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Connectivity research in Iceland – using scientific tools to establish sustainable water management strategies

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Since the ninth century when the first settlers arrived in Iceland the island has undergone deforestation and subsequent vegetation degradation and soil erosion. Almost the entire birch forest and woodland, which originally covered $\sim$ 25% of the nation, have been deforested through wood cutting and overgrazing. Consequently, soil erosion seriously affects over 40% of the country. During the last 50 years extensive drainage of wetlands has taken place. Furthermore, about 75% of Iceland electricity production comes from hydropower plants, constructed along the main rivers. Along with seismic and volcanic activities the above mentioned anthropogenic impacts continuously altered the hydro-geomorphic connectivity in many parts of the island.
In the framework of ongoing efforts to restore ecosystems and their services in Iceland a thorough understanding of the hydro-geomorphic processes is essential. Field observations and numerical models are crucial tools to adopt appropriate management strategies and help decision makers establish sustainable governance strategies. Sediment transport models have been used in the past to investigate the impacts of hydropower dams on sediment transport in downstream rivers (Finger et al., 2006). Hydropower operations alter the turbidity dynamics in downstream freshwater systems, affecting visibility and light penetration into the water, leading to significant changes in primary production (Finger et al., 2007a). Overall, the interruption of connectivity by physical obstructions can affect the entire food chain, hampering the fishing yields in downstream waters (Finger et al., 2007b). In other locations hydraulic connectivity through retreating glaciers assures water transfer from upstream to downstream areas. The drastically retreat of glaciers can raise concerns of future water availability in remote mountain areas (Finger et al., 2013). Furthermore, the drastic reduction of glacier mass also jeopardizes the water availability for hydropower production (Finger et al., 2012). All these factors reveal the importance of a thorough understanding of hydro-geomorphic connectivity to adopt adequate water management strategies.
The presentation will conclude by outlining how the above presented methods can be applied to Icelandic study sites to help water managers and policy makers to adopt resilient based policies regarding the challenges of future climate change impacts.

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