides. Next to that there would be a soaking system where the 3rd soaking water for one batch can be used as the 2nd soaking water for another batch and then again this as the 1st soaking water for a third batch. This is called counter

current soaking and will reduce water consumption (Interview with the CETP project manager). One can also plan to have enough space for treatment and drying of by-products so these can have another use afterwards.

Concluding remarks

Even though the Indian environmental regulations for the tanning industry are equally stringent as the international regulations, the pollution load coming from the tanneries is still heavy, and it is a problem both for the people living nearby, and for the river and ground water. From interviewing tanners in Kanpur, the field site for this study, it has been revealed that most of the tanners do not comply with the regulations and therefore have a poor environmental performance. The reasons for this are many and intertwined, but it is clear that the enforcement of the regulations does not work as intended because of corruption and mal-information. Many of the tanners believe their activity is not harmful to the environment, or they do not see the environment as something that needs to be protected or treated properly. In addition, many of the Indian tanners are making low quality, standardized products, for which there are no demanding customers asking for clean products or production. Finally, it is important to acknowledge that the opportunities for technological upgrading that could trigger a better use of resources and hence reduce the production of waste, are few and costly. Implementing costly technology or even cleaning mechanisms is a problem particularly for the many small tanneries (around 80% of the total number) that are in a poor financial position.

However negative these findings may be, there are opportunities to improve this situation. First, by ending corruption, one would stop giving the tanneries an opportunity of not complying with the regulations. Other options include giving tanneries negative reactions, fines or penalties for not complying with the regulations, or positive incentives for the tanneries that comply. It would also be important to increase each tanner's sense of responsibility for the effluent they let out, by accounting them for the quantity of pollution, or even better; the pollution load or concentration, that they send to the CETP. Many of the tanners also need more information and skills to deal with the environmental issues related to operating a tannery, and many could benefit from technical as well as financial assistance for upgrading their production units, making the production process less polluting. Fortunately, the government has seen the need for financial assistance for this upgrading, and has launched a 'tannery modernization programme' consisting of loans and grants for tanners to invest in new machinery. The terms of the loan, such as interest rates and pay-back period, are

planned to be better for small than larger tanneries. It therefore has the potential of being successful among the majority of the tanneries that most times are also the ones with the poorest environmental performance. The success of the modernization programme depends on the terms of the loan, still to be proposed by the government.

While all this is slowly going on in the offices of decision makers and the information is to some extent spread to the offices of the tanners, the people living south of Jajmau, using the water coming from the CETP for the irrigation of their fields, are complaining about skin rashes and allergic reactions from working in the water. Currently, the water contains high concentrations of sulfur, which is dangerous because in anaerobe conditions it can transform into H_2S , a very poisonous gas, and in aerobe conditions the sulfur can be transformed to sulfuric acid, which is corrosive. The skin problems and rashes are most likely a result of this corrosion, or of the high concentrations of chrome in the water (Personal communication with researcher at NIVA).

Appendix A

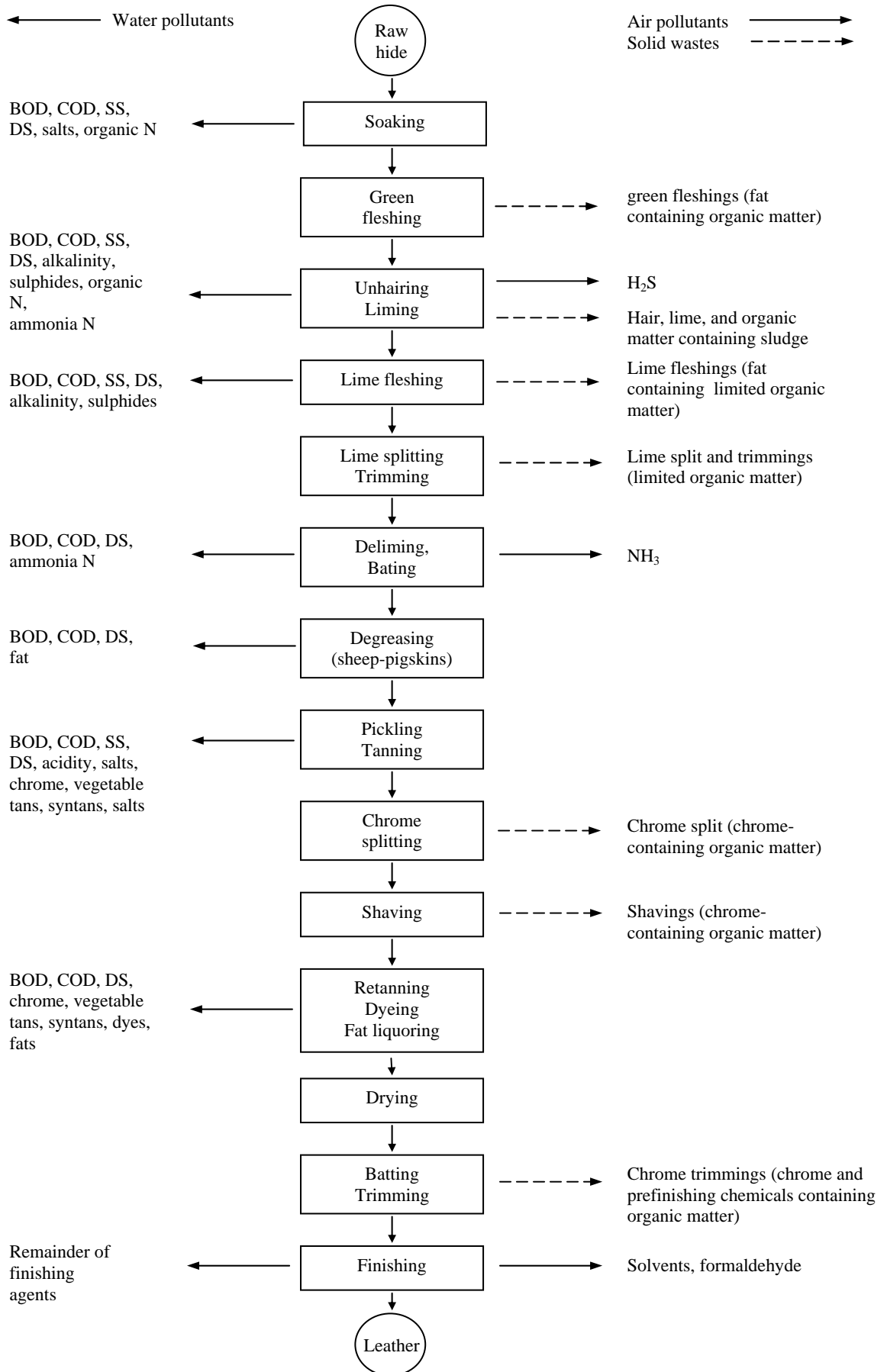


Figure 7: Schematic of the tanning process (UNEP 1991)

Appendix B: Abbreviations

BOD	Biological oxygen demand
CETP	Central Effluent Treatment plant
CLE	Council for Leather export
CLRI	Central Leather Research Institute
COD	Chemical Oxygen demand
CPCB	Central Pollution Control Board
EOU	Export oriented unit
GAP	Ganga Action Plan
(I)ETP	(Individual) Effluent treatment plant
NIVA	Norwegian Institute for Water Research
NOC	No objection certificate (license from the PCB to establish an industry)
PCB	Pollution Control Board
PCP	Pentachlorophenol (organic chemical/toxic fungicide, earlier used in the pickling process to avoid fungi growth in leather)
RBI	Reserve Bank of India
RePo	Regional Program Office of UNIDO in Chennai. Programme for pollution control in the tanning industry in South East Asia
SC	Supreme Court
SPCB	State pollution control board
TMF	Tannery modernization fund/ scheme
UNIDO	United National Industrial Development Organization
UP	Uttar Pradesh

References

- Chandramouli, D. 1998. *Indian leather industry: An overview*. Draft, Central Leather Research Institute, Chennai.
- CLRI. 1996. *Project report for setting up leather complex at Unnao*. Central Leather Research Institute, Chennai.
- CPCB. 1991. *Minimal national standards for tanneries*. COIN DS. 35/1991-1992. Central Pollution Control Board, New Delhi.
- CPCB. 1999. *Common Effluent Treatment Plants: Performance evaluation of operational projects (U.P.)*. 73/1999-2000. Central Pollution Control Board, New Delhi.
- CSO. 1990/91-1997/98. *Annual Survey of Industries: Provisional results for factory sector*. Central Statistical Organisation, Ministry of Planning and Programme Implementation, Calcutta, India.
- Dixit, P.K. 1995. *Influence of government policy and analysis of leather industry: A case of Kanpur*. M. Tech. thesis in Department of Industrial and Management Engineering, Indian Institute of Technology, Kanpur.
- FAO. 1998. *World statistical compendium for raw hides and skins, leather and leather footwear 1979-1997*. Food and agriculture organization of the United Nations, Rome.
- Frendrup, W. 1997. *Recent developments in eco-labelling with regard to leather and leather products*. US/RAS/92/120. UNIDO, Regional Programme for Pollution Control in the tanning industry in South-East Asia, Vienna.
- Gjerdåker, A. 1998. *Miljøreguleringer og konkurransevne i garveri-industrien*. M.Phil. thesis, Department of Human Geography, University of Oslo.
- Gjerdåker, A. 1999. *Leather tanning in Scandinavia*. *FIL Working Paper, No. 18*. Department of Human Geography, University of Oslo.
- Gjerdåker, A. and J.T. Odegard. 1999. *The tanning industry in Poland and the Czech Republic*. Hesselberg, J. (ed.) *International competitiveness: The tanning industry in Poland, the Czech Republic, Brazil and Mexico*. *FIL Working Paper, No. 15*. . Department of Human Geography, University of Oslo.
- Gopalakrishnan, A.A. 1999. *Leather and leather products industry in selected Asia-Pacific countries: An in-depth study of competitiveness*. Wheeler Publishing, New Delhi.

- Henriques, I., and P. Sadorsky. 1996. The determinants of an environmentally responsive firm: an empirical approach. *Journal of environmental economics and management*. **30**, 3, pp. 381-395.
- Hesselberg, J. 1998. Environmental problems and policy: the firm level. *FIL Working Paper, No. 13*, pp. 7-34. Department of Human Geography, University of Oslo.
- Heyes, A.G. 1998. Making things stick: Enforcement and compliance. *Oxford review of economic policy*. **14**, 4, pp. 50-63.
- Hutchinson, C. 1996. Integrating environment policy with business strategy. *Long range planning*. **29**, 1, pp. 11-23.
- Kennedy, L. 1999. Cooperating for survival: Tannery Pollution and Joint Action in the Palar Valley. *World Development*. **27**, 9. pp. 1673-1691.
- Kjellberg, F., and D. Banik. 2000. *The Paradox of Pollution Control: Regulations and Administration in a South Indian state*. 2/2000. Department of Political Science, University of Oslo.
- Knutsen, H. M. 1998. Restructuring, stricter environmental requirements and competitiveness in the German, Italian and Portuguese tanning industry. *Norsk Geografisk Tidsskrift*. **52**, 4, pp. 167-180.
- Knutsen, H.M. 1999. *Leather tanning, environmental regulations and competitiveness - final report*. Department of Human Geography, University of Oslo.
- Knutsen, H.M., and K. Wiik. 1999. Tanning and the environment in Mexico: the case of León. Hesselberg, J. (ed.) *International competitiveness: The tanning industry in Poland, the Czech Republic, Brazil and Mexico*. *FIL Working Paper, No.15*. Department of Human Geography, University of Oslo.
- McGee, J., A. M. Rugman, and A. Verbeke. 1998. Commentary on corporate strategies and environmental regulations: An organizing framework. *Strategic management journal*. **19**, 4, pp. 377-387.
- Odegard, J.T. 1999. Leather tanning in Brazil. *FIL Working Paper, No. 19*. Department of Human Geography, University of Oslo.
- Polonsky, M.J. 1995. A stakeholder theory approach to designing environmental marketing strategy. *Journal of business and industrial marketing*. **10**, 3, pp. 29-46.

- Porter, M. 1990. *The competitive advantage of nations*. Macmillan Press Ltd., London.
- Porter, M, and C. Van der Linde. 1995. Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*. **9**, 4, pp. 97-118.
- RBI. Various years. *Reserve Bank of India Bulletin*. Reserve Bank of India, New Delhi.
- Reinhardt, F.L. 1998. Environmental product differentiation: Implications for corporate strategy. *California Management Review*. **40**, 4, pp. 43-73.
- Rugman, A.M., and A. Verbeke. 1998a. Corporate strategies and environmental regulations: An organizing framework. *Strategic Management Journal*. **19**, 4, pp. 363-375.
- Rugman, A.M., and A. Verbeke. 1998b. Corporate strategy and international environmental policy. *Journal of international business studies*. **29**, 4, pp. 819-833.
- Staffin, E. B. 1996. Trade barrier or trade boon? A critical evaluation of environmental labelling and its role in the 'greening' of world trade. *Columbia Journal of Environmental Law*. **21**, 2, pp. 205-86.
- Thyagarajan, G., A.V. Srinivasan, and A. Amudeswari, (eds) 1994. *Indian Leather 2010: A technology, industry and trade forecast*. Central Leather Research Institute, Madras.
- UNEP. 1991. *Tanneries and the Environment: A Technical Guide to Reducing the Environmental Impact of Tannery Operations*. United Nations Environment Programme, Industry and Environment, Programme Activity Centre (UNIDO, IE/PAC), Paris.
- UNIDO. 1999. *Manual on design, operation and maintenance of tannery effluent treatment plants*. UNIDO, Chennai, India.
- UPSIDC. 1999. *Leather Technology Park, Banthar (Unnao)*. Uttar Pradesh State Industrial Development Corporation, Information Pamphlet.
- Varadarjan, D.B., and S. Krishnamoorthy. 1993. *Environmental Implications of Leather Tanneries*. Ashish Publishing House, New Delhi.
- Yadav, S.S. 1998. *Integrated Environmental Management Plan for Leather Tanneries: A case of Jajmau, Kanpur*. M.Tech. thesis in Centre for Environmental Planning and Technology, School of Planning, Ahmedabad.

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