

Hydropower and its ecological impacts – case studies from Iceland and Switzerland

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Since the 1950s Japan's ratio of hydropower production has been continuously declining (from more than 90% in the 1950s to 8% in 2013), making the country almost entirely dependent on non-renewable energy sources, e.g. oil, LNG, coal and nuclear power. Nevertheless, topographic features (Mt Fuji reaches up to 3776 m asl.) and precipitation rates (annual precipitation in Tokyo amounts up to 1500 mm yr⁻¹) in Japan suggest that there is a high potential in hydropower production. Iceland is the world leader in hydropower production per capita and accordingly has a long history of hydropower production. In the framework of the Icelandic master plans new technologies were developed to assess the hydropower potential of ungauged mountain areas (Finger, 2015), using satellite retrieved snow cover images (Finger, 2011, 2015). Furthermore, long-term climate change projections indicate that hydropower infrastructure should be adapted to changing environmental conditions (Finger et al. 2012). While hydropower operations are almost entirely emission free and thus present a clean and renewable energy source, large reservoir construction can lead to significant ecological impacts affecting flooded areas as well as downstream freshwater ecosystems (Finger, 2006). Naturally occurring riverine sediment transport can be interrupted and downstream river and lake turbidity can be altered (Finger et al. 2006), affecting ecosystems and fisheries (Finger et al. 2007). The talk will conclude by outlining how numerical models can be used to optimize hydropower production while minimizing environmental impacts.

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