



Contact

Sustainable Hydropower Website
C/- Hydro Tasmania
4 Elizabeth St
Hobart TAS 7000
AUSTRALIA

sustainable.hydropower@hydro.com.au

Water quality

Where water quality issues are prevalent, there are a number of design and operational systems that can be used to minimise impacts of a hydropower scheme within a reservoir and downstream. These begin with adequate data collection and a comprehensive environmental assessment process.

Issue

Changes in water quality may occur within and downstream of the development as a result of impoundment. The residence time of water within a reservoir is an influence on the scale of these changes, along with bathymetry, climate and catchment activities. Where water quality issues arise, they can vary greatly and can include reduced oxygenation, temperature, stratification potential, pollutant inflow, propensity for disease proliferation, nutrient capture, algal bloom potential and the release of toxicants from inundated sediments. Some water quality problems relate to activities within the catchment beyond the direct control of the proponent but which can cause water quality problems when compounded with the power station operations.

Flooding of biomass, especially forests, results in underwater decay. In deep lakes that tend to stratify, colder de-oxygenated water at depths in the lake have in some cases released metals from the sediments e.g. methylmercury. Deep intakes can in some cases result in deoxygenated and hydrogen sulphide rich releases out of the power station tailrace into the downstream river system. Particularly high hydropower dams have in cases had problems with gas supersaturation resulting in fish deaths. In shallow lakes, water quality problems can under certain catchment conditions result from wind-induced sediment re-suspension, eutrophication and algal blooms.

Water temperatures in the discharged water can differ from ambient temperatures, and can also fluctuate over short time scales depending on operating patterns. Temperature can have a major influence on biological health and be instrumental in providing migrational cues for some species. Turbidity issues can arise in cases due to erosion of riverbanks, incoming sediments, and re-suspension of bottom sediments in shallow lakes.

Management

Adequate data collection and an environmental assessment process that identifies potential water quality problems prior to dam design are essential to problem

avoidance and mitigation. Where warranted, there are a number of design and operational systems that can be employed to minimise negative water quality impacts within the storage and downstream:

- Selective or multi-level offtakes in deep reservoirs can limit the amount of water drawn into the power station from cold, anoxic depths. Seasonal management of lake levels can also be utilised to ensure offtake of oxygenated water at seasonally appropriate temperature.
- Downstream gas supersaturation can be addressed through the use of stilling basins, spillway design, or through structures that favour degassing.
- Air injection facilities and aerating turbines can be considered to avoid de-oxygenated water being delivered to the downstream river system.
- Reservoir clearing prior to inundation can limit the amount of organic decomposition in the reservoir, and thus the consumption of oxygen.
- Reducing the residence time in reservoirs limits and ensuring flow-through can improve water quality conditions.
- In shallow lakes, baffles can direct circulation and ensure adequate water flow-through and mixing, and can also to inhibit wind-induced resuspension. Planting of appropriately selected microphyte communities (aquatic vegetation) can control turbidity due to sediment resuspension and erosion. Raising minimum lake levels to minimise wind-induced resuspension.
- Catchment management to improve water quality of run-off, and collection/treatment of pollutant-laden inflows can have significant water quality benefits for hydro reservoirs. Water pollution control measures such as sewage treatment plants or control of industrial emissions may be required in particular cases.