Some Impacts of Industry Pollution in The Brantas River, East Java, and Constraints on Efforts Towards a Clean-Up: An Overview

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"If you want to destroy East Java, then you need only destroy the Brantas Basin". (Pak Soelarso, the former Governor of East Java, March, 1993.)

"Why am I so 'lucky' to be at the centre of so much attention?" (Pak Ischak, Tannery owner, Malang, 1994)

"Care for the river is very little. The river must flow to the sea, not be dammed, extracted or polluted". (Pak Usman, shrimp farmer, 1994)

"Water management is as much about economics, social and political policies and power as it is about hydrology and ecology". (Johnson et al: 1993: 85)

Abstract

The rapid expansion of industrialisation in East Java during the last two decades has caused severe river pollution. The Brantas River Basin constitutes the core of that industrialisation and the core of much of East Java's development activity. River pollution in some cases has impacted heavily upon riparian communities.

Issues of river water quality and pollution control have become a focus for government, NGO's, media, educational institutions and foreign aid. These issues, and the focus they are receiving, have created complexities in the political, economic, social and environmental life of the Brantas Basin which are stretching the status quo. In the process of realigning these "life" forces towards a healthy river, inconsistencies and contradictions have become apparent.

This paper aims to map out the issues of industrial pollution in the Brantas Basin by exploring the expansion of industry, the impacts it has had on communities and showing that their responses and protests have been an important catalyst in shaking up inertia, though not always with a desired end. It also aims to explore the river clean-up activities, and the conflicts and constraints between industries, communities, bureaucracies and NGOs (the stakeholders) that have emerged out of those activities.

The Brantas Basin: geography, population, and industrial deepening

The above statement by the former Governor of East Java bears some fact. The basin has one main river, the Brantas with a length of 320km from its source to its outflow, 39 major tributaries, approximately 80 lesser tributaries, and others still which are seasonal. The Brantas flows in the form of an upside down question mark with much of the catchment located in the middle of the arc formed by steep mountains and volcanoes up to 2,800m high. The basin is also bordered by mountains at the western and eastern ridges, including Mt. Semeru, the largest volcano in Java at 3,600m. The Brantas River starts north of Malang city flowing south through the city and then bending westwards into the Karangkates hydro dam complex and onto Blitar city and Tulungagung. From there it arches northwards to Kediri city and then arches eastwards to Mojokerto where the delta outflow begins. From Mojokerto the river splits and flows a further 60kms - northeast as the Surabaya River, eastwards as the Mangetan irrigation canal, and southeast as the Porong River. The Surabaya River further splits forming the Mas River flowing to the north, and the Wonokromo River flowing east.

The Brantas basin has a major social and economic role to play in Indonesia. It is Java's second largest river with a catchment area of 12,000 sq.km and is heavily occupied by extensive upland agriculture, and intensive lowland sugar and rice agriculture and aquaculture. East Java's total rice production contributes 36% of the total national harvest (Dick et al: 1993: 122). In an area just one quarter the size of East Java, the Brantas basin produces around 35-40% of East Java's rice contribution, around 40% of the province's sugar harvest, contains 66% of its soya beans acreage, and a bulk of the province's production of corn, cassava, peanuts, coffee, clove, coconuts, meat products and shrimp (SLHJT: 1995. KSJT: 1994). With an irrigation network covering 375,000ha, the Brantas
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River system is not only the source for a large part of the province's food supply, it is also the sole source of town water supply for Surabaya, the provincial capital of East Java. East Java has a population of nearly 33 million, with a little over half living in the Brantas basin. While East Java population growth averages at 1.2%, growth rates in the Brantas basin stand much higher. It has on average the highest population density in Java, with of 1250 per sq.km compared to Java's overall average of 815 per sq.km. However, if one considers the "remote" mountainous area in the centre of the basin, as well as the strip development along the major transport lines, actual dwelling densities are much higher. The urban centres, especially in the kampung (urban village) areas have rates of up to 10,000 per sq.km.

These density rates are reflected in the fact that the basin is also the most urbanised area in Java with approximately 50% of the basin's population living in towns and cities. Between 3 and 4 million live in the environs of Surabaya which is growing at a rate of 3.6% annually while some smaller towns are growing at about 2.0% (Dick et al: 1993: 33). Another 30% of the rural population is expected to migrate to the city by the year 2013. The Brantas River links five of the largest cities and towns in East Java.

East Java demonstrated strong economic growth throughout the decade of 1975-85, averaging 7.3%. This above national average growth, was achieved without the advantages of natural resources (oil, gas, and timber), nor tourism and the massive foreign capital investment experienced in other regions of Indonesia. The main achievement in growth has come from rice agriculture, plantation and smallholder cash crops (Dick, et al: 1993: 24).

Over the last decade industrial deepening has begun to "take-off" in East Java though it is difficult to place exact figures on the amount of investment. Official figures are unreliable as they register "approved" projects rather than "actual" projects completed and only around 40% of approvals materialise. However, if this average of 40% is applied to extrapolate actual projects developed and amount invested, then between 1986-1995, total foreign investment saw the establishment of over 500 industries valued at US$ 14.2 billion of which 70% (350 industries at $9.9 billion) were located in the basin. Total domestic investment between 1991-95 created nearly 190 industries valued at $4.2 billion of which 80% (150 industries at $3.4 billion) were located in the basin. The bulk of the projects were metals, chemicals, food processing, timber, pulp and paper, leather goods, textiles and apparel. Many of these industries are high strength polluters. Approximately 70% of the foreign came from Asia (BKPM: 1991, 1995. KSJT: 1992, 1994).

Indeed, mega projects have gone ahead - prime examples being Taiwanese investment in two pulp and paper industries, PT. Tjiwi Kimia, the largest pulp and paper mill in Southeast Asia with a production capacity of 360,000 tonnes per year, and PT. Pakerin, the second largest in East Java with a capacity of 220,000 tonnes per year. PT. Pakerin has a total foreign investment of over US$100 million, with a total paper export capacity of US$59 million annually (Bintoro: 1992: 29). In 1994, exports of paper products were 347,000 tonnes valued at US$ 261 million, an increase of 65% from the previous year. This represents 8% of total export value out of East Java and the fourth largest export (SPLN: 1994).

Clearly, industrial development is occurring at a staggering pace, with exports of manufactured goods increasing at 15% per year in the late 1980s (Dick et al: 1994: 23) and a further 23% for the first half of the 1990s. Export value increased from US$ 280 million in 1982 to US$ 3.36 billion in 1994 (SPLN: 1994). It is clear also that most of the industrialisation is mushrooming especially within the Brantas delta of Mojokerto, Surabaya and Sidoarjo which has been rightly labelled the "golden triangle"(Dick et al: 1993)¹. The sheer number of factories (and their volumes of wastewater) makes the delta the most industrialised region per hectare in Indonesia (BPS: 1996).

Water capacity and pollution loads in the Brantas Basin

East Java's total river water reservoir capacity is 500 million cu.m per year, 75% of which is sluiced into irrigation systems. This figure is way below the total amount afforded to the other two provinces of Java. Central Java has a capacity of 3.5 billion cu.m per year, while West Java is blessed with 6.5 billion cu.m per year. The majority of this capacity lies in the Brantas basin with 9 major dams and barrages. However, by standard measurements of water quantity per capita, the basin is classified as 'scarce' in water resources. Although 10 million basin inhabitants currently rely on well water for potable supplies, demand on piped urban supplies is estimated to increase by 100% by the year 2000, and treble by 2013, due to rural migration to the urban areas (Roedjito: 1993). Prospects for further water resource infrastructure development to enhance reservoir capacity are limited.
Industry is not new to the Brantas River. Traditional Dutch processing plants such as foods, sugar mills, distilleries, breweries, abattoirs, tanneries, textiles mills, caustic soda plants and food processing plants have been operating since the early twentieth century and some of those same sugar mills, distilleries and breweries are still operating today. Indeed up to the early 1930's, Surabaya was the centre of Dutch manufacture, its population larger than Jakarta, and its port (Tanjung Perak) the largest and busiest in Southeast Asia. However whereas the Dutch factories of the early 1900s were located far from populations, massive increases in the latter have crept up to the factory boundaries (Dick et al: 1994). Meanwhile modern industrial development has been less discriminate in its site planning.

As will be seen further below, measurements of loads and concentration of wastes must be treated at best as estimates though official sampling records have been kept since 1989. The Brantas River, especially its delta outflows of the Surabaya, Mas and Porong Rivers, and the Mangetan Canal, suffer from uncontrolled discharge of industrial effluent. In all, more than 100 major industries such as pulp and paper mills, chemical plants, electro-plating, as well as the "traditional" process industries mentioned above, and a throng of cottage industries such as metal plate finishing and battery recycling operations, dump raw or near raw waste directly into the river system creating great stress on the riparian communities and the water resources of the basin. Only a handful of these industries have treatment technology and those have been considered ineffective. Though the lower reaches of the river system are unfit for public use, it is here that Surabaya extracts water for supply, and riparian communities, the poorest of Surabaya's inhabitants, depend on the river for ablution purposes.

The impact of uncontrolled pollution on communities and their livelihoods

The affects are all - environmental, social, economic, cultural, political and gender based - communities bear some considerable costs. The communities want industrial development but they do not want industrial pollution, and will protest against the deterioration of their environment and their livelihoods.

a) Impacts upon agriculture

Rice fields have been affected by direct industrial discharge into irrigation canals. This practice can destroy hundreds of hectares of rice fields in the long term. A study of Mangetan Canal which irrigates 18,200 hectares of agricultural land in the lower Brantas region, reported: "obvious chemical contamination ... unusual qualities characterised by high value of \( \text{SO}_4 \), Cl, COD and \( \text{KMnO}_4 \) .... The source of the contaminated water should be attributed to the activities of a factory located upstream along the Mangetan Canal" (Yoshinori: 1991: 41)

The factory referred to in this study was the pulp, paper and chemical factory, Tjiwi Kimia mentioned above, located in the Mojokerto region (but within the Sidoarjo administrative borders). But there seems little doubt that a percentage of the discharge from Aneka Kimia, a government owned molasses distillery, also located in Mojokerto, and one of the heavier polluters of the lower Brantas, is flowing into the Mangetan irrigation canal especially in the dry season. It is beyond the scope of this paper to put any firm analysis on the overall impact from these two factories upon agricultural lands irrigated by the Mengatan Canal. But the impact cannot be doubted, especially when the average household land size is between 0.5 - 0.8 of a hectare. One factory can ruin the livelihood of many families. Two other large pulp and paper mills in the Brantas basin, Pakerin and Ureka Aba have negatively impacted upon the livelihood of hundreds of families through the practice of discharging untreated wastewater into extensive irrigation systems.

b) Impact upon groundwater

It is widely documented that household wells in the area of industries become polluted by the industries' contaminants. Along the Brantas River, this condition has been reported on many occasions and verified by laboratory analysis. The water quality laboratory of the Brantas River Management Corporation (Perum Jasa Tirta - PJT), a subsidiary of the national Public Works Department, has taken samples from wells within a hundred metre radius of Pakerin, located in Mojokerto region, and found that the wells were unfit for human use, the tests confirming the factory as the cause of the contamination.

Independent studies of wellwater surrounding Tjiwi Kimia have also verified this condition. Also, joint research conducted by Aneka Kimia and the Institut Teknologi Surabaya...
discovered a leak in Aneka Kimia's wastewater lagoons, concluding that the waste was seeping into the wellwater of the adjacent community. The leak was repaired and deep wells were provided for each of the 50 affected households. Other industries that have damaged irrigation canals and polluted groundwater, such as Ureka Aba, in the Mojokerto region have been investigated by the Regional Police of East Java.

Sarana Surya Sakti, an electro-plating industry manufacturing bicycles in Surabaya was (and still is) polluting the groundwater with zinc, nickel and chromium wastes. The walls and bed of the wastewater lagoons were unlined, bare earth. Housing is situated some 5 metres from the lagoons holding wastes. In 1990, twenty wells became contaminated, the water turning yellow, oily and causing "gatal-gatal" (skin irritation). The local women reported the problem to the government authorities and by 1992, sought (unsuccessfully) legal compensation with the help of the NGO, Legal Aid Foundation, Surabaya (Lembaga Bantuan Hukum - LBH). The industry's response was to change the people's water supply from the wells to public town water. This response merely produced a much added expense to the people as now they must pay for their water supply and does not solve either the problem of abating the industry's polluting activities nor the problem of rehabilitating the ground water (LBH: 1992).

The contamination of ground water, already stressed with high levels of nitrates, poses a serious threat to the livelihood of people within industry environs because well water is the only source of potable water for 60% of the total population, not in the Brantas basin, but all of Java.

c) Impact upon shrimp production and local fisheries

East Java is Indonesia's fourth largest shrimp producer with almost 50,000 hectares along the north coast under brackish water aquaculture, a method traditionally called "tambak". Approximately 44% of East Java's tambak are located in the delta region of the Brantas system, along the eastern reaches of Surabaya, and in Sidoarjo and Bangil, producing 42% of the total East Java harvest (SLHTJ: 1995). In 1994 East Java exported 22,500 tonnes of shrimp (34% of the total harvest) to Japan valued at US$ 235 million and was East Java's fifth largest export earner with 7% of the total export value (SPLN: 1994). However, the industry has been in a process of decline since 1988. Between 1988 and 1992 production rates per hectare dropped from 2.3 tonne/ha to 1 tonne/ha. Only increases in market value had kept the industry afloat, more than doubling from $1,900/tonne in 1988 to $4,400/tonne in 1994. Approximately 11,000 families in the Brantas delta depended on the industry (KSJT: 1994). Tambak communities in the delta have been operating since the Majapahit Era of the 13th Century, considered one of the famous of eras in Javanese history. These communities take strong historical and cultural pride in their livelihood.

In the Brantas delta region the problem of wide sweeping shrimp kills began in 1991. The tambak farmers repeatedly reported to authorities that their stocks were dying from pollution, citing the two pulp and paper mills, Pakerin and Eureka Aba, upstream as the source. In 1992, the tambak families formed an independent association in order to put their case to the government authorities. When kills reached a critical point in mid 1993 production over 9,000ha declined by 60%, with an estimated loss of $20 million and a retrenchment of 20% of the workforce. When the tambak farmers approached the Pakerin mill, the mill complained that proper waste treatment would cost $6,000 per day. The farmers complained that the cost was not profits lost, but instead, illegal profiteering.

The Fisheries Faculty at the Brawijaya University, Malang have taken strong interest in the tambak farmers' concerns. In 1993 staff conducted tests on shrimp and water quality of the tambaks and confirmed the tambak farmers' own suspicions that industrial pollution has been the cause of the kills though ironically, the results were not permitted by government to be released to the farmers themselves. The results indicated that two large pulp and paper mills were contaminating the ponds. However, there are innumerable other sources of pollution discharging into the waterways between the paper mills, located 30km and 40km upstream, and the tambaks located at the outflow. Among them are tanneries and battery recyclers in Sidoarjo as well as a major dumping site of raw septic pump-out sewage just 5km upstream from the tambaks along Porong River, and a similar site for septic discharge of similar quantities on the Surabaya River. The pollution sources cannot be attributed to just the paper mills alone. However, river water is the main flow that fills the ponds, depending on tidal currents to hold back and raise the rivers high enough in order to enter the pond intake gates. Tambak owners believe the viruses are only dominant because the prawns have unhealthy conditions to live in - made unhealthy by the contaminants in the water. Since late 1995,
tambaks all along the north coast are harvesting a mere 7% of former production levels, bankruptcy has become wide spread and the cost of shrimp "seedlings" has dropped from Rp.17 per seed to Rp.4 per seed because farmers are no longer prepared to invest in production. Unfortunately the government authorities state that the reason for the sharp decline is theft of the produce. But this can hardly be the case. Harvest procedures confirm that it would take one night to drain a pond and seven workers another half day to "steal" the catch (Personal communication, Franz Tjoa, tambak investor, Malang, September, 1996).

River pollution is not only confined to issues of BOD. In Surabaya, Airlangga University's Faculty of Community Health have been assessing mercury, cadmium and copper contamination in the lower reaches of the Brantas Basin since 1982. At the end of the Surabaya River it branches into the Mas River flowing north and the Wonokromo River flowing east to the Kenjeran coast of eastern Surabaya. In 1991 analysis of cadmium in crabs in Kenjeran showed levels of 18ppm (Gatra, 19/10/96) while a 1993 analysis of lead (Pb) content in the Mas River showed levels of 34.4ppm (DIOTEK, 1/2/94), more than 650 times higher than the lead level standards for drinking water established by the World Health Organisation and 137 times higher than EC standards for fish. In August 1996 massive fish kills occurred along the river (Surya 9/8/96). In 1996 the same Faculty reported that the Wonokromo River was the source of high mercury and copper levels found in the fishing communities and seafood catch along Kenjeran. Mercury levels in estuary mud reached 1.485ppm, in fish 0.230ppm and in snails 0.210ppm. These levels are critically above the WHO standard for mercury of 0.001ppm. Mercury in blood samples from community members averaged 0.025ppm, and people are showing neurological symptoms from poisoning (Gatra, 19/10/96). But also wide press exposure about this case has lead to a market collapse of up to 80% of Kenjeran's seafood catch (Jakarta Post, 9/10/96).

d) Impact upon duck breeding

Along the up section of the Mangetan Canal, some 200 rice farming families use to earn added income by duck breeding - boiled ducks eggs and fried duck being popular restaurant foods. However, between 1991 to 1994 the breeders reported the death of thousands of ducks. As mentioned above, sampling confirmed contamination of the canal water (Yoshinori: 1991). Tests to assess toxicity levels in the ducks, sponsored by the Surabaya branch of the Indonesian Legal Aid Foundation (LBH) on behalf of the duck breeders, were never responded to. But the breeders felt they knew the cause of death - when the canal water would periodically change colour from the "natural" brown to red, blue or black, the ducks would fall ill. The "colours" were discharged from the pulp and paper mill, Tjiwi Kimia located 5km upstream.

Seeking compensation, the duck breeders banded together and put their case to the government authorities, mediated by the LBH. The government response was to persuade the mill to build fences for the ducks to prevent them from swimming in the canal. The was a heavy loss to the farmers considering price of laying ducks is between US$3-4 per duck and that each farmer kept around 200 ducks. When it is further considered that each duck can produce around 700-1,000 eggs in its laying life which the farmers can sell at 5 cents per egg with very few overheads, the total loss to the 200 farmers between 1991 to 1994 can be conservatively estimated at $1-1.5 million. In 1994 one of the boilers in the pulping section (whether by accident or design) exploded, and the mill halted its pulping process, preferring instead to import from a subsidiary plant in Sumatra. Although the mill finally adopted abatement technology in 1995, the damage had already been done and the farmers are still no longer willing to risk re-establishing what was once for them a very lucrative local initiative.

e) Gender issues: women and water quality

Women's relation with water primarily focuses around their responsibility for family health, child care, sanitation, hygiene and food preparation and food production. Women have a vested interest in the maintenance of reliable water supply be it river or well water. Though official figures state that only 5% of the basin's population depend upon the river for domestic purposes, this still adds up to three quarters of a million people. Women's use of the river system for washing and bathing both themselves and children, while very common in rural areas, is often still concentrated in urban and semi-urban areas, especially among the poorer riverbank communities where population densities are often the highest. This phenomena will remain a predominant feature of river use for as long as contemporary basic socio-economic conditions exist, and for as long as infrastructural needs are not provided. Industries also are basically an urban or semi-urban
phenomena. It stands firmly to reason therefore that it is the most vulnerable in society that are
affected by the dumping of untreated wastewater into river systems.

While cases of diarrhoeal diseases in the Basin appear to be below national averages, in
1989 in East Java, 20,000 cases of typhoid were reported. This figure doubled by 1992, to an infection
rate of 850 per 100,000 population. Within the Brantas Basin, some areas showed increases of
typhoid cases of between 2 to 18-fold (DK: 1993). Certainly industrial waste cannot be considered a
major contributor to this increase, but the concentrated river use by the poor in areas of concentrated
river abuse by industry contributes to a number of illnesses, depending on the waste. People complain
of “gatal-gatal” (skin irritation) in some areas, headaches and dizziness in other areas, and
vomiting and dysentery in others.

This situation is exacerbated by seasonal shifts. The river has extreme fluctuations in flow.
In the six monthly wet season (the typhoid season) there is too much water. In the dry season
however, there is too little water and consequently industrial wastes have higher levels of
concentration. Of the 68 sugar factories in Indonesia, 34 are located in East Java with six in the
Brantas Basin, and all discharge their waste into a river or irrigation canal (Suyoto: 1991). Sugar
mills operate in the dry season parallel with the sugar cane harvest, precisely when community
water needs are highest but the river flows are at their lowest. In the dry season Porong River
trickles at 0 debit. This is a major problem for riparian communities in the low lying regions of the
Brantas.

Foul smelling industrial wastes are also a problem as they often sit in exposed holding
ponds such as with the distillery in Mojokerto mentioned above, the acidy smell hanging over the
neighbouring communities for a 1km radius on a still tropical night. They can also flow in open
drains along public roads. The wastes from one tannery, Kebalen Timur in Malang, cascade down to
the river through an area with 90% higher density rates than the East Java regional average.

Women have been at the forefront of complaints to both distillery, and the tannery because
they have born the brunt of the pollution problem. In the area alongside the tannery, some women
have had to send their children away on doctor's orders because of a chronic lung condition. The foul
smell of the wastes contributed to the children's illness. Women have lead placarded protests
against both the tannery and distillery, the latter attaining the name "the acid factory" by the
locals who complain of watery eyes and troubled breathing.

The culture of silence

It is widely stated both within and without Indonesia that the underclass are positioned in
a peripheral condition of disempowerment and thus tend to be politically docile and
characteristically fatalistic. They live within what has been called "a culture of silence".
However these same people have in East Java demonstrated violent reactions to the pollution of
their lands and water, and to the consequent deterioration of their livelihoods.

In the Pasuruan region, though not in the geographical basin but wholly within the
"economic basin", in March 1992, some 200 villagers from the surrounds of the Indaco Sejahtera
company, a cattle feed production factory, protested against the industry's practice of dumping
waste shrimp heads into their irrigation canal. The villagers had for three years made formal
complaints to government authorities who in response had issued warnings to the factory. The
protest became uncontrolled and the farmers broke into the factory, set fire to it and brutally
assaulted the Managing Director of the Company. Damage by fire to the factory was estimated at
US$ 150,000. The Managing Director was admitted to hospital for 10 days and 200 jobs were lost
(Bintoro: 1992).

In Mojokerto, at the distillery mentioned above (see groundwater section), rightly said to be
one of the heavier polluters of the river, five treatment lagoons used for sedimentation and aeration
were built in early 1992. By mid 1992, complaints arose about the smell, but trouble fermented when
the wells of residents on the eastern side of the lagoons became contaminated. In August 1993, the
eastern side residents held a protest demonstration at the factory. The demonstration involved
some 70 residents, mostly women, carrying placards demanding a stop to the wellwater pollution
and to the smell. It is fortunate this particular protest did not get out of hand as the factory
produces ethyl alcohol9.

The list of protests does not stop here. The Surabaya LBH has documented 19 protests
occurring in the Brantas Basin between 1991 to 1994, and there have been at least 8 more protests
against other industries in the basin since then.
Between 1993 and 1995 a community in Malang complained to local authorities about waste from another tannery, Pagina Cita located 200m upstream, polluting "their" river which began to smell like decaying meat and had incurred an infestation of leaches due to the accumulation of fats and blood. The tannery processes 30,000 raw sheep skins a month. Frustrated with the lack of cooperation from both government and the factory, the community broke into the plant smashing the front office and destroying the waste outlet pipe. Though this factory had good relations with authorities, the latter could not protect it from the anger of the community. The factory closed down tanning operations and changed to cement fibre board production.10

Again in Pasuruan in late 1995 a South Korean joint venture producing monosodium glutamate for export was confronted by 200 protesters, who blocked the main regional highway, burnt the factory's cars and buses and 14 of the factory's on site houses. The surrounding communities' protest was because wastewater was being discharged into the Rejoso River, important for the people's water supply and main feedline of water for their tambaks. Meanwhile the regional government defended the factory, claiming that pesticides and domestic wastes were the cause of the shrimp kills occurring in the tambaks (Surabaya Post, 23/11/95).

The Clean Rivers Program (PROKASIH)

PROKASIH is a national program, in fact born out of pollution issues arising in the Brantas River and was legislated in Surabaya in 1989. Indeed the program has achieved much of its childhood learning on the Brantas. It is a crash program focused on BOD, requiring industry to reduce effluent loads by 50% by 1990 and to meet specified effluent quality standards by 2000. Throughout Indonesia, all industries with river or irrigation outlets must install and operate waste water treatment plants, or face closure. This requires the development of waste minimisation practices and techniques as well as the uptake of state-of-the-art wastewater treatment systems for factories. So far, these have clearly not happened. As a policy, PROKASIH has tried to combine incentive with litigation. Agreements have been struck between government and 14 major industrial sectors on water pollution control. Some members of government agencies involved show serious concern.

Constraints to PROKASIH in the Brantas Basin

On paper the PROKASIH program appears exemplary. In the field however there are some major problems. Monitoring officials complain they cannot monitor wastes properly. Government complains that industry is being deceptive. Agencies in the program deceive each other. Industry complains that it is doing the best it can to avoid causing problems to the people and that wastewater treatment technology is too expensive. Mediating NGOs complain of collusive practices while the affected communities complain of degradation of their health, land and livelihood. These constraints combine and link in ways that make the program difficult to implement.

The first major constraint is keeping up with industrial development. In 1989 more than 720 medium to large industries (ML) were registered in the Brantas Basin of which 459 were assessed as potential polluters for the river system (Bintoro: 1992). Early PROKASIH plans were to eventually bring all 459 into the PROKASIH agreement. However by 1996 only a 3 out of the 60 targeted PROKASIH industries had adopted adequate abatement technology, a further three were in the process of adoption and only a handful of others had development rudimentary levels of primary treatment. In the meantime the number of registered ML in the Basin has risen dramatically since 1990 and industry types ensures increases in the BOD levels.

The second major constraint is the PROKASIH management of the monitoring program. According to East Java Regulation No.12, 1988, the Bureau of Technical Environmental Health (BTKL) has the sole responsibility for monitoring industrial discharge into the river. However, under PROKASIH regulations two other agencies, the Bureau of Industrial Research and Development (BPPI), and the PJT, have also been given this duty. Therefore there has developed a conflict of interest between bureaucratic departments and a lack of accordance to legislated regulations regarding monitoring. Nonetheless, the river is monitored on a monthly basis by the three agencies at 50 separate points along the river targeting 60 industries in the Brantas Basin. In the past, monitoring instruments have been in lengthy states of disrepair, BOD/COD samples have sat for days before analysis and the three agencies' labs have no standardised procedures. Funds have been allocated inefficiently and the monthly reports on the targeted industries have definitively been adjusted to suit a "best case scenario" so as not to disturb "civil stability", at least according to PJT managers (personal communication, Technical Director, PJT, Malang, February, 1990).
1997). In the PROKASHIH II Report (1991) it was claimed that 1,248 ton BOD/day was discharged into the Brantas river system from the targeted PROKASHIH industries and a further 3000 ton BOD/day was discharged through domestic sources. In 1993 it was claimed that industry discharge had been reduced to 66 tonne of BOD/day (PROKASHIH IV: 1992-93), i.e., to a mere 5% of the 1991 figure for industrial sourced BOD. PROKASHIH IV claimed that industrial wasted caused only 30% of the total BOD while domestic waste caused 70%. Yet no change within industrial practice during that time could warrant such a reversal in figures. Meanwhile, PJT, a PROKASHIH team member, still claimed that industry discharge was still the big polluter, with 20% was produced by sugar mills, 15% by distilleries, 42% by pulp and paper mills being the dominant contributors (Roedjito: 1993). The 1996 PROKASHIH VII Report however, shows a significant increase in BOD, by up to an average of 1,222% for 20 of the targeted industries, including a 97% increase on average for 7 of the largest pulp/paper mills. Once again in 1996, government sanctions in the form of letters of reminder were issued to the big polluters, once again the industries claim the abatement technology is in process of development.

And so the third constraint is the industries' ability to deceive. They have become adept at stalling for time to adopt abatement technology and use the excuse to overcome sanctions. Industries also know when the monitoring teams will take samples and can either withdraw or dilute the discharge of their effluent accordingly. Also samples are taken by day but many industries discharge by night. Consequently the monitoring is not at all representative of the true condition of the river system.

Industry deception has lead to legal constraints. It was the regional East Java Police (Kepolisian Daerah - POLDA) who took up the PROKASHIH drive with the most vigour. In late 1989, in an operation called "Kemukus", they set about gathering data on industries in East Java and classifying them based on their potential as polluters. In all, 459 industries were pinned with the potential polluter tag. Also in 1989, the first court case was set down against a tofu factory. When the court case failed due to improper waste sampling and inconsistent laboratory results, POLDA conducted a one week training course for police officers, judges and lawyers. The course covered such areas as environmental planning, environmental legislation, methods of assessing environmental offences, water quality standards and pollution characteristics, and proper sampling procedures (ITS: 1990). Following on from this, by Governor's Decree, the three laboratories involved in PROKASHIH monitoring were ordered to standardise procedures of sampling and analysis.

Between 1991 and late 1993, the Chief of POLDA, Major General Koesparmono attempted to put pressure on the paper mill, Pakerin. In 1992, supported by POLDA, the East Java Governor decreed the mill must build waste treatment facilities by October 1992 but nothing came out of this warning either (Tempo, 16/4/94). A number of press releases were issued and the LBH, encouraged by these events began a law suit on behalf of affected communities whose rice fields had been degraded by Pakerin's wastewater discharging into the irrigation system. The law suit against the company was based on the Environmental Act, No.4, 1982 which states that people whose health and/or livelihood are affected by the pollution, or whose environment is destroyed by pollution, have the legal right to prosecute the polluting industry. The suit was supported by witness from BPPI and BTKL. By early 1994 Chief Koesparmono was promoted and transferred to Jakarta, a practice commonly applied to officials who become too "active" in their cause.

The Pakerin Case conducted by the LBH ran for six preliminary hearings at the Mojokerto District Court. Pakerin was never brought before the court because the District Prosector faulted the case on technicalities, preferring to look at the way the evidence was processed rather than the evidence itself. The monitoring evidence was rejected because it was photocopies of official monitoring reports rather than originals. The Prosecutor also made the claim that Pakerin was committed to the uptake of effective treatment technology. But he also claimed that the section of the river where the company discharges its waste had been given the wrong classification of standards for effluent quality. The court case bogged down into an argument against the Prosecutor rather than an action against the industry (LBH: 1994). This case lead confirmed a statement made two years earlier by the High Court of East Java that large industries with strong backing in Jakarta can easily override East Java regulations (Bintoro: 1992). However, in the final hearing, the Prosecutor stated that in future the High Court would permit the use of the Criminal Act in environmental cases (LBH: 1994). This proved worrisome for the company and in late 1994 it issued its own statements that it had commissioned a new treatment plant claimed to cost US$ 7.5 million. However the 1995-96 monitoring reports from PJT detected BOD levels from the mill of between 2-8
times higher than permitted effluent standards, bringing into question the validity of the company’s statements and/or the effectiveness of the treatment technology it adopted.

In 1996, efforts by LBH to use the Environmental Act against three other paper mills in a joint case failed because it was ruled that the mills were committed under PROKASIH agreements to adopt treatment technology. Ironically, PROKASIH appears now to be protecting large industries through collusion rather than pursuing them. The LBH has attempted to bring four factories to court. All have failed because of industry’s power to evade them.

A dilemma for small to medium industries

It is clearly evident that large factories have the capital required to clean up their waste problems, though in the past they have squashed all efforts of persuasion. But small to medium factories (SM) when for example, faced with a PROKASIH deadline, do not have the bargaining power that large industries do. To stall a deadline they "buy" time from rent seeking authorities. But also, because they often must compete with higher tech monopolistic industries, the added expense of abatement technology capable of meeting water quality regulations could drive them out of business. Tanneries in the basin face this problem because a joint venture combining French and Indonesian conglomerate interests has built a large new tannery, Ecco, near Surabaya which can produce skins much cheaper than the smaller operators. The tannery Pagina Cita in Malang mentioned above, now buys processed skins from Ecco for its leather garment operations. The French tannery, like Japanese and American interests in the basin, automatically designed abatement technology into the production process. It may appear that because Pagina Cita buys processed skins from Ecco that this is a step in the right direction due to the overall reduction of waste, however, it is also an indication that in predatorial economies such as Indonesia’s, water quality control can assist large industries swallow the small.

As a private business enterprise, wastewater technology is extremely competitive and there is a growing number of Indonesian environmental consultants who are not trained to conduct the rigorous analysis required for waste management thus leading to inappropriate technology design and application. At the same time, government agencies such as BPPI who assist SM industries with design of abatement technologies are inexperienced to do so and have relied on these consultants to provide SM factories with technical assistance. To date applications have been haphazard, straight out of the text book without any analysis of individual industry needs.

In 1994 two SM tapioca factories, Sumber Tani and Sumber Timur, located alongside each other on Kali Lesti, a major tributary of the Brantas in the Malang Regency were provided with design specifications and technical assistance for the construction of wastewater treatment facilities. The facilities comprised of a screening stage for solid wastes, basic holding lagoons for sedimentation, and aeration ponds to reduce the BOD potential. The assistance, provided by a private consultant recommended by BPPI, cost $30,000 per factory. The major factor of BOD strength, ie, the dissolved starches, as well as the 10ppm of cyanide naturally occurring in tapioca wastes (more than 100 times the WHO recommended levels) were not accounted for in the design.

At the same time, the SM industries are demonstrating a lack of ability to join and coordinate treatment practices that would ultimately serve to benefit them. The above tapioca factories are situated alongside each other. They have similar production processes (though one has more machinery) and the same wastewater but they could not share a treatment system even if their discharge could be metered to determine their respective flows and costings.

Conclusion

Clearly, improved water quality in the Basin would be an important means of achieving humanitarian goals. Deterioration of water quality leads to a deterioration in quality of life. In terms of equity, communities existing alongside or downstream from polluting industries are losing out but they have shown they will defend their rights. The benefits of discharging untreated wastes favour the industries while the costs are borne the communities. Reversing this position is of absolute necessity though ironically, enforcing polluter pay principles on small to medium industries may provide greater manoeuvrability for conglomerate interests.

The agencies responsible for river water quality and pollution control have learned a great deal about the task at hand and some of their younger staff members understand the issues but as yet do not hold influential positions to confront their often uninformed leaders above because of the possibility of disturbing the status quo. They must sit docile. However, precisely because they are aware, they sit comfortably on the promotion lines. This strata of the bureaucracies may need to
wait some 10 years before it will be able to operate effectively. The critical question is, whether the pace of industrialisation over that 10 year period can be balanced with community rights to clean water and the frustration they display when that right is abused.

Endnotes

1. The triangle constitutes Surabaya, Gresik, Mojokerto, Kediri, Malang and Pasuruan. The Brantas basin constitutes approximately 75% of this region. While called a "triangle", it is not so in a geometric definition of the word. It should be noted that the administrative boundaries of Gresik and Pasuruan are not wholly within the Brantas Basin. This overlap has been taken into account with estimating total number of investment projects located within the Basin itself.

2. Personal communication with Mas Purwoko, environmental advocate, Legal Aid Foundation (Lembaga Bantuan Hukum - LBH) Surabaya, February, 1994.


4. Personal communication with Pak Usman Hidayat, Bangil, March, 1994. Pak Usman is a tambak owner and at the forefront of the tambak protests.

5. Personal communication with Ms Godji, Dept of Fisheries, Brawijaya University. Ms Godji has been researching water quality of the Brantas River and its affects upon fish downstream since 1989. However more recent research sheds doubt the validity of the farmers claims. Firstly, there had been a widespread viral epidemic that swept across shrimp production throughout Indonesia and the first plunge in production levels seems to have been a result of it. Recent research has detected four types of virus in tambak shrimp. Shrimp kills began in the basin three years after it began occurring in other parts of East Java and this could be due to the more traditional low stocking density methods of farming used in the delta rather than the capital intensive high stocking density methods used elsewhere in East Java (Hariati et al: 1995. 1997). Secondly, and related to the first point, there is a case for poor management of tambaks. Continued production loss lead farmers to adopt semi-intensive cultivation methods thus exceeding appropriate stocking densities without appropriate technological support. They used 200 kg/ha of compost to help grow plankton and used triple super-phosphate or urea, and they began to over feed the over stock, using 40% protein enriched commercial feed, leaving excess food waste on the bottom of the ponds, which in turn lead to excess parasites and bacteria. Farmers also changed shrimp species from banana prawn (sp. penaeus mergenensis) to black tiger prawn (sp. penaeus monodon) because they are a larger variety and can reach harvestable size before dying off from either the pollutant load or the virus, whichever comes first (and though the harvestable size is still only a quarter of that the species reach in natural open sea conditions).

6. The World Bank (1994: 139) states that a caustic soda plant has been operating near Surabaya for nearly 40 years. It also cites a report that high levels of mercury wastes from the plant have entered the local fish ponds.

7. Personal communication with duck breeders along Mangetan Canal, Mojokerto, July 1992, December 1994, October 1995. In December, 1994, Mas Purwoko (LBH) stated that the test results conducted at Airlangga University revealed levels of toxicity, but university staff did not know what the compounds were. This is perhaps an understandable inability given the quality of laboratory facilities in Indonesia. But it is also a statement about the level of chemical compounding occurring in the canal.

8. This data was classified as not for public distribution. It was collected in 1994 with special permission from the East Java Government. Unfortunately, I am no longer in such a favourable position to update it though indeed, it would be most interesting to follow more recent trends.


11. In the PROKASH IV report for the year 1992-93, BOD levels for the Pakerin mill dropped from the 500-400 level to the 150-50 level with an average reduction of 40% between 1990-94. The reduction happened as if by magic without any real change to their discharge practices though the report claimed that the industry had built effective wastewater treatment facilities in July 1993.

12. As another example of industry deception, there are 14 pulp and/or paper mills along the Basin, 12 of which are on the PROKASH priority list. These twelve mills produce approximately 1 million tonnes of paper a year. A very conservative estimate of the volume of wastewater from the production of one tonne of paper is 100 cu.m, therefore the total volume of wastewater just from the twelve mills is approximately 100 million cu.m per year of varying concentrations. Yet the PROKASH VII Report for 1996 states that the total load of wastewater from these pulp and paper mills is 30.4 million cu.m -around 30% of an estimation on averages (PROKASH VII: 1995-96) The discrepancy is caused by a general lack of admission by industries as to the actual amount of water being consumed. One mill, Jaya Kertas, in fact has 6 times more discharge than official PROKASH reports proclaim, according to one consultant who was asked by the mill to design a treatment plant. Though the PJT have an elaborate water pricing system, it is struggling to collect fees accountable to the actual volume of water usage. It is quite possible for larger industries to construct deep wells and thereby bypass official government metered wells. Though not confirmed, it is reported that one paper mill Tiwi Kimia, has adopted water recycling technology.

13. Personal communication with Pak Ischak, Director, Kebalen Timur tannery, Malang, February, 1994, October 1995. He said that he may only last 5 years in operation because of the Ecco tannery. With the added cost of
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abatement technology, he would go down much faster. To date, he has managed to build a sedimentation pond with the assistance of BPPI.

14. While it is still questionable whether the technology is operated, it is already in place to operate if the crunch line comes. It would appear that most joint ventures with Europe, America or Japan design and build abatement technology from the outset while ventures with Asian interests do not.

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