

Barbados: from ridge to reef

In this installment of the International Year of the Reef article series, join me on a journey from 'Ridge-to-Reef' (R2R).

We will begin by unpacking the terms. Warning: there is clever wordplay involved.

- R2R describes an approach to environmental management that recognises the interconnectedness of our natural systems. It is also called Hilltops-to-Oceans (H2O).

- 'Ridge' in this context refers the top of the land surface or hilltop.

- 'Reef' is more complex. In general, the word means 'a ridge of rock or sand just above or below the surface of the sea.' A living coral reef is more than that – it is both a physical structure and a biological community. Some corals, known as 'hard corals,' build hard skeletons of calcium carbonate to protect their soft bodies. The skeletons of these animals build up over many years to form the physical structure of the reef, which provides habitat for a complex community of interacting plants and animals. The entire system - the biological community and the physical environment - is called an ecosystem. More on that later.

- 'to' speaks to the link: water, good old H2O, is the link from Hilltop 2 Ocean. Clever see?

To understand the link, we follow the water. In general, water flows in a continuous cycle, on, above and below the surface of the Earth. Basically, water evaporates from the surface, cools, condenses and falls back to the surface as rain. When rain falls on the land surface, what happens to the water depends on the shape and nature of the land. On a simple slope, water flows downhill - from ridge to reef or from hilltop to ocean.

So water is the link from ridge to reef. But this is just one of many links in a beautifully interconnected natural system. As the land influences the flow of water on and below the surface, the water also shapes the land



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through erosion and accretion. Water also supports life, and various forms of life on earth interact and impact the water, the land, and each other.

For an example, we need look no further than the interesting and unique small island system that is our 'Rock.' Barbados is not in the Eastern Caribbean, it is east of the Caribbean, in the Atlantic Ocean. This is important because it relates to how the island was formed. Barbados is the top of an undersea ridge, formed by the subduction of the North American Plate below the Caribbean Plate. As these huge plates of Earth's crust

collide, sediment from the bottom of the Ocean is pushed upward. Over geologic time, the ridge built up and the land mass was uplifted. The Scotland District was the first section to emerge, exposing the Oceanic sediments to the atmosphere. When conditions were suitable, corals colonised this ridge and built reefs in the shallow waters around the emergent peak. Uplift continued, pushing those early coral reefs above the surface where they fossilised to form the 'coral cap' that covers approximately 85% of the land surface. Uplift happened in stages, producing the distinct coral ridges of the west and south sections of the island. This offers us another clever spin on R2R; as you could say that Barbados was formed from ridge to reef.

Barbados' formation is critical to the flow of water on the island. The coral limestone is porous and fractured – geologists call this Karst topography. Water infiltrates limestone quickly, which is why Barbados has very little permanent surface water. Instead of water flowing continuously on the surface in rivers, the gullies are dry most of the time and the water flows continuously underground. Both overland and underground flow ultimately connect to the sea, and the flow also reshapes the limestone over time: it has carved the deep gullies in the surface and the caves below, giving rise to beautiful cave formations.

Humans have also changed the land surface and the water. Barbados is densely populated and developed, and we made big changes early in our history with extensive land clearing for sugar production. Land development affects how and where the water flows: paved surfaces are more impermeable than soil and limestone so that a greater proportion of water flows overland than infiltrates to groundwater reserves. Our underground aquifers have historically provided a naturally filtered water supply, but when we do not properly treat and dispose of the wastewater we produce, it can contaminate our natural water resources. When our activities introduce harmful substances into water, it is polluted. This is bad for us, but also for other life supported by the same cycle of water.

The flow of water also links a network of ecosystems from ridge to reef: gullies, caves, wetlands, seagrass beds, coral reefs. Each ecosystem influences the water as it flows, providing 'buffering' that is beneficial to the other ecosystems in the network and to us. Gully vegetation slows the flow of water, increasing the opportunity for infiltration to groundwater, and retaining sediment. In coastal wetlands, mangroves naturally process pollutants and improve water quality. Buffering also occurs in reverse, from reef to ridge: coral reefs act as 'natural breakwaters' protecting the coastline, and seagrass beds and coastal wetlands also offer secondary coastal protection. Ecosystems are not just valuable because of the benefits that humans obtain from them, they also have intrinsic value.

Unfortunately, water also carries land-based sources of pollution from ridge to reef, contributing to the degradation of ecosystems along the network. When we clear gullies and fill in wetlands, that also has consequences up and down the line. Land development, agriculture, and waste management all have impacts from ridge to reef. Humans are a part of this interconnected natural system: we benefit and we affect, whether positively or negatively depends on us.

There are many ways to make a positive contribution. A few suggestions from the perspective of ridge to reef: learn, engage, observe and speak up. Learn more about our island's natural systems. Read the whole IYOR article series. Go on a gully hike, visit Harrison's Cave and Folkestone Marine Park. Pay attention to national governance related to land development and natural resource management. Go to public meetings. Insist on sustainable development.

(Karima Degia is Barbadian professional with engineering qualifications, a wide range of project experience, a strong interest in natural systems and a love for this little rock.)

