

RIVERS – THE LIFEBLOOD OF ASIA

Rivers are the lifeblood of Asia. For thousands of years the major waterways of Asia have been used to transport people, livestock and cargo. They are also a ready source of food and water for people and animals. Many of the great rivers of Asia have become part of the regional folklore. These same rivers are dying.

Poverty – Restraining Environmental Protection

Hundreds of millions of Asians live in dire poverty. Poverty and environmental destruction are inextricably linked. Poverty is one of the original causes of damage to the environment and this damage then reinforces poverty through constraining development.

Direct sources of pollution such as sewerage and industrial effluent exist because poverty levels push environmental protection away from government and community attention. Environmental degradation will never be stopped by pollution control mechanisms alone; the sources of poverty itself must be addressed.

Migration to urban centres combined with high population growth has resulted in an unparalleled explosion in the size of major Asian cities. The failure of infrastructure to keep pace with this population expansion has



seen rivers become dumping grounds for garbage, sewerage and industrial pollution.

While rural areas contribute to the declining level of water quality in Asia's rivers, the sprawling cities on riverbanks are the major culprits. The pollution control mechanisms in these cities have been unable to deal with the increased waste burden.

Poverty and the lack of options for the poor have contributed to the degradation of watersheds. There is a strong relationship between poverty and acute ecological damage. Raising living standards is critical for improving environmental as well as social conditions. Efforts at development must be environmentally sound to ensure that the resource base upon which sustainable development depends is not destroyed.

Organic and Inorganic Pollution

Organic and inorganic pollution are the two main types of pollution that exist in water.

Organic Pollutants

Organic pollutants are defined as carbon-containing compounds that are discarded into the environment. They can be divided into the following two groups:

- “once living” matter such as sewerage and vegetable waste, and
- synthesised carbon based compounds, including some pesticides such as DDT.

The sources of “once living” organic pollution are generally agriculture, households and industry. Examples include rubbish (containing decomposing fruit, vegetables and meat) and human and livestock sewerage. The sources of the more insidious synthesised carbon-based compounds are primarily agriculture and industry. Some of these compounds (eg. DDT) increase risks of birth defects and are proven carcinogens.

Inorganic Pollutants

Inorganic pollution is defined as chemical substances of mineral origin that are discarded into the environment. This pollution is generally of an industrial or agricultural origin. Examples include heavy metals, sulphur and nitrates. Some inorganic wastes (heavy metals) tend not to affect oxygen levels in the water but settle in the sludge in rivers,

clouding the water and coating the riverbed.

Effect on Human Health

Both inorganic and organic pollutants can enter humans through the food chain, drinking water or physical exposure. There are serious concerns that ongoing absorption of pollutants, including bioaccumulation through the food chain, may cause irreparable genetic damage. Persistent Organic Pollutants (POPS), such as dieldrin, dioxins and heptachlor, are suspected carcinogens. These compounds also disrupt the reproductive and endocrine systems of humans. Mercury poisoning from fish in Japan is a telling example of the effect of inorganic pollutants on people’s health.

Effect on Water Quality

Most kinds of aquatic life need oxygen to live. Rain and the movement of the water body replenish oxygen naturally. Since organic wastes require oxygen to decompose, they diminish the quantity of oxygen available in the water for natural aquatic plant and animal growth. Organic wastes are responsible for the majority of odours that emanate from polluted rivers. They are also responsible for the blackening of the water.

Both organic and inorganic pollution can contribute to the phenomenon of eutrophication. Nutrients contained in sewerage and fertilizer runoff lead to blooms of algae and cyanobacteria. When the bloom dies, the process of decomposition dramatically increases biological oxygen demand. As most kinds of aquatic life need oxygen to live, the water can be rendered poisonous. Toxins have

caused death to birds, fish and animals and have been linked to human illness. The distinctive blue-green algae blooms of Australian river systems are an example of the disastrous effects of excessive nutrient loads in water systems.

Inorganic wastes smother the riverbed in a blanket of toxic residue and cloud the water. This clouding reduces sunlight penetration into the water and therefore obstructs photosynthesis and inhibits plant growth.

Watershed Management

Rivers are 'sinks' for wastes in their catchment areas. Even waste from activities carried out a very long way from rivers ends up in the river system. The movement of wastes into rivers may be very obvious with pollutants

such as domestic garbage, but the movement of pesticides and sewerage into rivers is less so. A river's feeder tributaries, often flowing through a wide geographical area, drain such wastes into major rivers. For example, deforestation, roads and open cast mining strip the land of its ability to retain water causing massive water run-off. The run-off washes chemicals, minerals, topsoil and human-generated wastes into rivers. Each of these pollutants causes different problems.

The link between watershed protection and river health means that looking after watersheds is critical for river maintenance. It is not possible to have clean water in the large rivers of Asia unless the multitudes of waterways that flow through the watersheds of these rivers, and therefore collect waste, are cared for.



THE PASIG RIVER

The Pasig River flows through Manila, the capital of the Philippines, and is a telling example of how large cities affect river water quality.

The river is only 26 kilometres long but plays a crucial role in linking Laguna de Bay with Manila Bay. Its banks provide a small space to live for about 70,000 squatters.

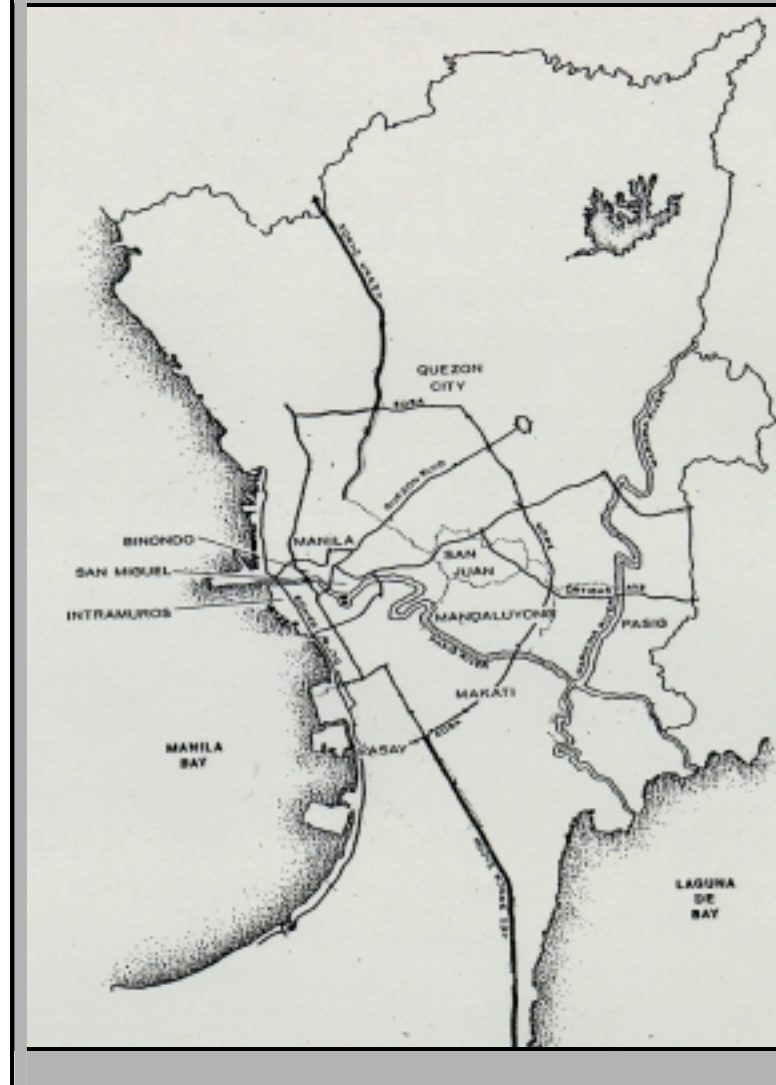
A reflector of growth

Manila is a city of enormous contrasts. At the time of Spanish arrival in the Philippines in 1521, Manila was a small tribal settlement situated on the Pasig River.

The Spanish ruled Manila from 1571. Later, the United States of America ruled the Philippines from 1898 until it gained independence in 1946. The Pasig River was the principal channel of communication within the interior. It offered the most convenient means of transporting people and cargo. It had an average breadth of 110 metres, with depths ranging from one to eight metres.

In the years before large-scale development of metropolitan Manila, the Pasig was compared to the Grand Canal of Venice as it ‘Serpented inland, framed on either side by patches of lush greenery, its waters clear and unimpeded by waste or debris.’

Metropolitan Manila



The infrastructure of Manila has failed to keep pace with its escalating population. Rubbish disposal and sewage treatment problems have developed. In order to find room for Manila's increasing population, there has been government-led land reclamation to the west of Manila. There has also been a population-forced expansion to the northwest, and private sector-led movement to the south and east.

Geographical Significance

The Pasig River is the only outlet that drains excess water from the landlocked Laguna de Bay. It also drains 13 major river tributaries, in addition to Manila's vanishing network of esteros (narrow canals) and creeks. If the Pasig became blocked, the low-lying areas of Rizal, Laguna, and Manila north and south of the river would be transformed into a lake, flooding large areas of farming land. Communities would be displaced.

Manila suffers extensive flooding in most wet seasons. Flooding occurs when Laguna de Bay overflows with water from its catchment area. Siltation of the Pasig limits water movement into Manila Bay, worsening the problem.

The Pasig needs to remain clear of debris so the natural reverse flow of salty water at high tide can make its way up the Pasig to Laguna de Bay. This salt water is essential to Laguna de Bay's ecology. The salt helps to clump solid particles in the lake, causing them to sink. Clarity of the water is therefore improved, allowing greater sunlight penetration. This leads to increased plant growth, which is essential for the sustainability of fishing industries.

Ecological State of the Pasig

The Pasig has suffered as a result of decades of pollution. About 4.4 million people live in the barangays, or suburbs, near or along the Pasig River and its tributaries.

The Pasig is currently considered unsuitable for any use. During the dry season, the water level drops and the river becomes stagnant. The dissolved oxygen levels in the river are often zero, which means that no life can grow.

Cleanup could take 15 years to raise the water quality standard to class C, which means that it is capable of sustaining aquatic life. It would also be suitable for secondary contact recreation activities such as boating, the growth of fish and other aquatic resources, and for industrial water supply. The cost of rehabilitating the river to class C standard could exceed US\$10 billion.

The massive overpopulation in metropolitan Manila has seen the river used as a refuse point. One third of Manila's rubbish is not collected. Only 20% of the residents in Manila have access to sewage facilities. Much of the excess rubbish and sewerage ends up in the Pasig.



'In the 1930's, the fish started migrating away from the river; in the 1950's it was no longer possibly to bathe in the water; in the 1960's you couldn't wash your clothes in it; in the 1970's it started to smell; in the 1980's everything just declined.'

More than 300 factories operate on the river's banks. Many factories release untreated industrial effluent directly into the river. Throughout the 1980's and 1990's, industrial waste accounted for approximately 145 tons, or about 44% of a total of around 330 tons of pollution dumped into the Pasig daily.

The other obvious source of pollution is the squatters who have settled in semi-permanent makeshift dwellings on the river's banks. The squatters account for approximately 35 tons of solid domestic waste and 150 tons of liquid domestic waste a day.

The Pasig River system serves as a catchment for the wastes produced by about 12,000 industrial and commercial establishments. Factories poured an estimated 50 million litres of industrial waste into the Pasig each year during the 1980's and 1990's.

Poor maintenance of the drainage infrastructure has worsened the pollution problem. The Pasig's main tributaries are the San Juan and Marikina Rivers, which also flow through metropolitan Manila. The tributaries are blocked with plastic bags, garbage and other debris, leading to incomplete flushing of the polluted water.

The esteros, built during Spanish colonial rule to drain Manila, have also been badly neglected. Proper cleaning and maintenance of the canals is necessary to maintain flow and water quality.



Poverty in the Philippines

Poverty is an enormous problem in the Philippines. The Philippines has failed to achieve consistent economic growth since it gained independence in 1946. Political instability in 1985 caused an economic decline until 1993.

Current population growth in the Philippines is a high, at 2.1% a year. High population growth has meant that economic growth has not always led to increases in the standard of living.

Gross National Product (GNP) per capita is currently around US\$1,200, with Purchasing Power Parity (PPP) at \$3,200. While the Philippines has levels of GNP and PPP per capita that place it in about the middle of the spectrum for developing countries, it suffers disproportionately high levels of poverty.

Approximately 37% of the population live on the equivalent of less than one US dollar a day. The level of abject poverty is even more extreme in rural areas with an estimated 51% of the population below this poverty line.

Part of the reason for the disproportionately high level of poverty in the Philippines is a heavy reliance on agriculture. More than 40% of the workforce is in agriculture. Countries with a heavy dependence on agriculture often suffer high levels of poverty and low levels of economic stability.

Life on the Pasig

Some 1.7 million of Manila's residents are squatters. Up to 70,000 live on the banks of the Pasig alone. They build their homes out of whatever they can find. Pressure for land around the river has become acute, with some squatters resorting to building multi-storey shanties.



Life on the Pasig is desperate. Many do not have enough work and eke out a living by sorting through Manila's rubbish dumps, collecting materials that can be sold for re-use. A depressing sight on the bridges spanning the Pasig is children fishing for plastic bags to sell or re-use. Often squatters cannot afford to send their children to school as the cost of materials and clothing is too great. Manila has an acute shortage of adequate housing.

The living conditions in the squatter's dwellings are terribly inadequate. There is no garbage disposal, clean water or sewerage facilities. Dwellings are cramped and unstable. Floods also present a significant risk. Because of the proximity of dwellings to the river, they are often damaged or destroyed when the river swells with floodwater. The people have nowhere else to go and simply repair their homes and get on with their lives.

Public Housing

Philippine law states that no structure should be built within ten metres of the banks of the Pasig. Despite this, squatters, industrial buildings, private lot owners, petroleum depots, and even the Malacanang Palace, have usurped every spare inch of space along the waterway. While the Government of the Philippines recognises that the squatter communities represent one of the major sources of pollution in the Pasig, it is also concerned about the fate of the squatters. By law, the shanties can only be demolished when the squatters can be transferred to a specific relocation area.

The Housing and Urban Development Coordinating Council is responsible

for the management of public housing in Manila. It is searching for suitable government properties that can be used as relocation sites for the squatters living on the river's banks.

Removal of the squatters, and their resettlement into other areas, is one of the significant tasks necessary for the rehabilitation of the Pasig. Relocation will also protect the squatters from the dangers that floods present. The government is hoping, over a two-year period, to relocate the squatters and clear all easements along the Pasig of industry.



Relocation may do little to improve the situation of squatters. As the demand for land is so intense in Manila, most of the sites prepared for relocation are on the fringes of the metropolitan area. The ability to find employment is often decreased when people live in isolated areas. Relocated squatters will need to contend with the difficulties of searching and travelling to work from these distant sites. A number of those resettled have returned to be near their means of livelihood.

Transport on the Pasig

The city of Manila has an enormous transport problem resulting from its inadequate transport infrastructure and expanding population. The Pasig has been used as a transport route for people and goods for hundreds of years. The Pasig is seen as one possibility for reducing the burden on land-based transport services. This will also improve air pollution problems.

There are twelve historic landmarks and many points of interest along the river. These include the Mabini Shrine, the Malacanang Palace, the Manila Boat Club and the thirteen bridges spanning the river. The Iglesia Ni Cristo Church is also visible from the river as is the historic Matthew Goldenburg Mansion, where the very first Senate sessions were held. The close proximity of these points of interest is seen as a way to promote the Pasig as a tourist attraction.

A ferry serviced points along the river until 1969. A new ferry service began operating in 1990 using river buses to transport residents. The trip began in Bambang in the east and ended in Escolta, near the mouth of the river and the walled old town of Manila. With seven stops, the boat trip to the centre of Manila usually took 30 to 40 minutes, which was about half the time taken by road. It was quick, convenient, reasonably priced and less crowded than land-based transport.

However, utilisation of the ferry was inadequate to cover operating costs. The ‘offensive odour’ of the river was listed as the number one reason why prospective commuters refused to ride. Even regular boat passengers did not use the ferry during summer months, when the smell is at its worst. The



ferry service was phased out at the end of 1992.

LIFE AFTER DEATH

The people of Manila are acutely aware of the historic and geographic importance of the Pasig. They do not wish to see it stay in its present state of decay. As a result, many community and government initiatives have developed to rehabilitate the river.

The Biochemical Oxygen Demand (BOD) measures the amount of oxygen required by aerobic bacteria to break down organic material present in the river. For aquatic animals and plants to flourish, the BOD must be below 200 tonnes a day. In 1991, the Pasig's was 327 tonnes, but it was reduced to 230 tonnes by the end of 1998.

Government Initiatives

Government efforts to rehabilitate the Pasig started in the late 1950's. Over the years, a range of agencies had

responsibilities for the river. In 1999, the three main ones were consolidated into a single commission. Philippines Government funding has been provided and rehabilitation of the Pasig is now a major Government program.

Community Participation

More than one hundred groups from the government and private sector have formed in response to the call to rehabilitate the Pasig. The Clean and Green Foundation is one of these groups. The Foundation sources funds from individuals and the private sector. Its Clean and Green awards are given to the most/least 'clean and green' of the 116 barangays along the banks of the Pasig, and its major tributaries, the Marikina and San Juan Rivers. Cash prizes are given to winning barangays.

The awards aim to educate residents towards the institutionalisation of a waste management system into their communal culture. This will help in the reduction of the disposal of domestic solid wastes into these rivers.

Donor Assistance

Many donor countries around the world, including Australia, are aware that addressing the causes of poverty, in addition to direct environmental initiatives, is the best way to present a solution for the ecological destruction of rivers in the developing world.

The Australian aid program has provided a number of grants to Philippine NGOs to carry out projects focused on poverty reduction in Metro Manila, including the Pasig. These projects typically focus on generating employment and income for the urban

poor through, for example, job training and provision of credit.

Other donors are contributing to poverty reduction programs and to programs focused directly on the Pasig River itself.



The Way Forward

A work program has seen the condition of the Pasig improve considerably during the 1990's. The program reduced floating debris and cleared nearly 10 kilometres of easements along the riverbank. River flow improved due to continued removal of silt and derelicts from the navigable parts of the river.

A Master Plan for the rehabilitation of the Pasig has been drawn up for implementation from 1999 to 2004. The activities in this plan are intended to:

- 1) remove the sources of pollutants caused by people;
- 2) ensure the proper maintenance of easements and the clearance of esteros and waterways;
- 3) increase the capacity of the river channel and enhance river flow;
- 4) pave the way for a modern transport system;

- 5) create riverside parks and other facilities that will utilise the river's potential for recreation and tourism; and
- 6) generate public support for the river's rehabilitation and continuous protection.

A comprehensive Ecological Waste Management Plan to deal with Manila's worsening rubbish disposal problem has also been developed. Sanitary dumping sites have been identified and training sessions provided on waste segregation, composting, recycling and re-use, along with the development of accompanying facilities. These training sessions have assisted in raising community awareness of pollution control issues.

Inadequate sewerage facilities are one of the main sources of pollution in the Pasig. The cost of providing sewerage to all of Manila's residents has been estimated at over US\$2 billion.

A river dredging operation began in 1999 and is expected to take 3 to 4 years. The dredging of the river is also intended to enable a passenger ferry service, which will ease traffic problems in Manila.

Addressing poverty

Developing mechanisms to deal with sewage, garbage and industrial effluent is important, but the sustainability and long-term effect of such initiatives will be limited unless the root causes of poverty are addressed. Tackling the problems of ecological degradation of rivers in Asia requires an approach that extends well beyond focusing on the most apparent sources of pollution.

In some ways, people living in poverty cannot afford the luxury of environmental protection. This is clearly illustrated by the case of the squatters living on the banks of the Pasig: there are simply no services to deal with their domestic refuse and sewerage. The intertwined nature of poverty and environmental protection means that protection of the environment is likely to be seen as optional until poverty itself can be addressed. This is the challenge for countries like the Philippines, because poverty alleviation becomes more difficult as environmental degradation worsens.

