

River valley civilizations

The first great civilization, Sumer, developed in about 5000 BC between the Tigris and Euphrates rivers. The area was later called Mesopotamia (now Iraq). The first civilization in Egypt, India and China all happened along rivers, too.

Rivers and environmental destruction

- According to the World Commission on Water for the 21st Century:
- More than half of the world's major rivers are being seriously depleted and polluted;
- 25 million people fled their homes in 1998 because of the depletion, pollution, degrading and poisoning of river basins – outnumbering the war-related refugees for the first time in history;
- By 2025, the number of environmental refugees could quadruple*.

Which is the longest river?
 Flowing 6,695 kilometers through north-east Africa, the Nile is the world's longest river with the River Amazon a close second, just 255 kilometers shorter. Much of Nile-river's course is through desert, where it brings life to the parched landscape. The 3rd longest river in the world is the Yangtze River in China with a length of 6,418 km.[3]

Rivers are for life not for wastes

There are four main sources of river-water pollution: agriculture, factories, mines and people.

- Many towns and factories are built near rivers so that they can use water from the river. But most often the water is not cleaned before it is put back into the river. This dirtying of water (also air and soil) is called pollution;
- The pollution of rivers and streams with chemical contaminants has become one of the most critical environmental problems of the century[6];
- Phosphates and nitrates (coming from fertilizers, detergents, and livestock wastes) presence in natural waters is one of the most serious problems in the environment because they contribute to the eutrophication process - too much of these nutrients promote algal bloom. Algae reproduce and die rapidly. The decomposition process will use up more oxygen in water depriving other organisms of oxygen;
- Americans ranked pollution of drinking water, and rivers and lakes as their top 2 environmental concern[7];
- Mining pollution has historically been a major source of degradation of natural resource systems such as river, coastal, and air (USEPA 1995);



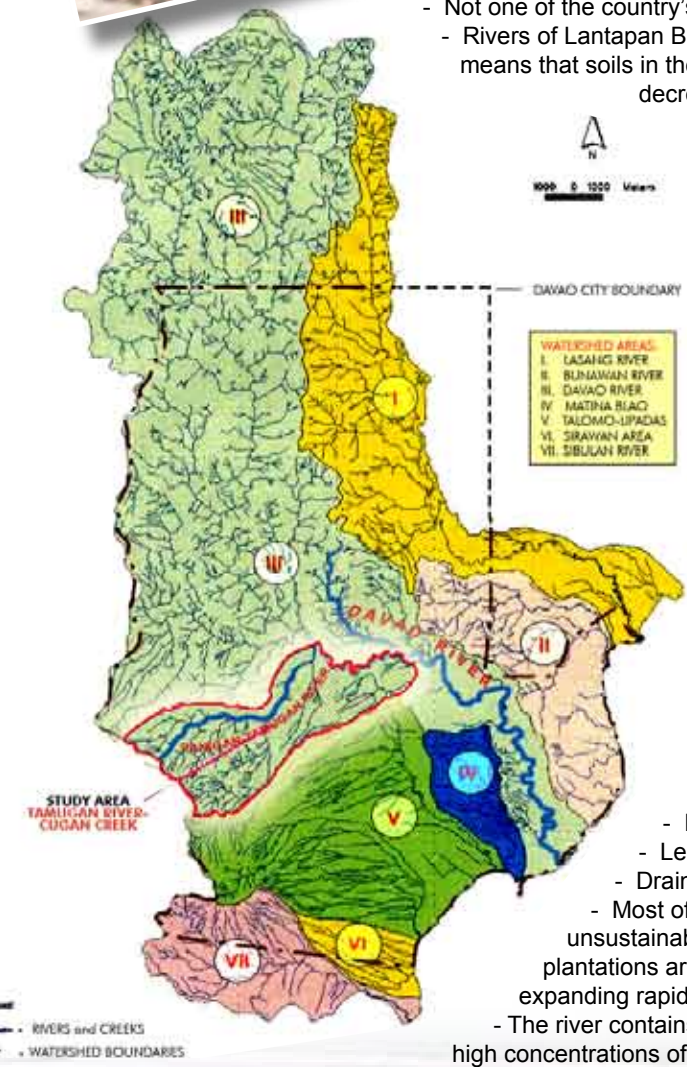
bantay kinaiyahan



The quality and supply of our drinking water is dependent on the health of our nation's rivers, streams and lakes. Many cities in the Philippines rely on rivers for their drinking water – Metro Manila, Baguio and Iloilo. Other countries such as the US depend on rivers too for their drinking water. In fact 60% of its drinking water comes from river alone¹⁹.

Water Quality at a glance:

- 54 out of 421 rivers in the country are considered dead[11];
- Three major rivers inside the former American naval base in Subic have high levels of chromium hexavalent, a contaminant that has killed several people in the United States[12];
- Nearly 37% of the 2.2 million tons of organic pollution are produced by the agricultural sector; 48% and 12% come from domestic and industrial sectors respectively;
- Not one of the country's 158 major rivers is safe for drinking in their natural flowing state[13];
- Rivers of Lantapan Bukidnon are found to have increasing amount of suspended solids. This means that soils in the watershed are being eroded/transported to the rivers. The progressive decrease in forest cover were closely correlated with the patterns of water quality degradation[14];
- Between 1996-2001 EMB monitored 141 rivers. About 41 rivers (29%) had minimum DO[15] values of less than 5mg/l; 92 rivers (64%) had BOD[16] that exceeded the public water supply criterion (Class A waters). These data indicate organic pollution. Critical areas: Metro Manila, Southern Tagalog and Central Luzon);
- At present, only one percent of rivers monitored by the government has a "Class AA" classification, which means it requires minimal treatment only to make it fit for drinking;
- Heavy metals and toxic pollutants (from industries) are polluting many rivers in the country mostly in Metro Manila, Central Luzon, Southern Tagalog, Cebu;
- Butuanon and Guadalupe Rivers in Cebu have very high coliform bacteria with 3,000-24,000 and 83 million - 630 million MPN/100ml respectively[17]. The seven (7) stations in Butuanon have zero dissolved oxygen[18];
- Pesticide pollution in rural areas is from agricultural run-off;
- Contributions of pesticides and fertilizer residues need to be better quantified and controlled;
- Toxic pollution are not monitored routinely;
- Mining areas of Cordillera, CARAGA, Marinduque and Davao del Norte contribute pollution to receiving bodies of water.



The Davao River [20]

- It is the third largest river in Mindanao;
- Length : 180 kilometers with headwaters from Bukidnon;
- Drainage area: 1,800 km²;
- Most of its watersheds consist of uplands with degraded forests, with unsustainable agricultural land use practices and where banana and pineapple plantations are expanding rapidly;
- The river contains high concentrations of sediments after storms;
- Pollution is due mainly to the unregulated use and poor methods of fertilizers and pesticides, inappropriate land use practices, inadequate monitoring of industrial and commercial premises and activities, and poor maintenance of septic tanks and absence of sewerage;
- The Davao River Situational Report recognized the following key problems within the Davao River Watershed: river pollution, water drainage and surface runoff, river bank erosion, soil erosion, flooding, health impacts of pesticide use and lack of implementation of existing laws.
- Panigan-Tamugan River is one of the tributary rivers of Davao City

- Mine tailings are major river-pollutants. Areas with mining operations experience destruction of their surface waters.
- The mine tailings spill from Marcopper in Marindugque, caused deposition of some 1.6 million cubic meters of tailings along the 27-km span of the Boac River system and the coastal areas. Boac River was left virtually dead[8];
- Construction of large-scale dams is another cause of social and environmental problems associated with the use of surface water. According to the World Commission on Dams, 40-80 million people have been resettled for dams in the past six decades. Changing the natural flow of water in a river can cause floods or droughts in other areas.

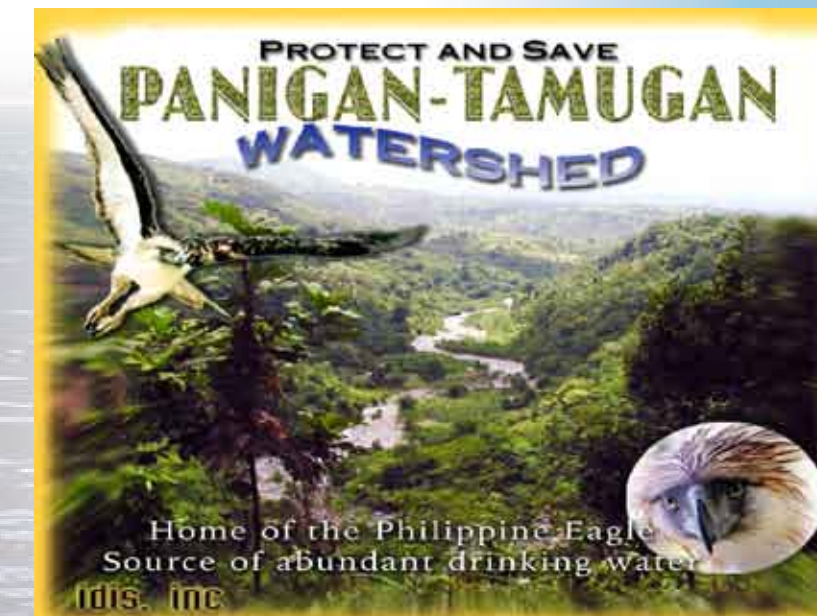
A Glimpse on the Rivers in the Philippines[9]

- Rivers and lakes in the Philippines occupy 1,830 km² (.61% of total area)
- There are 421 principal rivers basins, 19 of which are major river basins¹⁰ and eight (or 42%) of the 19 major rivers are in Mindanao.
- The longest river is the Cagayan River in Region II.
- Rio Grande de Mindanao is the biggest river of Mindanao and receives the waters from the Pulangi and the Agusan
- Other major rivers in Mindanao are Agusan, Agus, Tagoloan, Tagum-Libuganon, Buayan Malungon, Cagayan de Oro, and Davao.
- 36% of the country's river systems are classified as sources of public water supply
- There is considerable under-investment by the Government in sanitation and sewerage, though ranked as a high priority in the Philippines Agenda 21 of 1996.



What's the world's largest river?

The Amazon River in Brazil. At its mouth it is 240 kms. wide; average discharge is 180,000 cubic meter/second^[4] and a drainage basin of more than 7 million km², it drains an astonishing 1/5 of the world's run-off in to the Atlantic Ocean^[5]

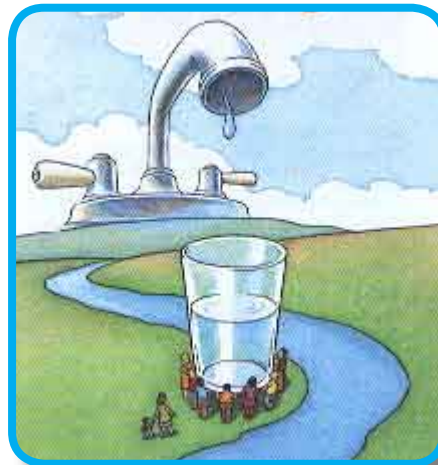


Panigan-Tamugan River – the future drinking water of Davao City

At present Davao City Water District is getting its supply of drinking water from groundwater sources (98% groundwater). But According to a JICA study¹ on Water Resources Management in 1998, Davao City's water demand in 2025 will be 153 million cubic meter (MCM)/yr while the groundwater availability average is only 84 MCM/year, a deficit of 69MCM/

year (45% of the demand). This could mean that 10 years from now in 2015, Davao City will be 34MCM/yr (29%) short of water supply if it will just continue relying on groundwater and at the same time unabated destruction of upland areas of the watersheds continues[21].

- Tamugan River is located in Baguio District. It is identified by the Davao City Water District as the City's future water source;
- It originates from Mt. Tipolog. Panigan River joins Tamugan at an elevation of +450 meter above sea level (at Sitio Sumpitan, Brgy. Tawan-Tawan);
- Soil along its banks is classified mainly as sandy-loam type;
- Other water sources: 5 springs and 2 wells and another 6 springs and 3 wells are found along Gumalang River, a tributary to Tamugan River;
- Panigan and Tamugan Rivers' average width during dry season is 7 meters with a velocity of 5 meters/second and average depth of 0.32 meters along relatively flat sections. Estimated flow rate is 11 cu m/s for both rivers;
- Erosion is visible in the entire Panigan-Tamugan watershed;
- The headwaters of Panigan and Tamugan Rivers have high recharge potential while lower-



source: www.epa.gov/rjon7/kids/drink

Tamugan has moderate to high recharge potential. This means that these areas play an important role in replenishing groundwater sources (aquifers);

- A great portion of the area surrounding Panigan, Tamugan, and Gumalang Rivers is vulnerable to pollution. This means that they may easily get polluted if pesticides and fertilizers residues and other pollutants are just dumped in these areas.

Source: MGB-IDIS Terrain Analysis of Panigan-Tamugan Watershed 2004

If the Tamugan-Panigan Watershed is the future source of Davao City's water then let us protect and rehabilitate it now.

What can we do to help PROTECT Our RIVERS?

- Practice proper waste disposal. Rivers are not garbage bins.
- Dispose properly your empty pesticide and other hazardous chemical containers.
- Use less synthetic fertilizers and pesticides and target to shift to total organic farming method
- Practice sustainable farming practices specifically soil and water conservation measures – hedgerows, river bank reforestation, terracing, planting of nitrogen-rich plants to reduce synthetic fertilizers application, observe multiple or alternate cropping,
- Practice terracing in areas with steep slopes.
- Participate in community-based water monitoring activity in your area or help set up one if there is none yet. This could be a regular school activity/project among schools in the area.
- Participate in information drive to protect Panigan-Tamugan and other rivers in the City.
- Strictly implement buffer zones along rivers, streams, creeks and other bodies of water.

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EVERY MARCH 14 IS INTERNATIONAL DAY OF ACTION FOR RIVERS!



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Kinaiyahan Watershed Issues In Brief

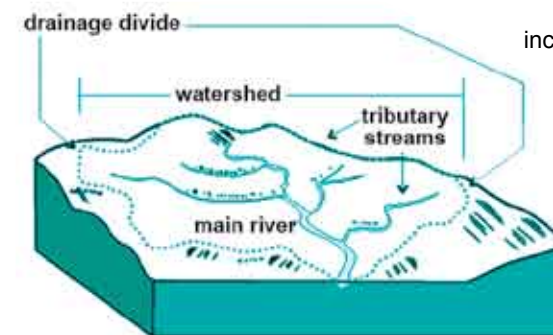
Bantay Kinaiyahan is a regular publication of Interface Development Interventions, Inc. to provide the public with relevant and concise information on pressing watershed issues

Call of the River

What is a river?

A river is a natural stream of water that flows over the land surface in a distinct course or channel. Water flows because of the pull of gravity, and thus starts in areas of high elevation and flows downhill toward lower elevations. The area of land that captures precipitation/ rainfall and directs it into a river or a lake is the **watershed** of that river or lake. Watersheds for different rivers are separated from one another by drainage divides, which are ridges of higher elevation.

Water is the Universal Solvent, having the power to dissolve things. Water can wear down the hardest surfaces and weaken structures much greater than itself. Water can move mountains.



Rivers are most powerful in flood conditions when the increased volume of water sweeps huge amounts of soil and large rocks downstream. Rivers can dissolve some rocks and carry them away down to the ocean floor.

How do rivers start?

The beginning, or source, of a river is often just a natural hollow in the ground. Rainwater trickles in from the surrounding soil to start a flow of water. Nile and the Amazon, start from tiny beginnings like this. A tributary is formed when a smaller stream joins with a larger one.

Other rivers are fed by underground springs or flow from marshes, and lakes. Usually these springs are found high up in the mountains. Also called headwaters, these mountain streams travel downward, carving out deep valleys and creating majestic waterfalls – like the famous Maria Cristina Falls in Iligan and the Pagsanjan Falls in Laguna.

River as an ecosystem

River ecosystems are complex and perform several natural functions important to living creatures, including people. A river ecosystem is not only the river itself but also the land around it. The land surrounding rivers links river ecosystems with the upland ecosystems. The water quality in a river system greatly depends on the land use occurring in the watershed.

Rivers contain less than one percent of all the freshwater on earth, yet they are a powerful force in shaping the land. Rivers rarely flow in a straight line, but twist and turn in loops called meanders.

Rivers bring forth life

People have always had a close relationship with earth's waters. Rivers play a central role in our lives. Fish from rivers have been a valuable food source (especially protein) for thousands of years and fresh river-water is vital for drinking, washing and irrigating[1] crops. Even today, many people get their drinking water from surface waters like rivers. Large rivers are often used as highways while some fast-flowing rivers are harnessed to generate electricity[2]. Most rivers offer leisure activities too such as canoeing, swimming and rafting.

“Water the lifeblood of all ecosystems is truly a wondrous substance that connects us to one another, to other forms of life and to the entire planet. Despite its importance, water is one of our most poorly cared for resources. We waste it, we pollute it!”

G. Tyler Miller, 1996

(Endnotes)

- ¹ Since the time of the ancient Egyptians, people have used various devices to lift river-water onto their fields to water their crops. Later many new technologies have been developed to irrigate crops.
- ² Mindanao electricity demand is supplied mainly by energy from Agus River in Lanao with Lake Lanao as the source.
- ³ Groliers Encyclopedia: Questions and Answer and Questions: Oceans and Rivers by Barbara Taylor
- ⁴ Discharge is the amount of water a river is carrying, measured in units of volume per time – cubic meter/second. The discharge of a river is the total amount of water from overland flow (run-off) and the amount of water received from groundwater. The amount of run-off reaching a river not only depends on the watershed area, amount of rainfall, but also on the amount of water that soaks into the soil (infiltration). Factors that affect infiltration in a watershed include vegetation and soil types.
- ⁵ How Come Planet Earth by Kathy Wollard. New York: Workman Publishing, 1999.
- ⁶ www.kwic.com...school/house/water/pollute.htm
- ⁷ www.riversmart.org/rivers101_journey.cfm
- ⁸ estimation of environmental damages from mining pollution; the Marinduque Island mining accident. Maria Eugenia Bennagen. (www.eepsea.org)
- ⁹ All data unless noted are taken from Philippines Environment Monitor 2003. World Bank.
- ¹⁰ Principal river basin has a drainage area of at least 40 km² while a major river basin has an area of more than 1,400 km²
- ¹¹ Cited in A Citizen's Guide to the Proposed National Land Use Act. KAISAHAN Quezon City, 2000. p. 3.
- ¹² www.bayanihan.org/html/public_html/index.php?topic=Agriculture&page=17
- ¹³ Cited in A Citizen's Guide to the Proposed National Land Use Act. KAISAHAN Quezon City, 2000 p3.
- ¹⁴ Current State of Lantapan's Environment: State of Rivers (Deutsch, et al, 2001)
- ¹⁵ Means the amount of oxygen dissolved in water. This is important because organisms depend on available oxygen. Unpolluted water must have not less than 5mg/l of dissolved oxygen otherwise it affects fish production
- ¹⁶ Means the rate at which organisms use the oxygen in water. The greater the BOD, the greater the degree of organic pollution or the more polluted the water is.
- ¹⁷ The maximum acceptable value for total coliform according to DENR-DAO 34 -Water Quality Criteria for Freshwater is 50 – 5,000 MPN/100ml for Class AA (Public Water supply I) to Class C (Fishery Water).
- ¹⁸ “2 polluted rivers not hopeless:EMB” www.sunstar.com.ph/static/ceb/2004/02/26/news
- ¹⁹ www.epa.gov/owlliquidassets
- ²⁰ Davao River Watershed Primer 3rd Edition, 2004. Davao River Conservation Coordinating Committee and Catholic Relief Services.
- ²¹ Derived by computing the average annual increase from 1995-2025. The 1995 demand was 50MCM/yr. From 1995-2025 the total estimated increase in demand is 103MCM or an average of 3.43MCM/yr.

* environmental refugees include also people displaced by mining and other projects that caused severe environmental impacts

**As presented in Philippines Environment Monitor 2003 by World Bank, lifted from Master Plan on Water Resources Management in the Philippines 1998.