

Water pollution problems posed by small industries: a case study of India and China

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Abstract Small-scale industrial enterprises play a highly important role in the development of countries such as India and China since they tend to be labour-intensive, contribute to decentralised industrial development, and are flexible and responsive to emerging demands. However they also often use outdated and highly polluting technologies and, operating in very competitive environments, have very limited financial reserves to invest in “non-productive” pollution control technologies. There has been very little research anywhere into low-cost pollution-control technologies or more applicable pollution control strategies for this sector.

Keywords China; development; India; industrial pollution control; pollution prevention; small-scale industry

Introduction

Western technological systems, which produce a lot of gaseous, liquid and solid wastes, are becoming adopted far and wide. But in poor countries, numerous small scale industry (SSI) enterprises are too small to avail themselves of the pollution control technologies developed in the West. These enterprises come into existence because there is a growing need for non-farm employment, particularly in countries where rural poverty and unemployment is high.

These enterprises work within an extremely competitive environment with extremely limited financial reserves to invest in non-productive and expensive pollution control technologies. Technical skills within these establishments are very low. They have a strong resistance to pollution control laws. In democratic countries, their large numbers make them powerful “vote banks” and, therefore, politicians do not want to touch them. The West has not developed pollution control technologies economically suitable for these enterprises. The number of these enterprises is huge and so is the pollution from them. Countries with a large small-scale industrial sector are fighting with their backs to the wall.

Small-scale industry in India

Since independence, the government of India has strong policies to promote the small-scale industrial sector for the following reasons:

- (a) they are relatively labour intensive and thus create more jobs;
- (b) they contribute to decentralised industrial development; and
- (c) they are flexible and quickly reorient themselves to emerging demands.

The government has reserved a large list of products that can only be produced in the small-scale sector. SSIs are today major players in the Indian economy. The sector accounts for 40 per cent of the industrial production, 35 per cent of the total exports, and employs about 16.7 million people in 3.2 million SSI units (Anon, 2001). SSIs involved with food processing, hosiery and garments, and leather and leather products were employing some 3.3 million people in 1988 and were generating Rs. 365 billion or US\$ 8 billion by 1997–98. All these sectors are globally competitive and have a high export earning potential. The share of small enterprises directly and indirectly is estimated to be 60 per cent of the total manufactured exports of India (Gulati, 2000).

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In 1987–88, it was found that 42.17 per cent of the registered SSIs were in rural areas, 47.97 per cent in urban areas, and 9.86 per cent in metropolitan areas (Anon, 2001). But the lifting of Quantitative Restrictions (QR) under the World Trade Organisation is posing a serious threat to the SSI sector which is marked by low skills, and low productivity and profits.

Village and small industries are categorized in three groups: traditional industries; household/non-household cottage industries; and modern industries. Small industry in India is defined according to the ceiling on investment in plant and machinery by gross value in Rs. Million; tiny industrial unit: Rs. 2.5 million; small industrial unit: Rs. 10 million (Anon, 2001).

SSIs have become a big source of pollution and contention

SSIs tend to form strong clusters. In all those clusters where SSIs are of a polluting nature, there are serious water pollution problems, see Table 1.

SSIs have become a major target of pollution control regulatory authorities. About 40 per cent of the total industrial wastewaters are generated by SSIs – about 3,881 million litres per day.

The large tanning industry, for instance, produces over 148 million cubic metres of leather every year. Since the latter part of the 1980s, tanneries have emerged as a major source of pollution (Gulati, 2000). Their efforts to duck the problem has led to a spate of judicial orders against them (Gulati, 2000). Common Effluent Treatment Plants (CETPs) have been proposed as a solution to their problems (Gulati, 2000).

Clusters of textile dyeing units have led to serious problems in towns situated on small

Table 1 Water pollution from SSIs in India

Industry	Cluster regions	Wastewater generated (million litres per day)
Engineering	Hand Tools – Jalandhar and Nagaur Locks – Aligarh Scientific Instruments – Ambala, Ajmer Bicycles and Parts – Ludhiana Brass Parts – Jamnagar Diesel Engines and Parts – Kolhapur, Agra, Rajkot, Coimbatore, Ghaziabad	2,125
Paper and Board Mills		1,087
Textile Industries	Woolen and Cotton Hosiery – Tiruppur, Ludhiana, Calcutta, Delhi	450
Organic Chemicals		60
Tanneries	Leather and leather products - Chennai, Ambur and Vaniambadi (Tamil Nadu), Calcutta (West Bengal) and Agra and Kanpur (Uttar Pradesh)	50
Pharmaceuticals		40
Dye and Dye Intermediates		32
Soaps and Detergents		10
Paints and Varnishes		10
Petrochemicals		10
Edible Oil and Vanaspati		7

Source: Anon, 2000

rivers like Pali, Balotra and Jodhpur in Rajasthan, Jetpur in Gujarat and Tiruppur in Tamil Nadu. Units producing dyes and dye intermediates have also become major sources of both ground and surface water pollution. The village of Bichhri has seen all its wells become black in one monsoon.

Locational policy

No industrial license is required from the central government to locate an SSI in cities with a population of less than 1 million. But in cities with a population of more than 1 million, polluting industries must be located in designated industrial areas (Anon, 2001). This policy is, however, extremely difficult to implement.

There has been a rapid growth of tiny and small industrial units in Delhi. Several tens of thousands of polluting industries – nobody knows the exact number – are located in non-conforming areas. A Supreme Court order this year to relocate them led to riots. Leading political parties blamed each other for the situation and protested in favour of the industries. The order has gone largely unimplemented.

River pollution is becoming very serious

In some rivers, the pollution conditions are leading to upstream-downstream conflicts.

River Bhadar, Gujarat (Katariya, 1998). 1,200 sari dyeing and printing units in Jetpur. When public protests proved ineffective, the people of downstream town Dhoraji filed a Public Interest Litigation (PIL). After 14 years, the Gujarat High Court ordered the closure of Jetpur units until effluent treatment plants were installed. But still little has happened.

Rivers Bhavani and Noyyal, Tamil Nadu (Banerji, 1998). 800-odd dyeing and bleaching units in Tiruppur. Water stored in the Orathapalayam dam on the Noyyal downstream of Tiruppur was expected to irrigate 5 per cent of the land in the Noyyal basin but it is now so poor in quality that the farmers have filed a PIL against pollution from Tiruppur.

Despite the scale of the problem, there is still limited civil society interest in river pollution. The following five action programmes indicate some actions taken by the government of India in trying to cope with the problem.

Industrial pollution control project. The Union Ministry of Environment and Forests/World Bank:

- (a) assist individual units to set up pollution control equipment;
- (b) assist in the establishment of Common Effluent Treatment Plants (CETPs) for SSI clusters;
- (c) introduce clean technologies.

Adoption of clean technology in SSIs. The Ministry of Environment and Forests is responsible for training workshops, studies in waste minimisation and publication of guidelines and manuals.

Waste minimisation in SSIs. The Ministry of Environment and Forests/World Bank/National Productivity Council awareness campaign on waste minimisation and establishment of Waste Minimisation Circles (WMCs) in SSIs.

Integrated technology upgrading and management programme. The Office of the Development Commissioner (SSIs) is responsible for studies on skills and research

requirements in SSI clusters, and facilitation in demonstration, delivery and assimilation of technologies.

Technology Bureau for Small Enterprises. The Small Industries Development Bank of India/Asia Pacific Centre for Transfer of Technology are responsible for one-roof assistance in technology accession, transfer and funds.

Given the large scale of the problem and fear of losing profits by SSIs, means that none of these programmes really address the problem, however good may have been their success in a few units.

Is it any different in China?

Economic growth in small units in China

In China, Township and Village Industrial Enterprises (TVIEs) play an important role in the development of rural areas. Because of the rapid development of the rural non-agricultural sectors, the real per capita income in rural areas increased by nearly 4 times between 1980 and 1995, and the number of employees increased from 41.37 million to 73.34 million. By comparison, there were only 65,000 State Owned Industrial Enterprises (SOIE). The average value of an enterprise was 0.23 million yuan for a TVIE, whereas it was 17.12 million yuan for an SOIE. The total gross output value of TVIEs increased rapidly from 19 per cent of the country's total gross industrial output value in 1985 to 56 per cent in 1995. TVIEs have low capital intensity, low level of technology, low educational level of workers and managers, and low labour productivity.

Environmental situation of TVIEs

Pollutants from TVIEs have increased at a remarkable rate for more than ten years now. Between 1985 and 1995, wastewaters increased by a factor of 1.6 and solid wastes by 2.7. They are now a major source of industrial pollution. In 1995, they discharged 28.2 per cent of the sulphur dioxide discharged by all industry in China, 68.3 per cent of industrial dust, 46.5 per cent of the Chemical Oxygen Demand, and 38.6 per cent of solid and harmful wastes.

The 1995 National Survey of Pollution by TVIEs found that 45 per cent of the total wastewater generated by TVIEs was generated by paper companies, and more than half of the total wastewater and sulphur dioxide generated by TVIEs was in the eastern provinces. By 2000, the major pollutants discharged by TVIEs were expected to reach 50 per cent of the total national industrial pollution.

The most seriously polluting TVIEs belong to 18 industries: paper manufacturing, dyeing, plating, chemicals, tanning, starch, brewing, sugar manufacturing, coke, sulphur, metal refining, mercury, gold, coal washing, coal concentrating, cement, brick and ceramics. TVIEs manufacturing paper based on straw heavily pollute China's waterbodies. They discharge 45 per cent of all wastewater discharged by all surveyed TVIEs and 67 per cent of the total COD.

Environmental policies for TVIEs

Policies *vis-a-vis* TVIEs encompass a pollution levy system, a synchronisation policy, and a closedown policy. The following provides some details regarding both the policy in question and its effectiveness.

Pollution levy system

- a) Standard unit fee which is charged in proportion to the amount of wastewater discharged.

- b) Over-standard levy on enterprises that violate standards of emissions and effluents. Up to 80 per cent of the over-standard levy is put into a Pollution Levy Fund which can be used by violating enterprises for setting up treatment facilities as loans or grants.

The amount of levies collected is very small compared to the magnitude of pollutants discharged. Environment Protection Boards (EPBs) find it difficult to monitor and investigate such a large number of TVIEs. Moreover, local governments' economic interests clash with EPBs' environmental objectives.

Three synchronisations. Design, construction and operation of a new industrial enterprise, or an existing factory that is expanding or changing its production process, must be synchronised with the design, construction and operation of appropriate pollution abatement facilities.

This policy has had a substantial effect on pollution abatement and investments in wastewater treatment facilities at new factories. But many small TVIEs seem to escape this policy. EPBs are too small to supervise the TVIEs with strictness.

The high costs of investment in treatment equipment, high operational costs, difficulties in maintenance, low level of technology, difficulties in learning operations, and low internal reserves to invest in environmental technologies are the major problems cited.

Closedown policy. Introduced in recent years, this policy forces polluting units to close down. In 1996, the State Council established "*Fifteen smalls*" or 15 categories, like paper units with an annual production of less than 5,000 tons, tanneries using less than 30,000 equivalent cow hides, dye factories with an annual production of less than 500 tons, etc., and decided to close them down.

Compared to other policies, this one has been implemented more forcefully. More than 60,000 *fifteen smalls* were closed down within less than a year of the policy announcement. In 1995, about 1,200 small rural factories, most of which were manufacturing paper, were closed down in Huai River Basin because of heavy water pollution. The same prefecture-level governments which were protecting the TVIEs for economic reasons are responsible for implementing this policy. The Chinese Agricultural Bank has stopped loans to the *fifteen smalls* but gives loans to other enterprises for environmental technologies. The 1997 Law of Township and Village Enterprises also includes the closedown policy.

So what does this tell us?

Given all these problems, the Chinese government and the Courts in India are all adopting a policy of closure. But the scale of the problem is so big, and employment and production so significant in these units that the closure policy cannot be fully implemented. Three conclusions may be drawn.

One, that all developing countries, as they begin to industrialise based on the Western model, will find an important segment of their industries using outdated and highly polluting technologies and their scale of operation will prevent them from adopting pollution control technologies.

Two, the problem has largely to do with the highly toxic model of Western industrialisation. India, for example, has dyed cloth and tanned leather for centuries but without any pollution because only vegetable dyes and tanning substances were used. It is only with the advent of Western industrialisation that dyeing and tanning units have switched to chemicals.

Three, as the West has moved out of this phase of industrialisation which it saw during its

own early phase of industrialisation, it has not contributed to any research in this field. For example, small-scale paper mills which use agricultural residues as raw material can greatly add to the incomes of poor farmers. But little research has been done to make them non-polluting.

Nobody should go back with the impression that large companies do not create any pollution problems. The environmental performance of even large-scale companies in India is very poor. They simply follow the local environmental regulations which are often very weak. Moreover, in countries like India which have a largely environmentally unregulated small-scale sector, many big companies outsource their more polluting processes to this sector so as to avoid environment protection costs themselves.

What then are the solutions?

1. Find low cost pollution abatement technologies.
2. Move from pollution control to pollution prevention technologies and strategies that are particularly applicable to the small-scale sector in the developing world. This will require a considerable amount of research.
3. International cooperation in the form of inter-local government assistance in the field of environmental management could be a solution.

But let us be clear there are no easy solutions. Resistance from these enterprises is very high. Local political support is very weak. And there is no interest in this problem in the West.

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