Sustainable development of hydropower - Case-studies and perspectives in Norway.

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Hydropower covers about 99 per cent of the Norwegian electricity production and has played a major role for developing industry and welfare in Norway. As we have gained more knowledge about environmental impacts of hydropower, the awareness of such impacts have also increased and is now incorporated in legislation and practice. This presentation will give a brief overview of Norwegian hydropower development, legislation and practice with respect to environmental impacts and mitigation. The focus further will be on case-studies of habitat, growth and migratory conditions for salmon from the regulated rivers Alta, Orkla, Surna and Mandal, and also from the Vefsna river where hydropower development was proposed but later refused by the parliament. In Alta and Orkla rivers, post-project assessments show wealthy salmon stocks. Field data and model simulations in Orkla show that negative impacts from decreased water temperature in summer is outweighed by the positive effect of avoiding very low flow periods in winter. In Surna and Mandal rivers, research has demonstrated possible measures to improve habitat, growth and migration of salmon. Solutions are now being tested, before eventual incorporation in the future license to operate. In Vefsna, a dialogue between the hydropower company (state-owned Statkraft) and researchers proposed a development to minimize the negative impact on salmon and trout. Finally, the presentation will show some specific results from recent research about how the future flexible hydropower system should be operated to avoid further negative impacts on the environment.