Task A

Impacts on physical conditions

When hydro power is operated with frequent changes in production, downstream flow variations will vary along a wave front leading to wetting and drying of river sections. The understanding and modeling of these dynamic processes are crucial to evaluate environmental impacts. Direct and indirect impacts on the substrate composition, erosion, siltation processes, pore space changes, interactions with ground water flow and the hypoheric zone, water temperature and ice conditions and changes in embeddedness are important to identify.

Task A1: Dynamics of dewatering. Dynamic processes followed by flow changes have been studied mostly with respect to flood wave propagation and during high flow situations. Different aspects of inverse wave propagation, dampening, dewatering speeds, timing and impacts on wetting-drying need to be investigated for a range of rivers with variable bathymetry, e.g. flat with gravel bars, steep sided and small-steep at several spatial scales (micro-, meso- and macro scale).

Task A2: Erosion, sediment transport, siltation and armouring of the substrate. Hydropeaking and alternative regulation will change the pattern of erosion and sedimentation processes, in many cases leading to more disturbances in the substrate composition. However, increased variation within the some limits may also lead to increased armouring and embeddedness. As the substrate is important for all aquatic organisms, it is crucial to study and predict changes in substrate conditions as well as to develop sustainable mitigation.

Task A3. Water temperature. Reservoir water used for peaking hydropower production often has a different temperature regime than the natural stream water. Combined with the effect of flow changes, an increased variability in water temperature may be the result of increasing changes in hydro operations.

Task A4: Ice conditions. During the cold season, the combination of rapid changes in discharge and altered water temperature will probably lead to reduced static ice formation (surface ice) and increased production of dynamic ice formation (frazil and anchor ice). The effects of hydropeaking on the ice regime and further on the physical habitat in streams are less known, but nevertheless essential if we are to understand the impacts of hydropower production on cold environment ecosystem responses.

Task A5: Hydro reservoirs and lakes. Peaking hydropower plants may cause changes in the circulation processes of downstream lakes and reservoirs, which again will affect flow patterns, erosion, temperature and ice conditions. In small and medium sized reservoirs and lakes this may play an important role to the environmental sustainability. Environmental impacts of hydropeaking KMB proposal for RENERGI 2008.