

MINI-HYDRO, AN INJURIOUS NOVEL THREAT TO HIGHLAND FOREST ECOSYSTEMS OF SRI LANKA

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Small hydropower generation by arresting mountain streams is being viewed as an environmentally benign energy source, compared with large dams and fossil fuel combustion as it has no effects on global climate change. They can however, exert multiple negative effects locally, especially on riverine and riparian ecosystems, and eventually on aquatic biodiversity and human health of riparian communities, but reported studies on these aspects are hardly any. Ecological risk of cascade operation of small hydropower plants established on the highland tributaries poses adverse effects, as it leads to almost drying up of the natural stream channels during dry season whereas small hydropower plants affect not only fish but also the ecological integrity of lotic ecosystems and terrestrial landscape. Apparently, present knowledge and findings have fueled that principles of ecosystem science need to be fully integrated into water resources planning and management. Although the negative impacts of mini-hydropower plants on aquatic ecosystems are fairly well understood, the holistic long-term effects of clustering mini-hydropower plants on highland forest ecosystems are hardly investigated along with ongoing climate change scenarios.

The present study examined the hydrological network of Sri Lanka's mountain landscape and its associated mini-hydropower plants, to understand their effects on highland forest ecosystems. All potential sites in Sri Lanka's highlands have been either tapped or permitted to tap for small hydropower generation. About 170 km of stream channels have no water as the water flows through concrete canals, conduits, and penstocks, resulting in lessened ecological integrity between vegetation and water. The northern boundary of Sinharaja Rainforest has been encroached to construct the Koskulana mini-hydropower plant. Several kilometer-long headrace canals have been constructed removing canopy trees (e.g. Badulu Oya mini-hydropower project) whereas penstocks over one meter in diameter have been buried for several kilometers within restricted forests hindering the growth of deep-rooted trees as in Wellawaya mini-hydropower plant in the Kirindi Oya basin. Obviously, river bank vegetation between the diversion weir and tailrace outfall consisted of canopy trees and other terrestrial and semi-aquatic plants that disappeared due to the decline of lateral flows. When the diversion weir of the mini hydropower plant is placed upstream of a waterfall, as it has happened at Ethamala Ella on the Nilwala River, forest vegetation unique to the spray zone will be badly affected. These potentially negative impacts will certainly result in gradual decline of the remaining forest in the highland of Sri Lanka as global climate change is proactive in the Asia-Pacific region.