

# **Community Water Quality Monitoring Programme in Malaysia**

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### **Abstract**

Fresh water is predicted to become the principal limitation for sustainable development within this century. The economic, social, environmental and public health implications of decreasing water quality are a worldwide threat. In Malaysia, rivers provide 97% of drinking water. So the status of rivers especially the water quality is vital for water management. Rivers also reflect the health of the surrounding land because they are the collection point for water flowing from all around. Therefore monitoring water body (river) is equivalent to taking care of our own health. Today, it is recognised worldwide that strong community participation is a key factor in river basin management approach. As major stakeholders, local community can be trained to become watch dogs of water bodies in their vicinity. Community water quality monitoring is a low cost approach that is reliable and sustainable.

### **1. Introduction**

Water is the basic element of life; without it life would not exist. It is second most important resource for man, and yet it is taken for granted because water is everywhere and it flows freely when we turn on the tap. The usage for water increases as population grows until the demand sometimes overshoots the supply or availability.

Although the quantity of water on Earth is same all the time (same as in dinosaur age, 60 million year ago), the quality of the water that is available has drastically changed. Every time we use water, we affect it in some way. Every watershed is affected by what takes place on the land. Once used, water flows out as quickly as it comes - down the drain and into our rivers. The gunk and grease that is flushed down into the drain unthinkingly every day will ultimately find their way to a nearby river. In other words, we are poisoning the very resource that gives us life. Therefore acquiring knowledge on ecosystem especially river basin will ensure efficient and effective management of rivers and water.

### **2. River Basin**

A river basin is a geographic area defined by the flow and movement of surface water. In a river basin, because of the elevation and contours of the land, all water flows to the same water body, such as a stream, pond, lake, wetland or estuary. River basin boundaries occur along high points in the landscape that separate different stream networks. Hydrologists sometimes refer to river basins as catchments or drainage basins. The term watershed is used synonymously with river basin. They come in various shapes and sizes.

In Malaysia, there are 1,800 rivers comprising 150 systems that run up to 38,000 km. As in many parts of the world, water from rivers and streams in Malaysia is used extensively for domestic needs, agriculture, aquaculture, industry and hydroelectric power as well as provide recreational use. Rivers are important as they support nation's economic development, social

and cultural needs, religious beliefs and the natural environment. Clean water body and the riparian area in its vicinity support diverse and delicately balanced natural aquatic ecosystems

### **3. River Pollution**

Generally, river water is potable (fit for human consumption) with minimum treatment, if it is not affected by human activities. However, rivers are now used as disposal routes for liquid and solid waste. While river pollution issues need to be and are being addressed by the government, such fundamental aspect of water supply requires the understanding and participation of end users. Water pollution occurs when a body of water is adversely affected by addition of small or large amounts of materials (pollutants) to the water. Pollutants may be divided into two types - point and non-point, depending on their source. Generally, controlling non-point sources is more complex than dealing with point source pollution.

Statistics published by the Department of Environment (DOE) for the year 2004 reveal 8% of our rivers to be polluted, 44% slightly polluted and remaining 48% to be clean. This is a clear indication that river basins in Malaysia are facing serious environmental problems. Studies indicate that residential, agricultural and industrial wastes are 3 main sources of river pollution in Malaysia. Degradation of water quality due to pollution causes adverse effects to aquatic life forms, disturbs the balance of life and reduces the bioavailability of potable water.

The burden on rivers to supply fresh water is likely to increase as demand is growing at 4% annually and is projected to reach 20 billion m<sup>3</sup> by the year 2020. Since rivers form 97% of our fresh water resource, this is an indication that water supply would have to be treated extensively in future and the cost would have to be absorbed by the public. This fact alone is enough to give us a wake call on the need for careful water quality monitoring to keep our rivers clean.

### **4. River Monitoring Programme**

River basin ecosystem such as streams, rivers, lakes, ponds, wetlands and estuaries are the lifeblood of our environment. They provide homes for wildlife; aquatic animals and plants; water supplies for homes and industries; and places of recreation for all of us. In addition, rivers reflect the health of the surrounding land because they are the collection point for water flowing from all around. Therefore the ultimate goal of river monitoring is to sustain or improve the health of its ecosystem for the use of inhabitants of the earth. One of the ways to achieve such goal is by creating awareness and educating various target audiences including school students and the general public on issues related to water quality monitoring and river ecosystems. Awareness need to be created on determining the current health of a river and the impact it receives from the cities. Data need to be collected on the quality of river water and such data would have to be made available to the community and the decision makers.

Water quality and quantity are two most important monitoring factors and are intimately linked although not often measured simultaneously. Water quantity is often measured by water level, discharge, and velocity. Whereas water quality is usually determined by analyzing samples of collected water in a laboratory or by conducting in-situ testing. Typically, water quality is determined by comparing the data from water samples against water quality guidelines or standards.

Despite dependence on streams, rivers, ponds and lakes for freshwater supply, Malaysian have historically not shown sufficient interest in the protection of her water resources.

Although there are adequate laws and regulations, compliance and enforcement are still lacking. Currently most of Malaysia's river systems are not monitored by any agencies. Adequate river water quality monitoring would ensure sufficient freshwater supply in the future and initiate emergency procedures should there be unexpected pollution incidents that cause severe damage.

Generally, the purpose of river monitoring is to:

1. Survey streams and water sources to assess its physical condition.
2. Identify areas where water quality degradation exist and investigate its causes and sources.
3. Provide a comprehensive database to analyze trends in water quality.
4. Indicate areas where water quality needs improvement and how this can be achieved.

There are three types of stream monitoring - physical, chemical and biological monitoring.

### 1. Physical Monitoring (Visual Observations)

The physical characteristics of a stream can provide clues to indicate its health. Healthy streams have lush riparian buffers, clear water and abundant wildlife. Several physical characteristics of water quality are: water clarity, water colour, smell/odour, general land use, description of stream origin & type, riparian vegetation (algae, wetlands), aquatic life forms (fish, prawns), and measurements of in-stream parameters such as width, depth, flow & substrate, drains, erosion and garbage.

### 2. Chemical Monitoring

Chemical monitoring and testing is one of the most accurate and reliable water quality monitoring methods. Chemical testing is often used to analyze drinking water. It is extremely useful for determining sources of pollution, as well as determining specific pollutants. Common chemical parameters tested are: pH, dissolved oxygen, conductivity, temperature, total suspended solids, turbidity and nutrients (phosphate & nitrate).

### 3. Biological Monitoring

Biological monitoring of rivers and streams provide remarkable insight into the functional quality of the environment studied. It can reveal important changes in the composition of biological communities that is caused by human activities. Insects and crustaceans that live in a waterway are excellent indicators of water quality because all organisms require specific conditions to live. Based on the sensitivity of the organisms, water quality can be classified into 4 status - excellent, good, fair and poor.

Bio-monitoring is easy to conduct and requires relatively inexpensive equipment. The quality of the water of each part of the river is identified based on the presence of living organisms that live in the water of the surrounding area. Two frequent groups of living organisms used for bio-monitoring are invertebrate and fish. The presence of these tiny organisms is used as an indicator for the quality of the river; whether it's clean or otherwise. The methods used are fun and simple and it can be done by individuals, families or groups with minimum training. Invertebrate is used to identify short term pollution effects. On the other hand, fish is used to observe pollution effects for a longer period of time. This method is also suitable for anglers and fishing enthusiasts who could play and important role as river watchers.

## **5. Community Water Quality Monitoring**

Managing our biological diversity is all about managing people because the ultimate decision makers for biodiversity are the individuals - you and me. Governments, companies and others have a responsibility to lead and inform the public, but finally it is an individual choice made billions of times a day that counts the most. Today, it is recognised worldwide that strong community participation a key factor in river basin management approach. Participation in the simplest of its meaning is taking part, sharing and acting together. Local community is a major group of stakeholders within a river basin and if mobilized adequately, they could play a key role in the management of rivers especially monitoring activities in the river basin. Community monitoring can stimulate the interest of public and would help induce ownership of river basin especially in their local catchment area.

However in Malaysia, the potential of local communities and special interest group's involvement in river management is currently not being fully utilized. As such, there is a tremendous need for local communities and authorities to work together to conserve and protect our rivers. In addition, the local community too can play an enormous role as watch dogs to safeguard the environment and create a win-win situation for all parties involved.

Why is community participation important?

1. Most of the time, local community acts as “polluters” and/or “end receivers” either directly or indirectly. They have enormous potential to become “eyes & ears” of the authorities. They can take preventive measures to curb unwanted incidents from happening by informing the authorities.
2. Local communities too have the potential to promote immediate curative measures to rectify unwanted incidents that had happened by informing authorities.
3. Local communities have better knowledge and understanding of the local environment. Therefore they make excellent informers.

Local community can be trained to monitor land use, illegal dumping, water quality testing and become watch dog (RIVER Ranger) of water bodies in their vicinity. However what to monitor will depend on the needs of the data users, the intended use of the data, and the resources of the community monitoring programme. The aims of community water quality monitoring are to develop community participation, partnership, awareness and ownership on issues related to water; and encourage them to take remedial actions. In addition, it can provide links between existing monitoring programmes and community within local river basin (watershed) as well as across the country to enable exchange of information and ideas.

## **6. Challenges**

The biggest challenge for community water quality monitoring programme is to have effective and analytical monitoring of environmental indicators. Effective monitoring schemes are necessary to identify specific pollutants, their sources and occurrences, to develop preventive measure, and to assess the efficacy of corrective actions. Another dilemma in community water quality monitoring is how their results can help or support government agencies effort to protect the environment. Some uses require high-quality data. For example, high-quality data are usually needed to prove compliance with environmental regulations, assess pollution impacts, or make land use planning decisions. In addition, understanding the relationships between water quality conditions and natural landscape, hydrologic processes, and human activities that take place within a river basin are lacking especially in developing countries like Malaysia.

## **7. Case Study : Community Participation in River Management : Sg Pencala and Kelana Jaya Lakes Rehabilitation Programme.**

“Community Participation in River Management”, a project funded by DANIDA was undertaken from Dec 2002 – July 2006 and implemented by Global Environment Centre (GEC) in collaboration with various partners/stakeholders. The Kelana Jaya Lakes Rehabilitation Programme was co-funded by UNDP-GEF Small Grants Programme.

The project was developed to assist in demonstrating community based approach to improve quality of rivers in Malaysia. This is the first river rehabilitation program in Malaysia that focuses on involvement from communities as a component in integrated river basin management plan.

The “Community Participation in River Management” project aims to improve the quality of Malaysian rivers and the status of its biodiversity through awareness campaign and enhancement of community participation in river management. It focused on facilitating the establishment of a two-way communication mechanism between communities and decision makers in developing appropriate solutions and management plans. The project also aimed to increase the understanding of the benefits of managing rivers well and develop ownership towards rivers among the general public, community groups and special interest groups.

The project mobilized community groups along Sg. Pencala to participate in awareness programs and activities related to water quality monitoring, river clean-up and river rehabilitation. Selected communities were trained on the aspects of river hydrology, ecology and biodiversity. In addition the communities were also involved in programs to adopt a sustainable life style such as changing their consumption patterns, reducing and recycling domestic waste, and conserving water and energy. Through the participation of community groups, the monitoring programme documented the presence of a wide range of point and non-point sources pollution along Sg. Pencala.

### **8. Community River Monitoring Programme**

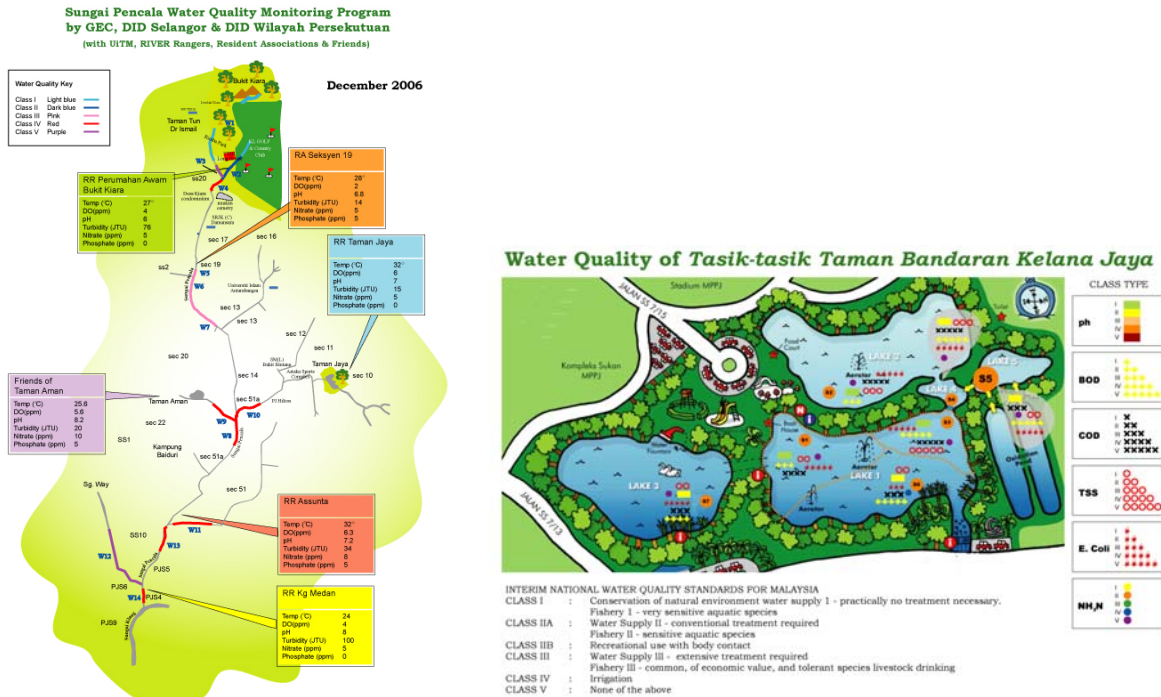
GEC in collaboration with several other NGOs, organized more than 50 training courses on river water quality monitoring and biological monitoring techniques to the following stakeholders: CBOs, schools, local authorities, government agencies, NGOs, private sectors and media. The Project established 13 water quality monitoring sites along 12 km of Sg. Pencala and 5 sampling points for the Kelana Jaya Lakes. Currently, there are 3 CBOs (Friends of Taman Aman and Kelana Jaya Park & the Resident Association of Sec 19) monitoring the water quality of Sg Pencala and Kelana Jaya Lakes.

As part of education program, GEC developed the RIVER Ranger Programme and SMART (Start Managing All Resources Today) Ranger Programme. In the past 1 year, 13 schools within these basins were selected and trained to be RIVER Rangers. The Rangers were trained to conduct water quality monitoring at an interval of 1 month for a period of 6 months and produce a brief report for compilation by GEC to be presented to relevant agencies. Beside water quality studies, Rangers are also required to fill ‘River Health Check Card’ that consists of 10 assessment categories to assess the health of Sg. Pencala and Kelana Jaya Lakes.

Furthermore the local university - Universiti Teknologi Mara - has undertaken a scientific water quality study at an interval of 1 month for a period of 18 months. A total of 15

parameters were analyzed that covers all six Water Quality Index (WQI) parameters, heavy metals, pesticides, hydrocarbon, fertilizer/nutrients and microbes.

Eventually, the water quality monitoring data of the Sg. Pencala and Kelana Jaya Lakes produced by River Rangers, local community and UiTM/GEC will be featured in the website [www.sungaipencala.info](http://www.sungaipencala.info) for public access, as below:



Currently the Sungai Pencala and Kelana Jaya community monitoring programme has been acknowledge and accepted as a model for community programme under the ‘One State One River programme’ by the Drainage & Irrigation Department of Malaysia.

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