Environmental guideline – PCC HYDRO and PCC NEW HYDRO

Compliance with international and German environmental and social requirements to build and operate hydropower stations in Southeast Europe

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Hydropower plants have positive effects if they are implemented in an environmentally and socially sustainable manner. Hydropower generates clean, renewable energy without producing any emissions of air contaminants and climate gases thereby making a vital contribution to preserving our environment, to climate protection and the achievement of the environmental goals of the European Community.

The enterprise PCC HYDRO and PCC NEW HYDRO undertakes to plan, build and operate its hydropower plants in compliance with the current ecological and social requirements, thereby minimising potential negative environmental and social effects of the projects to a reasonable degree while maintaining the positive yields from the projects. The enterprise shall, in this context, always comply with the applicablenational legislations and the guidelines of the host country and is, on top of this, geared to German and international standards.

In each stage of the project – from the feasibility study to the planning and construction to the operation of the facilities – the following environmental and social aspects will continuously be considered:

Feasibility study	Study on alternative production sites and decision on a site under consideration of the analysis on environmental and social impacts of the project
Planning phase	Compilation (quantitative) and appraisal (qualitative) of all resulting environmental and social impacts of the project Development of precise environmental and social management plans and

	definition of the required mitigation measures Continuous consultation with the relevant authorities, residents and enterprises involved/affected
Construction phase	Contractually bind developers, construction companies and supervisors to comply with the applicable legislation and provisions and the measures as laid down in the management plan Monitoring according to management plan at regular intervals
Operational phase	Monitoring of project impacts Implementation of the management plan Keep in touch with authorities and residents

All partners involved in the project – from project owner to those in charge of project monitoring and executing enterprises – are responsible for the realisation of the project implementation as described.

The major environmental and social aspects to be considered during the realisation of small hydropower plants are described in the Annex.

Annex
Environmental and social aspects concerning the implementation of small hydropower stations

Annex

Environmental and social aspects concerning small hydropower stations

Subject of protection to be considered	Details on subject of protection	Measures
ENVIRONMENTAL ASPECTS		
Water quality	(almost exclusively applicable for projects involving large reservoirs) - Modifications of reservoir flow rate - Risk of reduced oxygenation in the reservoir - Changes of water temperature in the reservoir - Stratification in the reservoir - Pollutant inflow - Propensity for disease proliferation - Change of nutrient capture in the water owing to altered water level - Algal bloom, especially in the reservoir - Release of toxins from inundated sediments owing to altered water level	**Planning phase:** - Comprehensive studies and documentation of the actual state - Identification (calculation, simulation) of the planned operational state - Planning of both project and operation with the aim of minimising negative impacts - Cooperation with authorities with the aim of improving the catchment area **Construction phase:** - Prevent pollutant inflow (concrete emulsion, machine oil, etc.) into both water and soil **Operational phase:** - Monitoring of water quality
Sediment transport and erosion	(preferably applicable for projects involving large reservoirs) - Risk of increased sedimentation in the reservoir up to potential failure of the plant - Reduction of the sediment load in the river downstream can result in erosion	**Planning phase:** - Consideration of sediment-producing activities in the catchment area - Measures aimed at the reduction of reservoir sedimentation (e.g. reforestation in the catchment area) - Sediment-removing technical equipment of the plant (flushing systems, sediment by-passes, etc.) is to be considered - Technical and operational measures to avoid

		erosion in the river downstream has to be planned **Construction phase:** - Avoid large-scale removal of vegetation cover **Operational phase:** - Monitoring of the bed load (till) transport
Downstream hydrology, reservoir hydrology and environmental flows	- Direct impact on the water flora and fauna due to changes to downstream hydrology - Direct / indirect impacts on the habited at tne river and near the riverside due to changes to downstream hydrology - Direct / indirect impacts on the resident population - Impacts on the biodiversity of the total area under consideration	**Planning phase:** - Ensuring adequate residual water volumes in view of ecological and sociological requirements, compliance with official provisions - Minimising the reservoir as far as technically possible **Operational phase:** - Monitoring of residual water volume to the local requirements

Rare and endangered species	- Possible loss or impairment of habitats by the project - Altered stream (flow) patterns with resulting impacts on animals and plants - Impacts on the overall aquatic fauna (fish, molluscs, macrozoobenthos) - Study impacts on birds and all terrestrial animal species - Study impacts on the terrestrial and aquatic flora	**Planning phase:** - Analysis of existing fauna and flora and their conservation significance and identification of adequate compensatory measures, e.g. fish protection facilities within and around the plant, conservation of spawning reserves in the water, warranting the passage of fish species, - Identification of alluvial forest and wetland - Identification of protection measures for affected wetlands - Planning of cultivations compensating for clearings **Construction phase:** - Plan for protection of fauna and flora right from the start (enveloping of trees, deviations/canalisation of the water, respect potential close seasons) **Operational phase:** - Monitoring of relocations and new cultivations of plants and animals - Maintain compensator measures
Passage of fish species	- Upstream migration - Downstream migration - Important for the fish population and therefore for the domestic economy	**Planning phase:** - Protection against access to turbines by appropriate measures and dimensioning of the plant - Planning of mechanisms for fish transfer (fish ladders, elevators, etc.) - Definition of a residual water flow between intake and power house according to official provisions **Operational phase:** - Controlled fishing regarding possible fish migration

Natural scenery	- Change in water appearance due to reservoir and/or residual discharge - Influence of constructions on the natural scenery - Influence of the construction phase on the natural scenery	**Planning phase:** - Allow for passage of residual water flow in the river section between intake and power house - Adaptation of new constructions into the scenery - Use local building style - Minimise interventions into the natural scenery during the construction phase, e.g. construction of access roads, storage area, etc. - Development of required reconstruction measures **Operational phase:** - Monitoring of cultivation - Monitoring of the project effects
Pest species within the reservoir	(almost exclusively applicable for projects involving reservoirs) - Possible colonisation of new species through their adaptation to new conditions	**Planning phase:** - Risk identification prior to development - Plan shorter residence time of water in the reservoir - Minimising reservoir volume if technically possible **Operational phase:** - Monitoring of species development

SOCIAL ASPECTS		
Land purchase, altered use of resources	- Ensure that residents are not adversely affected by the project or that inevitable interferences are appropriately compensated	**Planning phase:** - Analysis of past and present use of land and users - Early identification of property rights and use of land - Analysis of necessary physical and economic resettlements and development of corresponding compensatory measures - Observance of rights of way and use and changes concerning access to resources (land, water), if required, compensatory measures - Consideration of vulnerable groups
Health and safety of residents	- Ensure health and safety of residents	**Planning phase:** - Analysis of possible adverse effects on residents' health and safety - Consideration of vulnerable Groups - Development of appropriate operational plans - Observance of occupational health and safety for construction and operational phases - Development of emergency plans and reporting chains - Complaint management system **Construction phase:** - Compliance with occupational health and safety provisions - Development of and compliance with an occupational accident concept **Operational phase:** - Monitoring of project impacts - Compliance with operational provisions - Public display of emergency plans / telephone

		numbers
Infrastructure	- Detailed demand estimate for generated electricity - Technical practicability of grid connection - Possibilities for population to buy electricity	**Planning phase:** - For isolated operation mode: Identification of actual electricity requirement including peak and base load times - Forecast of demand development - Decision on parallel versus isolated operation mode - Calculation of purchase price per kWh and affordability for the population/network operator **Construction phase:** - For parallel operation mode: establish mains connection - For isolated operation mode: develop supply network - Continuous monitoring of compliance of the facilities with national regulations
Information & consultation of the population	- Appropriate incorporation of the affected population into project development and realisation	**Planning phase:** - Public announcement of project - Participation of the population - Approval by authorities **Construction and operational phases:** - Realisation of the measures laid down in the management plan - Complaint management system
Working conditions	- Provision of appropriate working conditions during construction and operational phases	**Construction phase:** - Contractual obligation of the general contractor to comply with local labour legislation and provisions including sub-contractors - Ensure appropriate supply if camps are required **Operational phase:** - Compliance with at least local labour legislation