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Is Costa Rica Killing Its Rivers?

Costa Rica has earned worldwide acclaim for its environmental accomplishments. It has enacted laws to protect forests, biodiversity, and marine areas, and its fine system of national parks and reserves attract more than a million tourists every year. Yet it continues to neglect one vital area of the environment with consequences that could destroy or degrade all the rest of this wonderful natural endowment. It has thus far failed to give adequate attention and protection to its rivers and streams.

Traditionally Costa Rica has regarded rivers as they once regarded forests – as an easily renewable resource to be exploited for the needs of man. Since the increased pace of development throughout the country brings an increased demand for construction materials – notably sand and gravel needed in the building of highways and shopping malls – the construction industry is turning to streams as handy sources. The rivers are public property, and the cost of applying for a river mining concession from MINAET is relatively low compared to the profits to be gained from the sale of sand and gravel. For that reason the last two years have seen a sharp increase in applications for concessions to use remote and hitherto pristine streams as sources of construction materials. Examples are the Rio Aranjuez near Puntarenas, the Rios Uvita and Morete near Punta Uvita, the Rio Naranjo south of Manuel Antonio, and the Rio Tigre near Puerto Jimenez on the Osa Peninsula. The increase in river concessions poses a grave environmental threat with impacts that go far beyond the river itself.

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Here is what happens when a sand and gravel mining operation excavates the bed of a living river in the process called in-stream mining. Removal of material causes an immediate change in the existing river geometry. "Geometry" here refers to the shape and course of the river. It includes all of the little meanders and pools, the riffles and rocks and bars and bends, as well as the streamside vegetation. In-stream mining destroys this geometry and replaces it with a relatively flat surface.

This simplified geometry increases the velocity of the river, which in turn increases the erosion. The faster flowing water tends to spread out the rocks and sand and gravel in the river rather than deposit it in bars and riffles. This eliminates the deep holes and slow moving areas, which means that all of the creatures that rely on the deeper water to survive no longer have homes. The greater erosive force of the altered riverbed creates more erosion along the outside of bends in the river and increases the rate that the river meanders, or moves around within the riverbed. This increases the sideways erosion of the river even more.

Increased erosion soon leads to loss of the riparian, or streamside environment. This piece of the river ecosystem is extremely important as a form of unique habitat that bridges the land and water. It is made up of species that generally only exist along the riverbank. These species not only provide unique vegetation and fruits for the environment, but have roots highly adapted to holding the riverbank in place against the erosive forces of the river.

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If the in-stream mining does not directly remove this streamside vegetation, the increased erosive force of the mined river will. Not only are the homes and food supply of the animals that require this vegetation gone, but the big holes under cut banks that are protected by overhanging roots are lost as well. All of this vegetation loss means more sun now hits the river. This completely changes the aquatic environment to one that is brighter (predators can see better) and warmer (many species cannot tolerate greater warmth). Compounding all of this, the warmer water does not allow the absorption of as much oxygen for the aquatic creatures to "breathe" as does cooler water.

Riverbed mining has impacts that reach far beyond the bed of the river. The river is the heart and circulatory system of a regional ecosystem. If the river is damaged, or removed in this case, the damage impacts the ecosystem around it and does not go away when the mining stops. The alteration of the riverbed feeds on itself and can become more destructive with time, even extending to the headwaters of the river. This is called an environmental feedback. As more damage is done to the river, the impacts on the surrounding area are increased. Biodiversity is drastically reduced and species eliminated. The cumulative impacts degrade the river and the entire system around it, including forests, agriculture, and human communities. It can have a disastrous effect on aquifers and water supply. It will also impact the vitality of the zone around the river mouth including reefs, mangroves, and fisheries.

Perhaps the saddest part of this "river-cide" that seems to have accompanied the current development boom is that it is completely unnecessary. Costa Rica has abundant

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resources of sand, gravel, and even better construction materials such as caliche and decomposed granite outside of the riverbeds. Some of it is nearby in the flood plain. Some of it is further removed in upland areas where there are prehistoric riverbeds. Materials can be removed through pit mining in either of these areas with far less impact and ultimately less cost than from the flowing rivers. This is why most developed nations have now banned the practice of in-stream mining. Costa Rica also needs to halt its use of streams as handy sources of building materials before the natural bounty of living rivers, with their otters, caiman, frogs, fish, crustaceans, water birds, and streamside species, disappears completely, leaving a tragically impoverished environment.

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