Application	**Policy issues** Who supplies forecast data? Who is the decision maker? What decision to take?	**Processes**	**Control Problem** (forecast horizon, forecast uncertainty, objectives and constraints)
Short-term hydropower reservoir management (e.g. Bonneville Power Administration)	Meteorological data from met office, in-house streamflow and load forecasts, BPA schedules the hydro system and implements the decision	Hydropower reservoirs (pool routing + turbine component) and intermediate routing with constant fixed delays	Hourly forecast over up to 30 days, plenty of forecast uncertainty, multi-objective (power safety, environmental obligations, maximize revenues, etc.), many constraints
FEWS Rivieren (Rhine, Meuse)	RWS: supplies validated deterministic forecast (based on probabilistic forecasts + post processing Verkade) Users: Water boards (boundary condition of regional water system), veiligheidsregio		Relevant lead time 3-4 days for evacuation measures Test case: Meuse, evacuation, trade-off: false alarm / costs, credibility, flood plain evacuation: campers & cows -> work out with direct users?
IWP	RWS Water quantity 12-13 water systems (existing: Twentekanalen, Ijsselmeer, etc.)	0D and hydraulic models + wind (external from SOBEK, internal consideration useful to get rid of the SOBEK model ?) Water quality aspects (salt intrusion, blue algae) by surrogate modelling? (direct or indirect consideration?)	2 days, 10min (tidal signal) – hourly steps, forecast from FEWS Rivieren, Waterbeheer, dedicated models, etc. Uncertainty in water balance (inflows / outflows, lock operations), Ijsselmeer → meteo (wind) Objectives: navigation (level setpoints), salt concentration, fish migration, energy costs Control: post processing for discrete decisions etc. (no/less changes at night), combinations of continuous and discrete pump operations, pump capacity depends on head, logical constraints → changes only

			if head < 10cm, Pre-defined, seasonal flow direction Min / max water levels by soft constraints, operating costs + costs for on/off, rate-of-change on settings, Pilot Kreekrak (N&S) on variable energy prices, also Ijmijden → operator provides future energy need and flexibility Water energy nexus → Ivo Pothof
NZV operation of a regional Dutch water system under daily conditions and flood events	Hydrological forecast, decision making and implementation by NZV Daily management (linked to telemetry) and during flood events	Canal system Bottlenecks: wind as additional process	Deterministic forecast (awareness about forecast uncertainty), future use of GLAMEPS Flood mitigation (level thresholds, priority), energy costs (STOWA project on variables energy costs?) Bottlenecks: existing setup suggests too low levels -> hard constraint for lower level threshold Operator friendly operation (avoid actions at night, etc.) Optional balance between compartment Post processing for continuous decisions (one action every 2 or 3 hours, discrete steps for discharge, pump needs to be running for a minimum period)
Delfland ➔ Work out with Bart after kick-off		See above	Max flow of structure in hydraulic model, weir coefficients
Fews Waterbeheer (Peter Gijsbers)	RWS: daily run of LHM based on NHI (14 days, daily steps) ->	Water balance + water temperature + salt	Multi-objective!!! Objective: water distribution by priorities

national freshwater distribution	decision-support / advise for LCW	intrusion	Quasi steady state (daily step) -> probably hourly step in the future ?

Cases:

Polder on/off + timing for flood mitigation on regional level, costs for use and drainage (by pumps)

Floodplain evacuation (camping?)