

COMMENTARY

Thermal pollution – yet another type of pollution

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LAST week I looked at medical waste as a source of pollution. This week I would like to emphasise another type of pollution – thermal pollution.

This type of pollution can be defined as an increase in the temperature of surface waters as a result of the use of these waters for cooling purposes by industry or public facilities. However, both warm and cold water has an effect on the environment, as we will later see. In this article I will look at the sources of this type of pollution and the effects it has on the environment, as well as how it can be prevented and controlled.

After hearing the name and nature of this type of pollution I am sure the question that first comes to mind is why use water as a cooling agent over air or another substance? Especially since using water as a coolant is more expensive than for instance if air was used. Well water is ideal as it can hold more heat than the same volume of air and transfer it away from the hot item much faster.

The most common source of warm water is when it is used as a coolant by factories and power plant for their machinery and released into a body of water, usu-

ally the same one it was pumped out of. However, industries are not the only source of thermal pollution. During hot days, the water that runs off from roads and parking lots carry with it a great amount of heat. Thermal pollution is also caused when shading vegetation along the banks of rivers, streams, and lakes is removed. Therefore, in areas where the water is normally cool it is now hot. Another source is the release of cold bottom-water from deep water reservoirs behind large dams.

So what is wrong if some warm water is added to a river or lake? Warm water has certain ecological effects attached to it that are quite detrimental to aquatic ecosystems. For instance, as the water temperature increases, the amount of dissolved oxygen decreases, thus reducing the amount available to aquatic animals like fish and amphibians. Temperature increase also affects the metabolic activity of animals by increasing it. This in turn means that the organisms consume more food as it is burning it off at an accelerated rate, therefore reducing the amount of resources in terms of food available to other members of the aquatic community. However, if too many organisms die in the body of water the amount of nitrite and ammonia released,

which act as fertilizer encouraging aquatic plant growth. If left unchecked, the area could become an ecological dead zone with respect to animals.

Besides lack of resources, animals that are tolerant of a narrow temperature range can die from "thermal shock" if exposed to a sudden rise in temperature when the heated water is returned to the lake, pond or river it came from. This is a shock because most aquatic animals have enzyme systems that operate within narrow temperature ranges. Other biological effects at the cellular level that can be affected include the metabolism of enzymes, the transfer of substances through the cell walls (via osmosis). These may also affect the animals' ability to reproduce.

Animals are not the only organisms affected by thermal pollution. Plants grow faster in response to the increased temperature, therefore resulting in them having a shorter lifespan as well as overpopulating the area. In an aquatic ecosystem, this is referred to as an "algal bloom". However, all of these plants take up a lot of oxygen, so that less is available for other animals, in turn limiting the amount of organisms and the biodiversity this body of water can support.

The same way hot water can affect biodiversity, so can cold.

This happens in areas where the normal water temperature is usually warm so that the entry of unnaturally cold water can make the organisms there go into thermal shock.

Since temperature is one of the main conditions that make a niche suitable for certain organisms. Therefore when this condition changes and the organisms in that niche die, it opens it up to occupation by other species more tolerant of the new temperature, therefore changing the species composition and diversity.

However, the effects of this change are not isolated to aquatic ecosystems. This is because some terrestrial animals depend on aquatic ones for food. Therefore if the aquatic species composition changes in an area those terrestrial animals that have a specific diet might leave the area in search of its preferred food. If this pollution is allowed to continue it may affect species composition at higher levels of the food web.

But thermal pollution can be prevented, firstly by limiting the amount of heated water that is released into the body of water it came from. Also since power plants are a major user of water as a cooling agent, by using less energy we are helping to reduce this type of pollution. Besides prevention, there are certain practices that can control thermal pollu-

tion, for instance, depositing the heated water at a point away from its source. Heated water can also be pumped into shallow cooling ponds or canals where it can be reused at a later time. However, this option is feasible where there is enough land available to accommodate these ponds.

The use of cooling towers is another option. Cooling towers can be of three types, wet, dry and fluid. Wet cooling towers use evaporation while dry cooling towers pass the coolant through a surface that separates the coolant from the ambient air. Finally fluid cooling towers can be considered a mix of the two where the coolant is pass through a tube upon which clean water is sprayed and the a fan applied so that through evaporation the heat leaves the coolant. However, the advantage of fluid cooling towers is that the coolant is not exposed to the environment.

So it can be seen that through increased amount of industries and our increasing need for energy another type of pollution has been created. However, this pollution is although its effects are directly felt by aquatic ecosystems, terrestrial ecosystems are also indirectly affected. However, there are methods by which both industries and individuals can do to reduce this type of pollution and in turn its effect on the environment.