Our ecological unconscious

As a growing economy, Bangladesh, too, pushed the development agenda hard and fast. For many, "to have" (acquire the land, claim the property, and profit as much as possible) took precedence over "to be" (live harmoniously with the environment and maintain ecological balance for wholesome development).

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THERE is still a lot of brouhaha and political polemics in Bangladesh when it comes to the safekeeping of the environment. However, it seems like our government is finally catching up with the subject with some degree of sincerity. The Parliamentary Standing Committee on the Forests and Environment Ministry recently proposed the inclusion of a number of environment-related clauses in the Constitution. This one caught my attention: "The State shall protect, preserve, and improve the environment and safeguard natural resources, ecological diversity, biodiversity, wetlands, forests, and wildlife of the country for present and future generations."

The proposed clause suggests that we, as a nation, are slowly maturing to fathom our tortured ecological unconscious, that deep-seated psychological attachment to the natural environment. Lately, we have been suffering from a peculiar distress, as our environment has become a mere commodity to be purchased, claimed, or exploited for material progress.

This is not just happening to us. Environmentalists worldwide are increasingly grappling with ecopsychological duress, especially when the effects of global warming, climate change, and unusual natural calamities are looming large. Indeed, a neologism has been introduced to describe this feeling: "solastalgia," a combination of the Latin word solacium, meaning comfort, and the Greek root algia, meaning pain. In short, it is a simultaneous feeling of comfort (from the environment) and pain (because the environment is degrading).

American filmmaker James Cameron's recent hit film Avatar uses an ancient tribe's solastalgia to bring attention to the environmental destruction wrought by the military-industrial complex.

In Bangladesh, we are feeling solastalgic because the green Bengal pastoral -- which, for ages, both sustained and captivated our painters, poets and novelists, as well as ourselves -- is withering away. It is a painful lament for something we, as a people, historically hold dear.

Therefore, the cultural and political significance of the environmental clause is enormous, especially when we take into consideration the brigade of real and abstract "villains" that are ravaging our environment: the thuggish culture of indiscriminate land grabbing; the financial muscle of real estate developers and their influence peddling; our general lack of environmental awareness; and, most important, our attitude toward development.

Let me focus on the fourth villain for it has broad ramifications for the ongoing environmental debate in Bangladesh. When it comes to the question of economic development, two conflicting attitudes toward the environment emerge.

First, humanity is only part of a larger ecosystem; therefore, it is humanity's moral responsibility to nurture the natural environment for the well being of all species. The proponents of this view are willing to moderate the scope of economic growth in such a way that Mother Nature is protected and preserved for present and future generations. For example, if offshore drilling for fossil fuel threatens marine biodiversity, then ban such a disruptive infrastructure, even if it promises vast riches.

In Water Wars (2002), environmental activist Vandana Shiva made an international plea to curb the corporate privatization of water. This natural resource not only plays spiritual and traditional roles in communities, but it is central to the world's ecological balance, as well. In short, development and environmental stewardship should occur in concert.

Second, there are those who believe that nature is an infinite resource that must be harnessed for human progress and material growth. The advocates of this anthropocentric viewpoint assume that human beings are at the centre of cosmos and that it is logical to exploit the environment for their betterment. For example, if mining coal can generate economic prosperity, then that activity is more important than some environmental costs. The premise is that nature has ways of adjusting itself. Pause for a minute to ponder why we can't get rid of the ship-breaking industry in Chittagong: Its economic appeal seems to outweigh, unfortunately, the cost of the environmental damage that it inflicts on the coastal belt.

Former American vice presidential candidate Sarah Palin's populist slogan "Drill, baby, drill" is based on the idea that if an unexplored oil reserve is found within America's borders, why not utilize it to reduce the country's dependence on foreign oil.

These two attitudes are at the centre of the current environmental debate across the world.

Both camps favour human progress, albeit with contrasting philosophies of development. Hungry for raw materials, western industrializing nations since the Industrial Revolution have embraced the second viewpoint as the only viable option, essentially, the bedrock of the progress doctrine.

But all this began to change in the West with the "counter-culture" of environmental movements in the 1960s and the Oil Crisis in the 1970s that compelled America and other industrialized nations to seek alternative and renewable sources of energy and articulate new policies of natural resource management. The idea that nature is, after all, a finite source of energy began to sink in, prompting new thinking about the balance of development and environment.

The fledgling debates on ecological sustainability also helped revisit the fundamentals of the market-based development discourse. Rachel Carson's Silent Spring (1962), Meadows and Others' Limits to Growth (1972), E.F. Schumacher's Small Is Beautiful (1973), and Erich Fromm's To Have or to Be (1976) are seminal books that assailed the profit-driven growth initiatives and their tragic consequences on the environment. In his ominous The End of Nature (1989), Bill McKibben argued that through all kinds of biochemical and technological manipulations, humanity had practically replaced the natural nature of the world with an artificial one.

Toward the end of the twentieth century, many developing countries caught up with the growth frenzy were on a fast track to modernization, propelled by new policies of financial management and demands of globalization.

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over "to be" (live harmoniously with the environment and maintain ecological balance for wholesome development). Unfortunately, in all of the haphazard modernization agendas in Bangladesh, neither the national dialogue nor educational curricula focused on the environment.

When a Dhaka real estate tycoon, in a now-infamous encounter, defied a Bangladeshi state minister with the boastful claim that real estate developers had done more than the political community, it could not present a more hideous Faustian bargain: Real estate developers have provided housing options to the urban middle class, sure (actually, not quite sure), while the environment rotted, natural water drainage systems and wetlands disappeared because of greedy land reclamations, and environmentally insensitive concrete jungles destroyed urban biodiversity.

Fortunately, things are beginning to change in Bangladesh, at least in the domain of policymaking. The Bangladesh Environment Network (BEN) and Bangladesh Poribesh Andolon (BAPA) have sensitized people about the hot-button environmental issues.

The environment is becoming a top political priority, and rightly so because we are a land-starved nation of 160 million people. Every square inch of Bangladesh must matter. The proposed constitutional clause that "the State shall protect, preserve, and improve the environment for present and future generations" shows that we are finally getting it. We must rediscover our ecological unconscious that has a cherished literary history. Rabindranath grasped it, Jibonanondo felt it, and Jashim Uddin mined it.

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How safe is surface water?

Microcystins--another scourge like arsenic

Water treatment techniques such as coagulation, sedimentation, filtration, disinfection, granular activated carbon, powdered activated carbon, ozonation, and ultraviolet radiation are effective to varying degrees in removing most common cyanobacteria and their toxins from drinking water. It could be mentioned here that heating and boiling of water cannot remove microcystin as it is a heat stable compound.

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TRADITIONALLY, surface water is the main source of drinking water and consumed without any treatment or after boiling when fuel is available. An increasing population density and inadequate sanitation has led to severe microbial contamination of surface water causing diseases (cholera, diarrhea, typhoid, dysentery) and mortality. In the 1970's the use of groundwater for human consumption was propagated to overcome this problem. In the following decade UNICEF installed about 10 million shallow tube wells (suctioned hand pump) over the country. However, in 1993, high levels of arsenic were found in drinking water from tube wells. Nearly 40,000 people showing the skin lesions symptoms characteristic of arsenicosis have been identified.

In this situation, there are a number of alternatives including the costly drilling of deep wells, a return to the use of surface water, utilization of rainwater and arsenic removal. The draft national policy on arsenic mitigation states a preference for the use of surface water over groundwater, although this does not necessarily take into account the potential risks of using surface water.

There are about 1.3 million ponds and lakes in the country. The increase of human population and the consequent intensification of agricultural and industrial activities along with deficient water management have led to the enhancement of eutrophication (nutrient enriched) in freshwater bodies used for domestic purposes and as drinking water sources. The occurrence of phytoplanktonic blooms is also becoming more frequent in these ponds and lakes. Environmental conditions such as higher temperature and pH values, low turbulence, and high nutrient inputs (particularly phosphorus, as well as nitrogen) enhance the development of planktonic cyanobacteria in lakes and reservoirs, leading to formation of surface blooms that may accumulate as scum.

Recently, potential health hazard -- cyanobacteria toxins, Microcystins (hepatotoxins) -- has been reported in freshwater ponds form different locations of the country (Ahmed, et al., 2000, 2008, 2010) which is alarming to use surface water for drinking.

What are cyanobacteria?

Cyanobacteria, formerly called "blue-green algae" are relatively simple, primitive life forms closely related to bacteria. Typically much larger than bacteria, they photosynthesize like algae. Depending upon the species, cyanobacteria can occur as single cells, filaments of cells, or colonies. Cyanobacteria contain a characteristic pigment which gives the group their blue-green coloration. The ability to fix nitrogen gives these species a competitive advantage over other algae. Many cyanobacteria have gas vacuoles that allow them to remain in suspension and migrate to surface waters where there is plenty of light for photosynthesis.

What is a cyanobacterial bloom? A mass of algae in a body of water is called a bloom. Blooms are often found in standing water in lakes, ponds, ditches, lagoons, or embayments of rivers. Because many cyanobacteria species can regulate their buoyancy, they rise to the surface of the water and form a surface scum. A scum is a thin oily-looking film that can become several inches thick. When conditions are good for a bloom, a lake or pond can change from clear to turbid within just a few days. When cyanobacteria blooms begin to die and disintegrate, their characteristic pigment may give the water a distinctive bluish colour.

When can blooms occur? There are about 300 species of cyanobactera found in Bangladesh among them more than 15 species frequently form blooms. However, most cyanobacterial blooms occur during late winter to spring and late summer to early autumn months.

What causes a bloom? Factors needed for bloom formation - whether toxic or not - are complex. No individual environmental cause or particular set of conditions clearly controls cyanobacterial bloom formation. Three genera of cyanobacteria account for the vast majority of blooms: Microcystis, Anabaena, and Aphanizomenon. A bloom can consist of one or a mixture of two or more genera of cyanobacteria. Cyanobacteria cannot maintain an abnormally high population for long and would rapidly die and disappear after 1-2 weeks.

Why is this a concern to public health?

Cyanobacteria are an emerging public health issue for their presence in drinking, domestic and fish culture ponds in rural area. Cyanobacterial blooms cause a variety of water quality problems, including fish kills, aesthetic nuisances such as odors and unsightliness, and unpalatable drinking water. Cyanobacterial blooms may also limit aquatic habitat for wildlife, impacting human health and recreational activities. Although humans are rarely killed by algal toxins, deaths have occurred in extreme exposures. In 1996, 101 persons were made ill and 50 died due to algal toxins in water used for hemodialysis at one treatment centre in Brazil. Low dose of microcystins in drinking water is a slow killer through liver damage or tumor formation.

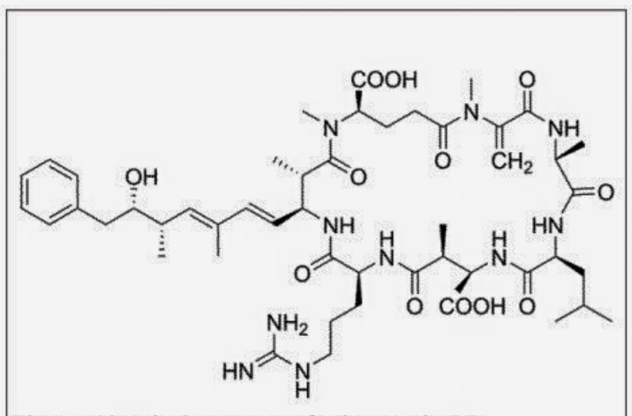

Figure. Chemical structure of Microcystin-LR.

Cyanobacterial Toxins; Microcystins: Cyanobacteria produce a variety of toxins, subsequently called cyanotoxins, that are classified functionally into hepatotoxin, neurotoxin, and cytotoxins. Defined by their chemical structure, cyanotoxins fall into three groups: cyclic peptides (the hepatotoxins microcystins and nodularin), alkaloids (the neurotoxins anatoxin and saxitoxins) and lipopolysaccharides (LPS). The toxicity of microcystins and nodularins is restricted to organs expressing the organic anion transporter on their cell membranes, such as the liver.

Human health effects

Human exposure to microcystins may occur through a direct route such as drinking water, recreational water or hemodialysis, or through an indirect route such as food. The knowledge about microcystin effects on humans is based on epidemiologic data, but there are also reports of intoxications and toxicological studies made on laboratory animals.

Acute and subchronic exposures: The earliest case of gastroenteritis from cyanobacteria was reported in 1931 in towns along the Ohio River, where low rainfall had caused the development of a large cyanobacterial bloom. A natural Microcystis bloom in a water reservoir in Harare, Zimbabwe, caused gastroenteritis in children each year when the bloom was decaying. In Brazil, A massive Anabaena and Microcystis bloom in Itaparica Dam was responsible for 2,000 gastroenteritis cases resulting in 88 deaths, mostly children.

Chronic exposure: When considering the chronic effects of long-term exposure to microcystins in drinking water, one has to take into account the high incidences of primary liver cancer (PLC) in regions of China where pond and ditch water are used for drinking water supplies. It has been calculated that humans living in areas with a reported high PLC incidence consume 0.19 picogram microcystin per day during the 4 summer months from June to September over their 40- to 50-year life span.

Tumor promotion : The cyanobacterial microcystin possess tumor-promoting activity by a TPA-independent pathway. Cyanobacterial extracts or microcystin-LR in drinking water induce skin tumors in rats and mice.

Microcystins in Bangladesh waters

Microcystins were first reported form Microcystis aerigonosa bloom in a pond at Matlab, Chandpore in 2000 (Ahmed, 2000). Since 2000, microcystins have been detected from cyanobacteria blooms occurred at least in 50 ponds at different locations of Dhaka, Chittagong, Comilla, Chandpore, Brahmanbaria, Gazipore, Mymensingh, Moktagacha, Khulna, Bagerhat, etc. Most common toxic species were Microcystis, Anabaena, Oscillatoria and Merismopedia sp. The amount of detected microcystins ranged from 10 -- 1400 microgram per liter of water which was much higher than the WHO provisional guideline value for microcystin of 1.0 microgram per liter of water.

What removes cyanobacterial toxins?

Water treatment techniques such as coagulation, sedimentation, filtration, disinfection, granular activated carbon, powdered activated carbon, ozonation, and ultraviolet radiation are effective to varying degrees in removing most common cyanobacteria and their toxins from drinking water. Close to 100 percent of particular toxins can be eliminated in finished water when the appropriate combination of techniques is used. It could be mentioned here that heating and boiling of water cannot remove microcystin as it is a heat stable compound.

Microcystins can accumulate in fish tissues, especially in the viscera (liver, kidneys, etc.). Concentrations in the tissues would depend on the bloom severity where the fish was caught. Take caution when considering consumption of fish caught in a water body where major cyanobacterial blooms occur. Before eating, remove the internal organs, which may contain more of the algae/toxin.

Recently, use of surface water for human consumption has increased due to arsenic contamination in ground waters. In rural and slum areas of the country such a practice amounts to replacing arsenic health hazard with that of microcystins (hepatotoxins).

Children taking bath in a toxic cyanobactera bloom pond, Brahmanbaria. (Right) Microscopic cyanobacteria from pond water.

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