

## Tovdal River, Norway

### Location

The Tovdal River is a major river in southernmost Norway and runs north-to-south from its headwaters in the uplands above 1000 m above sea level to the Topdalsfjord at the coast at Kristiansand.



### Catchment description

The catchment area is 1863 km<sup>2</sup> and underlain predominantly by Precambrian granitic and gneissic bedrock, with thin and patchy moraine of the same lithology. The higher lying areas of the catchment are characterised by alpine, heathland and peaty soils. Much of the lower parts are forested with pine, spruce and birch. There is very little farming, industry or habitation in the catchment, and it has not been developed for hydropower significantly. The Tovdal River basin is thus dominated by “semi-natural” unproductive uplands, similar in character to the experiment site of the CLUE project at Storgama and the experimental site of the CLIMEX project at Risdalsheia.



### Key descriptors

Catchment area at downstream monitoring site	1777 km <sup>2</sup>
Flow and rainfall data available from	1899

### Data availability

Discharge, flow routing and lakes:

## Hydrological Observatory description

The Norwegian Water Resources and Energy Directorate operate two gauging stations on the Tovdal River, one at Austenå in upper Tovdal and one at Flaksvatn. The Tovdal River is comprised of 102 REGINE catchments. The database includes the 1961-1990 mean specific discharge for each REGINE unit. A database of all the major lakes in Norway is also held by NVE; 24 of these are located in the Tovdal basin.

### Meteorology:

The Norwegian Meteorological Institute (met.no) operates 5 stations for temperature and 10 stations for precipitation in or adjacent to the Tovdal River Basin. In addition, the station at Kjevik, the airport for Kristiansand, has wind data. These stations have been in operation since at least the 1950s and in some cases since the second half of the 1800s.

### Water chemistry:

Routine monitoring of water chemistry is conducted by NIVA (Norwegian Institute for Water Research) and began in 1980 with monthly sampling at Boen near the mouth of the Tovdal River. The data are reported annually. Additional stations on the river and its major tributaries were initiated in 1995-96 in conjunction with the planning and operation of the river basin liming. These data are reported annually. A synoptic survey of lakes in the basin was conducted during the 1990s as part of the monitoring programs. All these water samples are analyzed by NIVA for concentrations of major ions, nitrogen species (total N, NO<sub>3</sub>, NH<sub>4</sub>), total phosphorus, and total organic carbon by standard accredited methods.

### Precipitation chemistry:

Monitoring of air and precipitation chemistry at two stations in or near the Tovdal River basin is conducted by NILU (Norwegian Institute for Air Research) as part of the Norwegian monitoring programme for long-range transported air pollutants (2). Samples are collected daily at Birkenes (located near Boen lower Tovdal) and weekly at Treungen (inland near Austenå) and analyzed by accredited methods at NILU. Samples are analysed for major ions, and gaseous and aerosol concentrations of N and S species.

### Land-cover and point sources of nutrients:

Land cover and land use data for the REGINE units come from Statistics Norway (SSB). N and P supplied from inhabitants in urban areas and individual dwellings come from Statistics Norway (SSB) database (by municipality), portioned to REGINE unit based on number of dwellings on the digital maps of the Norwegian Mapping Authority (Statens kartverk).

## Value to network

The Torval Observatory provides data for hydrological conditions that are common in its region but which are quite different from those monitored by many other observatories in the network. Some important distinguishing features of the Torval catchment in the European context are its almost natural land cover and impermeable bedrock.

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