Glommens og Laagens Brukseierforening (GLB)

Water Management Association for the largest river basin in Norway
Glomma and Laagen

- Area: 41,200 km²
- Elevation: 0 – 2469 masl
- $Q_{\text{mean}}$: 700 m³s⁻¹ (535 mm yr⁻¹)
- $P_{\text{mean}}$: 800 mm yr⁻¹

Land cover:
- 49 % forest
- 27 % barren
- 8 % bogs
- 5 % agricultural
- 4 % lake
- <1 % urban

Photo: Tore Sollibråten/Eidsiva
Photo: Jens Kristian Tingvold/Eidsiva
Photo: Ingjerd Haddeland/Eidsiva
Why Water Management Association?


§1 «Regulations of watercourses are understood to be measures for regulating a watercourse’s rate of flow (including diversions, pumping).»

§9 «No license for a regulation should be granted … until all interested owners of waterfalls or works in the watercourse have had the opportunity to form a water management association.»
When two or more owners of waterfall rights have hydroelectric power stations along the same watercourse, and utilise water from the same upstream reservoirs, these companies must join to form a co-operative body:

**Water Management Association**

* The WMA is granted licenses for reservoirs.
* The power companies are granted licenses for utilising the water for hydropower.
WMA objectives

• Water resources management:
  – For the benefit of the public (nation)
  – For the benefit of the companies involved

• Coordinate and create harmony between different owners of water works

• Coordinate and create harmony between different users of water

• Public safety
WMA principles

- All downstream plants share expenses for upstream reservoirs
- The management is coordinated in the same river basin (or river branch)
- Disputes are solved according to regulations or agreements, …
- …or in court
Norwegian WMAs

- Glomma
- Drammen
- Numedal
- Skien

Source: nve.no
GLB

- Water management association for the largest river basin in Norway

- Established in 1918

- Owned by 16 hydropower companies

- Daily tasks performed by Eidsiva on behalf of GLB (15 man-years)

- CEO: 0.5 man-years
Regulate water flow in the Glomma and Laagen river basin, within licensed conditions, in order to maximize energy production (economic outcome).
Hydropower in the Glomma & Laagen river basin

- 27 reservoirs and 7 diversions
  - storage capacity: 3500 Mm³
    (16% of mean annual runoff)
- 50 power stations
- Installed capacity: 2 500 MW
- Production: 12 TWh/year
  - appr. 9 % of Norway’s
- 16 hydropower companies
Annual runoff

Solbergfoss
Annual runoff

Solbergfoss, Glomma

Observed
Naturalized

Mean

Mm³

m³/s

2000

2003

2013
GLB’s activities (1): Hydrology

- Hydrometeorological data
- Short term discharge forecasts
- Long term discharge scenarios / projections
- Reservoir operations
  - Water levels, environmental flow
- Dam safety
- Investments
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_Flood frequency curve, Fundin (NVE’s software)._
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Increase in annual production: 900 GWh
GLB’s activities (2): Civil Engineering

- Build, operate and maintain dams, gates, diversions
- Dam safety

Photo: Fredrik Staff Edin/Eidsiva

![Image of dam construction and operation](Image)

Photo: Fredrik Staff Edin/Eidsiva
GLB’s activities (3): Environment

• Fish
  – Fish ladders
  – Fish stocking
  – Habitat improvements
  – Follow-up studies (actual project consequences)

• Vegetation and soil
  – Erosion protection measures
  – Establishing soil and vegetation cover
  – Follow-up studies (actual project consequences)
GLB’s activities (3): Environment

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GLB’s activities (4): Licensing

- Compensatory bridges and roads
- Compensate landowners and others
- New licenses (applications)
- Revisions

Source: it-novum.com
Water issues

- Hydropower production
- Water supply
- Agriculture
- Forestry
- Fishing
- Recreation
- Water quality
- Ice conditions
- Floods / droughts
Different needs

- Timber rafting
- Agriculture, forestry
- Recreation
Reservoir operations during floods

- The national authority (Norwegian Water Resources and Energy Directorate) has the final word.

- The WMA is in close contact with the national authority that issues flood warnings to the public.

- The river basin is for most practical purposes “run” by the WMA.

- Need permission from national authorities if regulation rules are to be set aside.
Laagen at Hunderfossen

Source: dagbladet.no