Dam-aging effects

EROSION: Let's focus on environmental impact of dam projects at inception stage

THE worsening haze reminds us about the consequence of environmental exploits. There is a lesson to be learnt here; there can be no action without ramifications. As more and more of the planet's resources are destroyed, environmental stability and ultimately human habitation are also affected.

Actually, humans have used the planet's resources since the beginning of civilisation. However, the magnitude of exploitation was not as gargantuan back then as it is now.

The environment was able to cope and reach a kind of stability or equilibrium with its human inhabitants. Things now, however, are shifting in one direction as global population soars to numbers never seen before. Demands for resources for example, food, water and energy, are at unprecedented levels. To satisfy the demand, more and more environmental resources are exploited.

In Malaysia, dams are constructed to store water for supply, generate electricity, mitigate floods, or a combination of one of these functions.

In Klang Valley, for example, the water level at the Sungai Selangor Dam usually comes under close scrutiny during dry spells as water service providers struggle to avoid disruption and meet consumer demand.

I remember when I was growing up, I was taught that hydroelectric dams were an environmentally friendly source of energy. Hydro dams, after all, produce electricity without the need to burn fossil fuels such as coal or gas. There is no emission of air pollutants such as smoke, NOx or SOx. The flowing water is used to turn giant turbines to generate electricity.

Notable hydro dams in Malaysia include the Kenyir Dam in Terengganu, Pergau Dam in Kelantan and Bakun Dam in Sarawak. Malaysia has more than 15 hydro dams of various sizes. The Kenyir, Pergau and Bakun dams are anticipated to produce more than 3,000MW of electricity between them.

The reservoir for the Bakun Dam is said to be the size of Singapore. And there are more on the way.

Not all dams are environmentally friendly. On the contrary, certain dams, depending on size and location, can harm the environment. Dams are erected on mountainous river valleys because a barrier needs to be created to block the natural flow of a river. When the flow is blocked, water is displaced from the bank and fills the surrounding area.

The water quality at these locations is usually pristine; the bottom of the river visible from the riverbank. You can see fish swimming in the water.

This is where the famous Kelah fish dwells and where elephants, yes, wild elephants, roam free. Mother Nature retains all its splendour here, rich in flora and fauna. The water quality is comparable to Class I of the National Water Quality Standards, the best water quality.

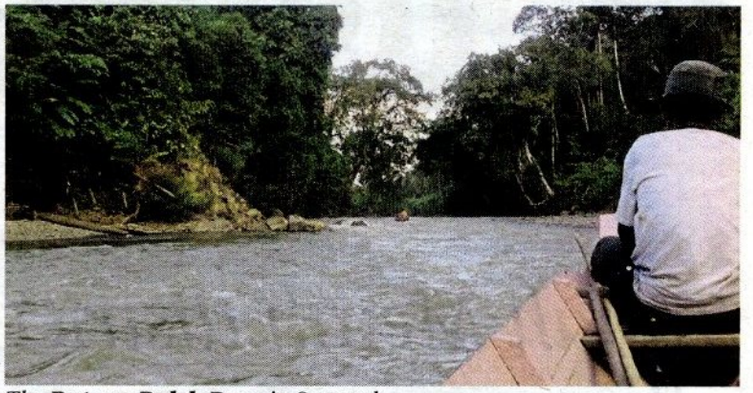
Yes, such places exist in Malaysia, but perhaps not for long, as more and more large-scale dams are built. As with most projects, land clearing is inevitable during dam construction. This incurs erosion, sediment transport and siltation.

The amount of erosion that happens is dependent on the scale of the project; essentially, the larger the project, the more the erosion. This causes the *teh susu* phenomena, inherent to many rivers in Malaysia.

It is true there are measures to reduce this kind of pollution, however, even slight deterioration is easily visible, since the water quality was pristine to begin with. Aquatic creatures will die because of this, especially the more sensitive ones, like kelah.

Besides the murky appearance, sediment will also settle at the bottom of the river, blanketing river rocks. Aquatic habitats are destroyed and fish lose their breeding sites. A fact that may not be known to many: fish need river pebbles to lay their eggs for insemination.

Then there is the logging impact. What has logging got to do with dams? Well, Malaysian forests are rich with timber and since the area behind the dam is going to be underwater anyway, (for some) it only makes sense to reap the benefit of this resource for commercial gains.



*The **Batang Baleh Dam** in Sarawak.*

Trees would be felled and exported out of the dam site before and during construction. The destruction of their habitat means forest animals, including elephants, will have to look to other areas for sustenance.

Besides forest creatures, Orang Asli may also need to relocate. To them, losing the forest means losing their source for supplies and maybe even income. Orang Asli folk sell forest items, such as petai hutan, a favourite among enthusiasts, including myself.

Loss of the forest means the loss of a carbon sequestration zone. As it is widely known, trees capture carbon dioxide, a greenhouse gas.

Hence, this process not only produces oxygen, but also regulates temperature. This is why in areas where there are fewer trees, the temperature would inevitably be hotter. So, in the case of Bakun, a carbon sequestration zone the size of Singapore is lost.

Once a dam's construction is completed, the reservoir behind the dam starts filling with water. To avoid drowning, remaining animals will have to make for higher ground or re-locate to other areas outside the valley. During this time, some water may be released to maintain the flow of the downstream river segments. The volume of water released is dubbed "environmental flow".

Unfortunately, while there may be guidelines relating to amount of water that should be released, the matter is a subject of contention. Ideally, the amount should be sufficient to sustain aquatic life downstream.

However, dam operators are pressed for time and releasing more water means it will take a longer time to fill the reservoir, delaying its operations. Releasing too little water, on the other hand, means environmental disaster.

After the dam is filled, it can commence operations. Typically, during this stage, lesser environmental impact is incurred as more water can be released into the river. The reservoir (or lake) and river ecosystems now begin the long journey to recovery, if they recover at all.

It is obvious that environmental impacts are incurred between the dam construction and operation. Entire river-catchment systems are altered, including aquatic as well as terrestrial flora and fauna.

Because the scale of alteration is so big, mitigation measures cannot address all issues. While it is understandable Malaysia needs to equip itself with power and water, and while it is also true the country cannot continue relying on fossil fuel, this does not mean we need to revert to a solution that has devastating effects.

As of the moment, the environmental emphasis, assessment and mitigation relating to dam construction in Malaysia is done at the end of the project spectrum, long after project inception, but before actual construction.

However, by then, the matter has snowballed into something big with little chance of going back. Thus, it is necessary to place a greater emphasis on the environmental impact of dam projects since the inception stage.

The writer is associate professor of Water Quality and Water Quality Modelling at International Islamic University

> *Loss of the forest means the **loss of a carbon sequestration zone.** As it is widely known, trees capture carbon dioxide, a greenhouse gas.*

DR ZAKI ZAINUDIN