

# Assessing and valuing ecosystem services for managing hydropower constructed rivers systems

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## Introduction

Rivers developed for hydropower production are important electricity generators with an increasing role as a balancing power source in new wind-power dominated energy systems. However, hydropower constructed rivers also provide many ecosystem services, such as habitats for migratory fish species and opportunities for recreational activities. *Currently, we see drastic changes in needs from society to use regulated river corridors for multiple purposes, and therefore, new approaches are needed to support the sustainable management of river resources.*

In EcoRiver-project we develop an integrated assessment framework and examine cost and benefits provided by hydropower constructed rivers. We use hydrodynamic modeling to quantify the ecosystem services and variability during short-term regulation practices (hydropeaking). Hydropower and energy market modeling are used to examine the impacts of increasing demand flexibility on hydropower. Environmental valuation methods are applied to evaluate the ecosystem services monetarily. Finally, we integrate these methods for a cost-benefit analysis to support well-informed decision making for river management.

**To summarize, there are conflicts between alternative uses of river resources and they are likely increasing in the future.**

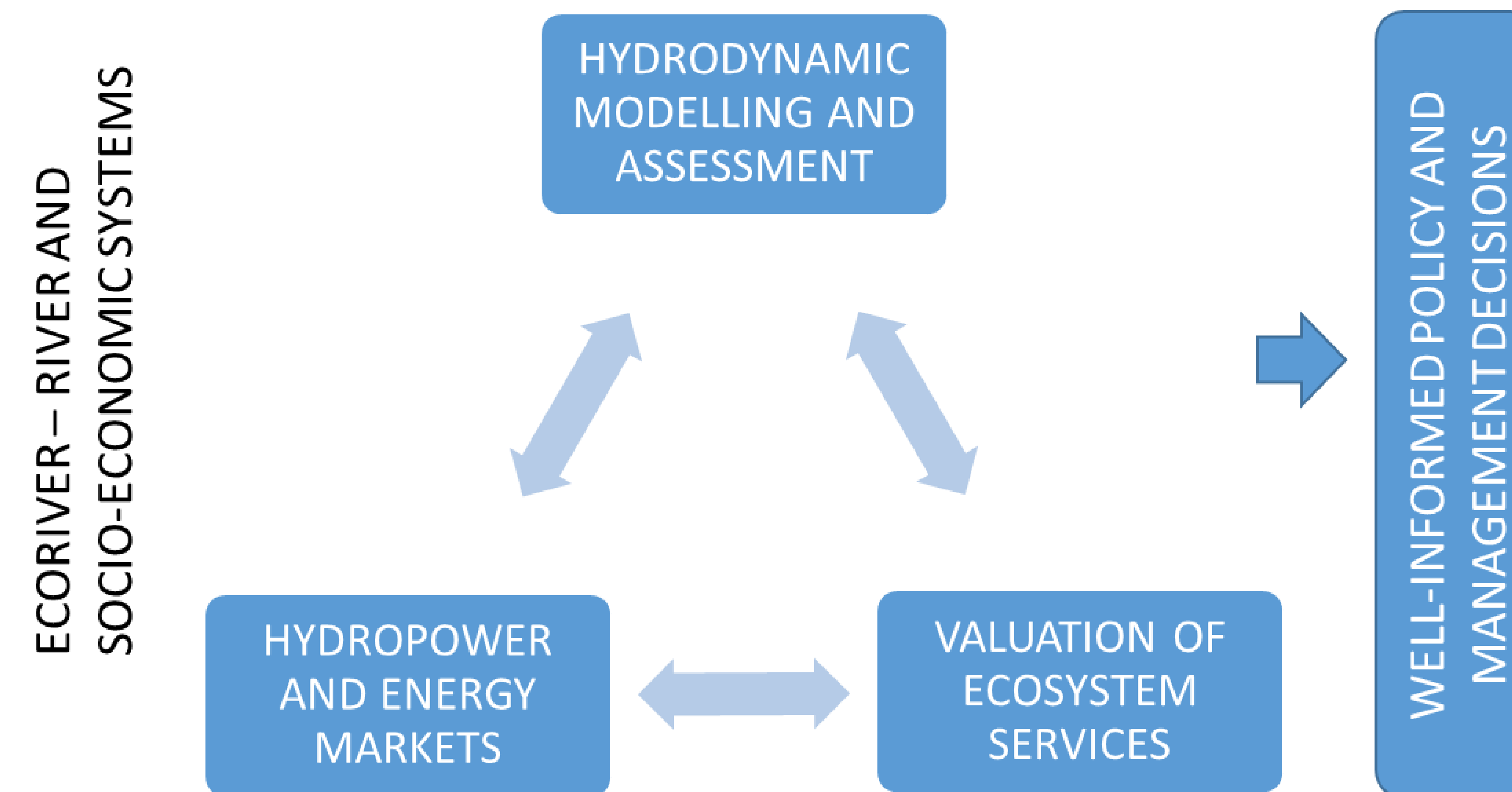


Figure 1. Conceptual assesment framework

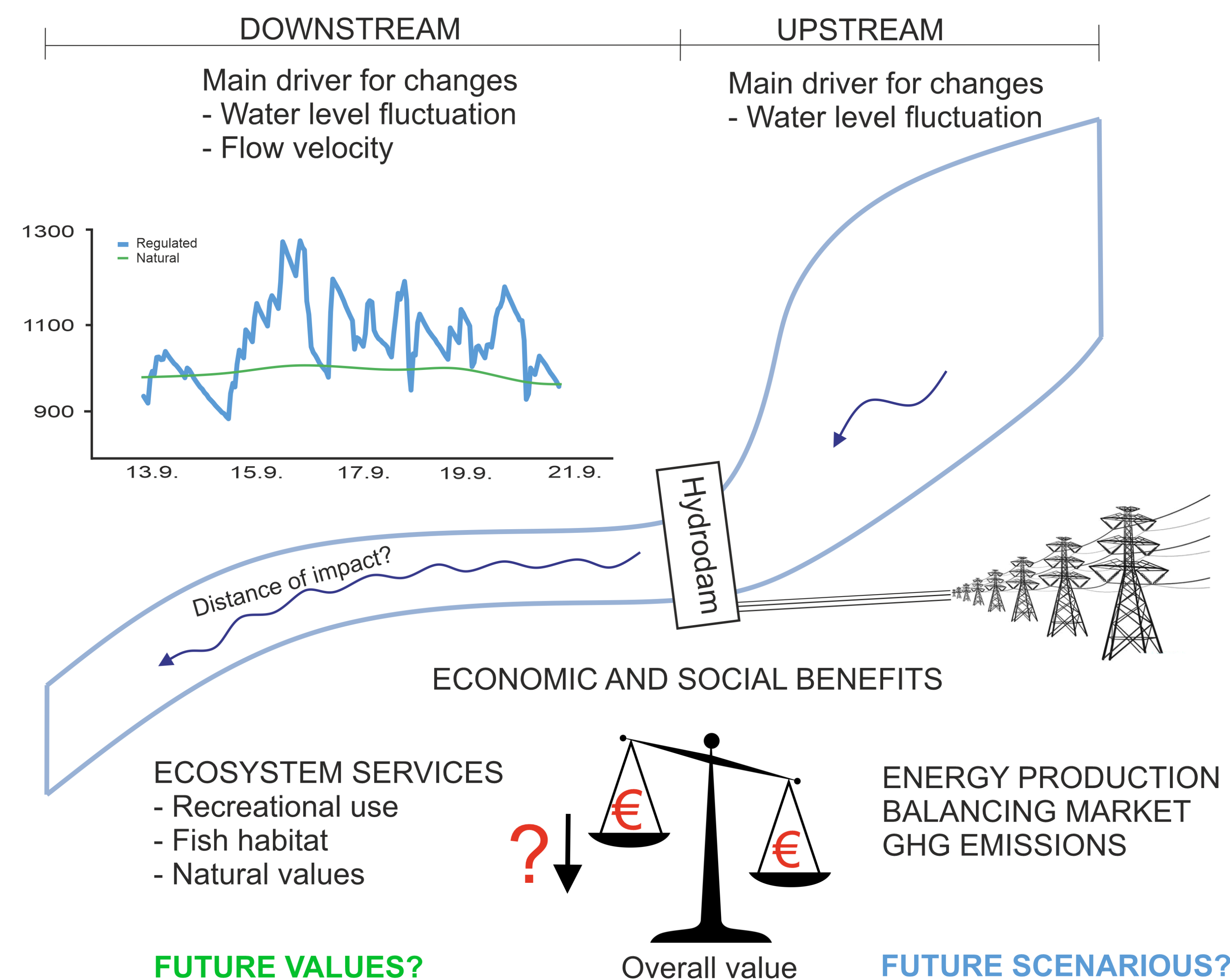


Figure 2. Balancing between economic and social benefits

## Research questions

**Question 1:** What aspects of hydropeaking are contrary to a diverse river ecosystem and which are not, and how could hydropeaking impacts be diminished?

**Question 2:** How does integration of increasing share of variable renewable energy sources (VRES) affect the utilization of hydropower? How does electricity demand flexibility impact hydropeaking? What is the effect of tighter environmental hydropower flow constraints on the supply of flexibility in the electricity system?

**Question 3:** How local people and visitors, including anglers and non-anglers, value ecosystem services provided by hydropower constructed rivers?

**Question 4:** How to enhance cost-effectively multifunctional use of large regulated rivers in Finland?

**Question 5:** What are costs and benefits of dams in small rivers in Finland? Does value of ecosystem services override monetary values of electricity production? Can valuation be used as a part of programme of measures in heavily modified rivers according WFD?

