

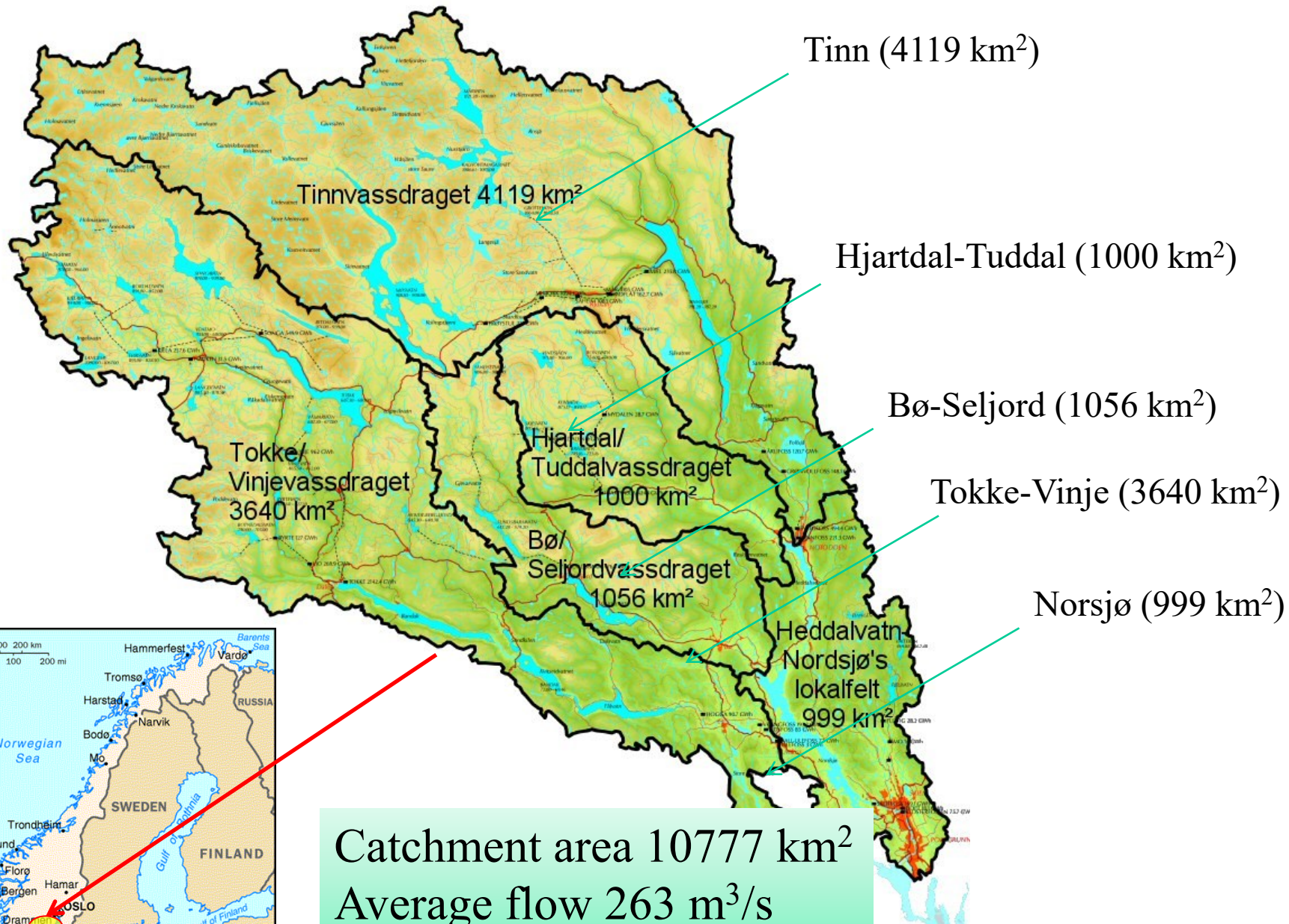
Flood forecasting and reservoir operation in the East-Telemark hydropower system

*Ånund
Killingtveit*

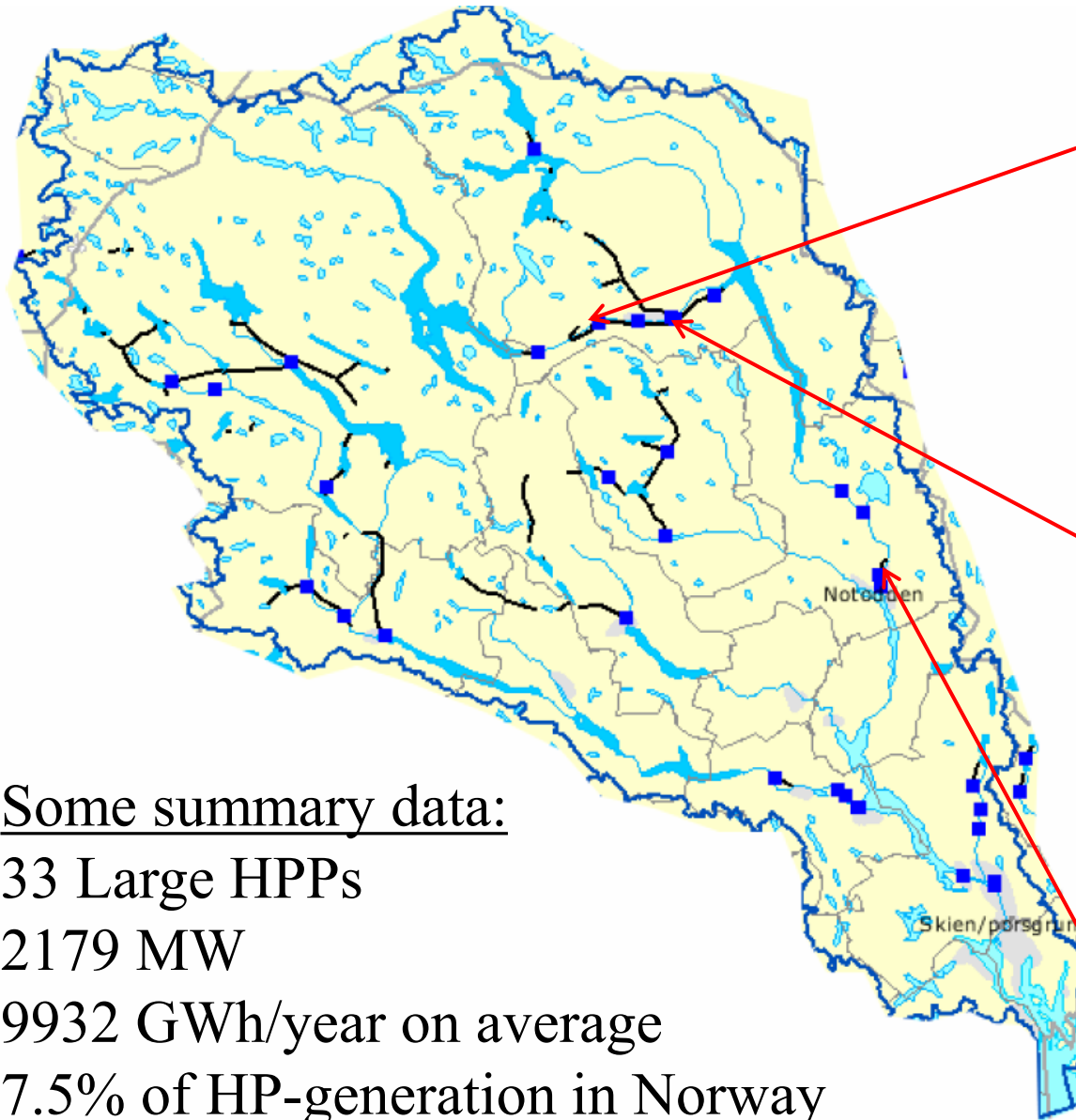
*Emeritus Professor
Norwegian University of
Science and Technology,
NTNU*



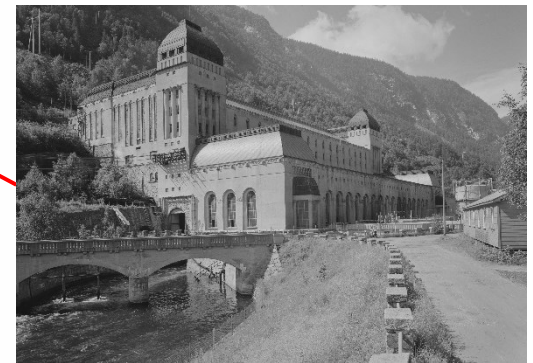
Telemark – major river basins



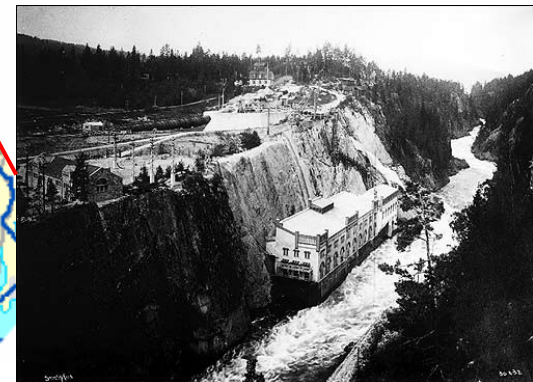
Telemark - Hydropower system



Vemork 1911



Sæheim 1916



Svelgfoss 1907

Some summary data:

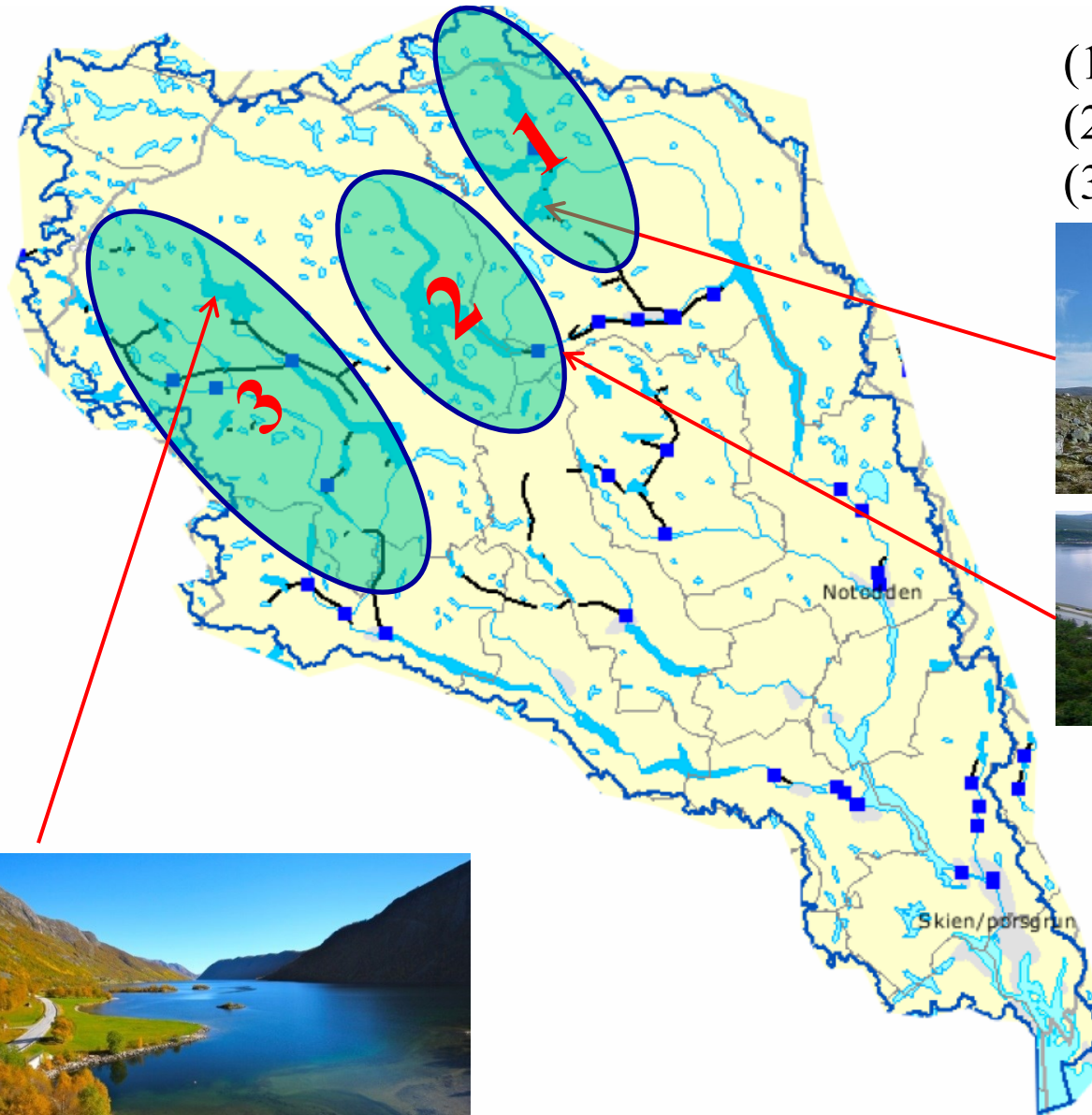
33 Large HPPs

2179 MW

9932 GWh/year on average

7.5% of HP-generation in Norway

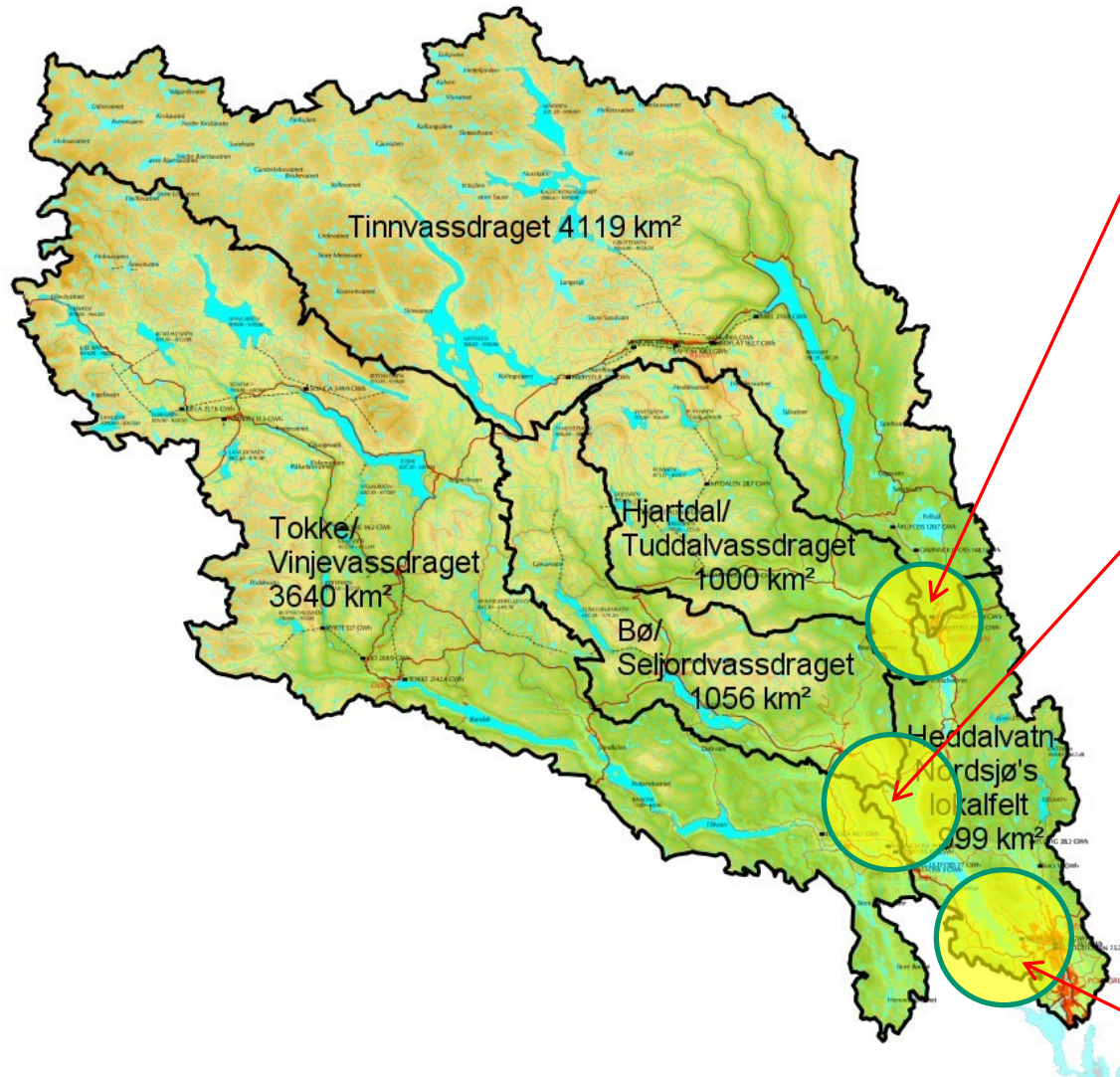
Telemark- Main hydropower reservoir areas



- (1) Mår
- (2) Møsvatn
- (3) Tokke



Telemark – most flood prone areas



Notodden



Norsjø



Skien Hjellevatn

Lake Møsvatn – The largest reservoir



Catchment area: 1510 km²
Lake/Reservoir area: 78.4 km²
Storage volume: 1066 Mm³
Regulation range: 900-918.5 m.a.s.l.

First regulation in 1903
Increasing dam heights later



Rjukan - Flood and landslides in 1927



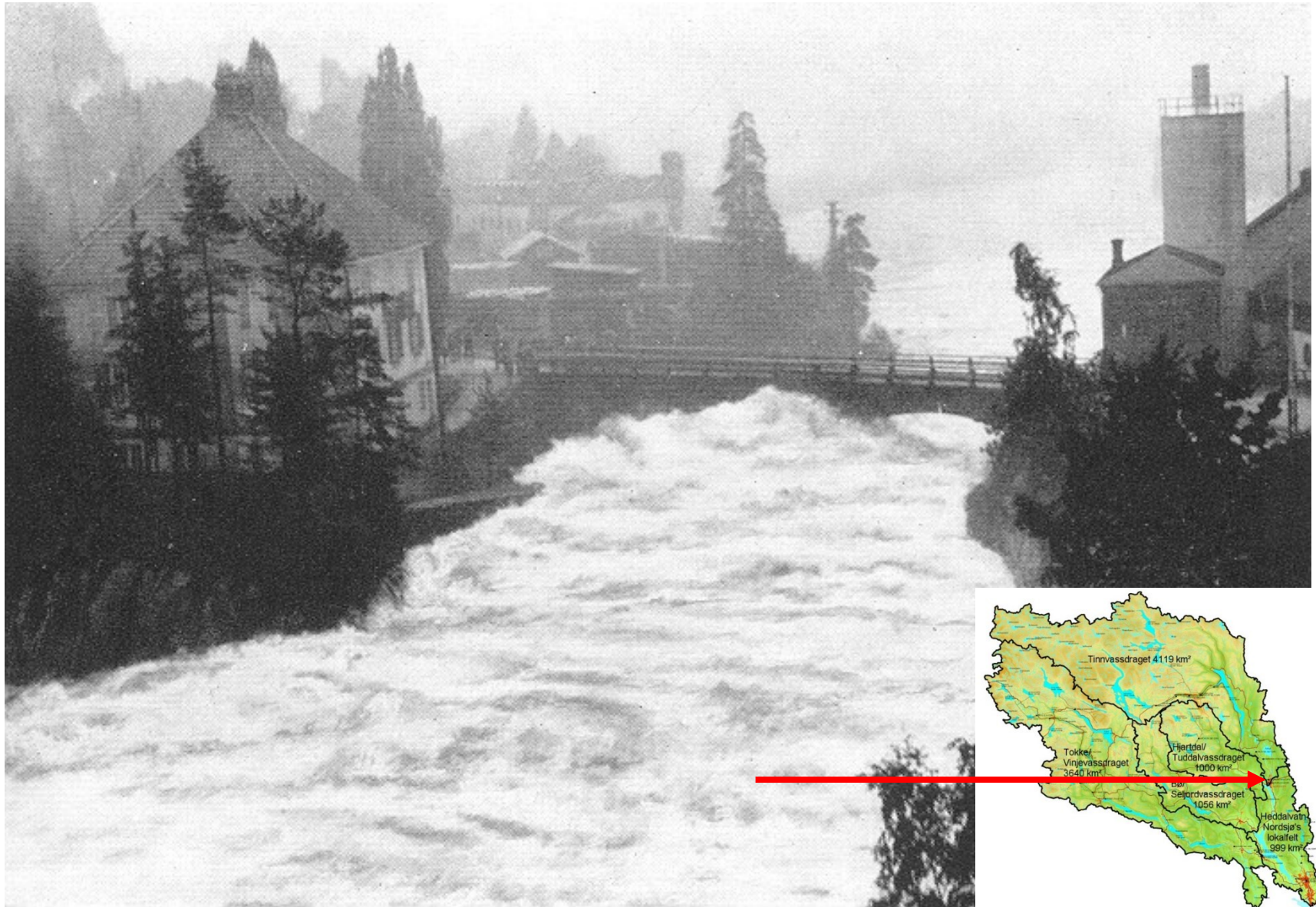
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Tinnelva - Flood in 1927



Hjartdøla (close to Notodden) – Flood in 2015



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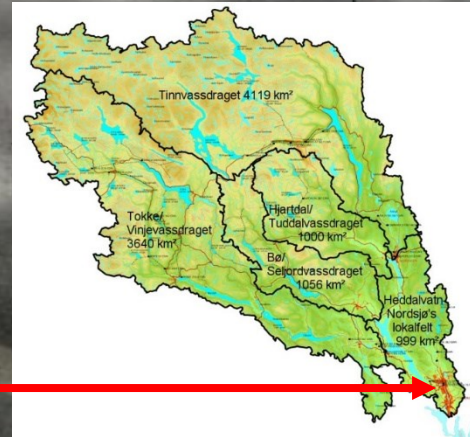


Skien – Flood in 2015



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Upstream – Downstream conflicts

Action

(Reservoir operation)



Flood Damage

but also on

- > Environment
- > Energy
- > Economy
- > Social

Response

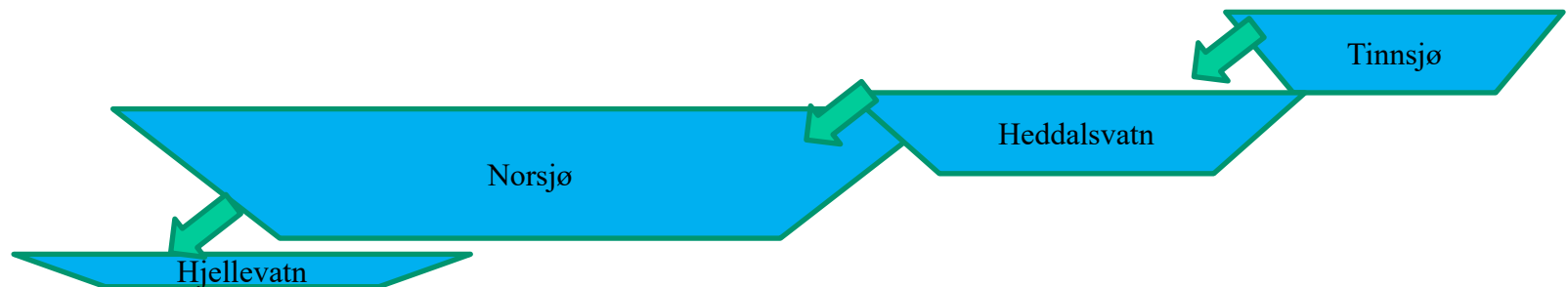
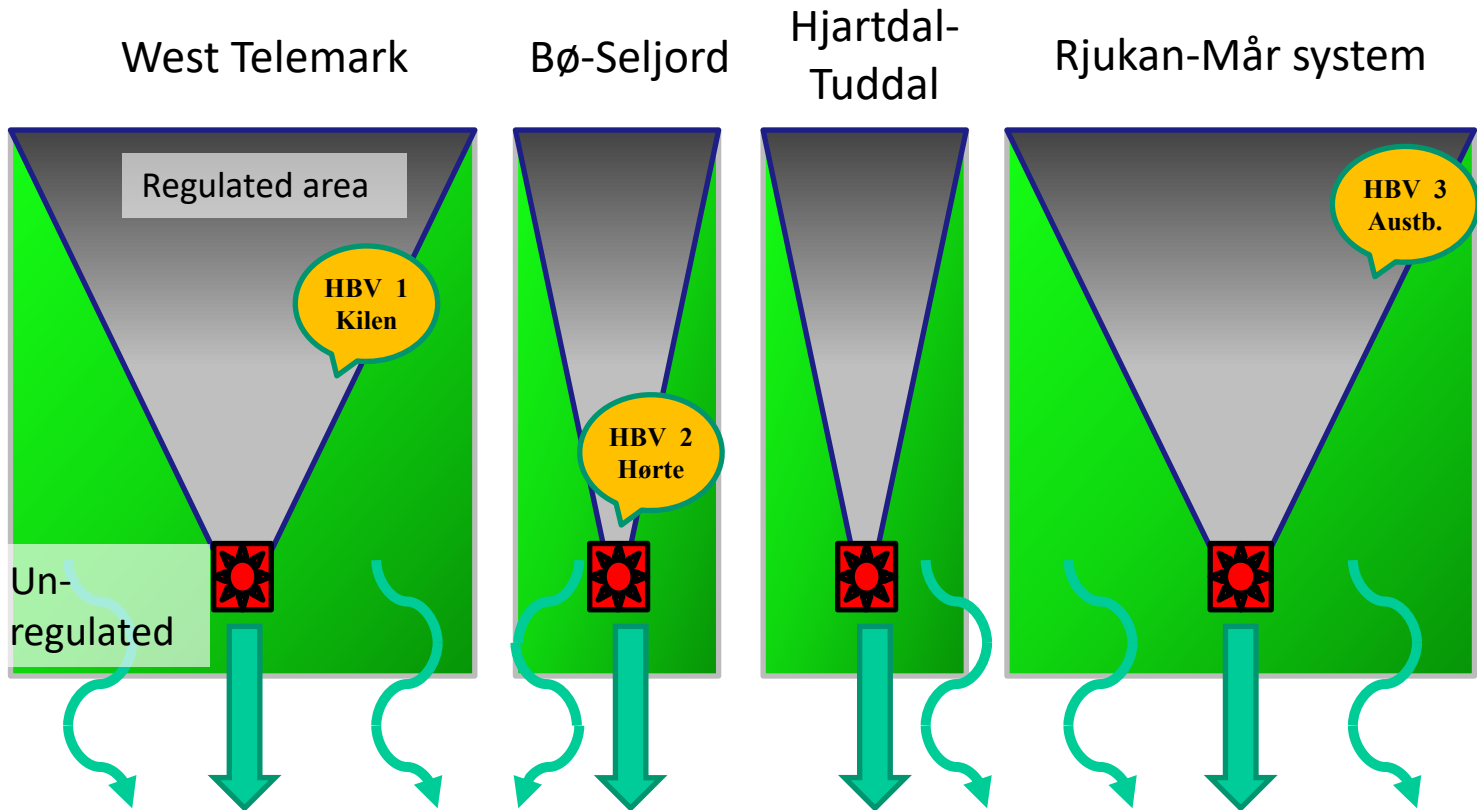
(Flood impacts)



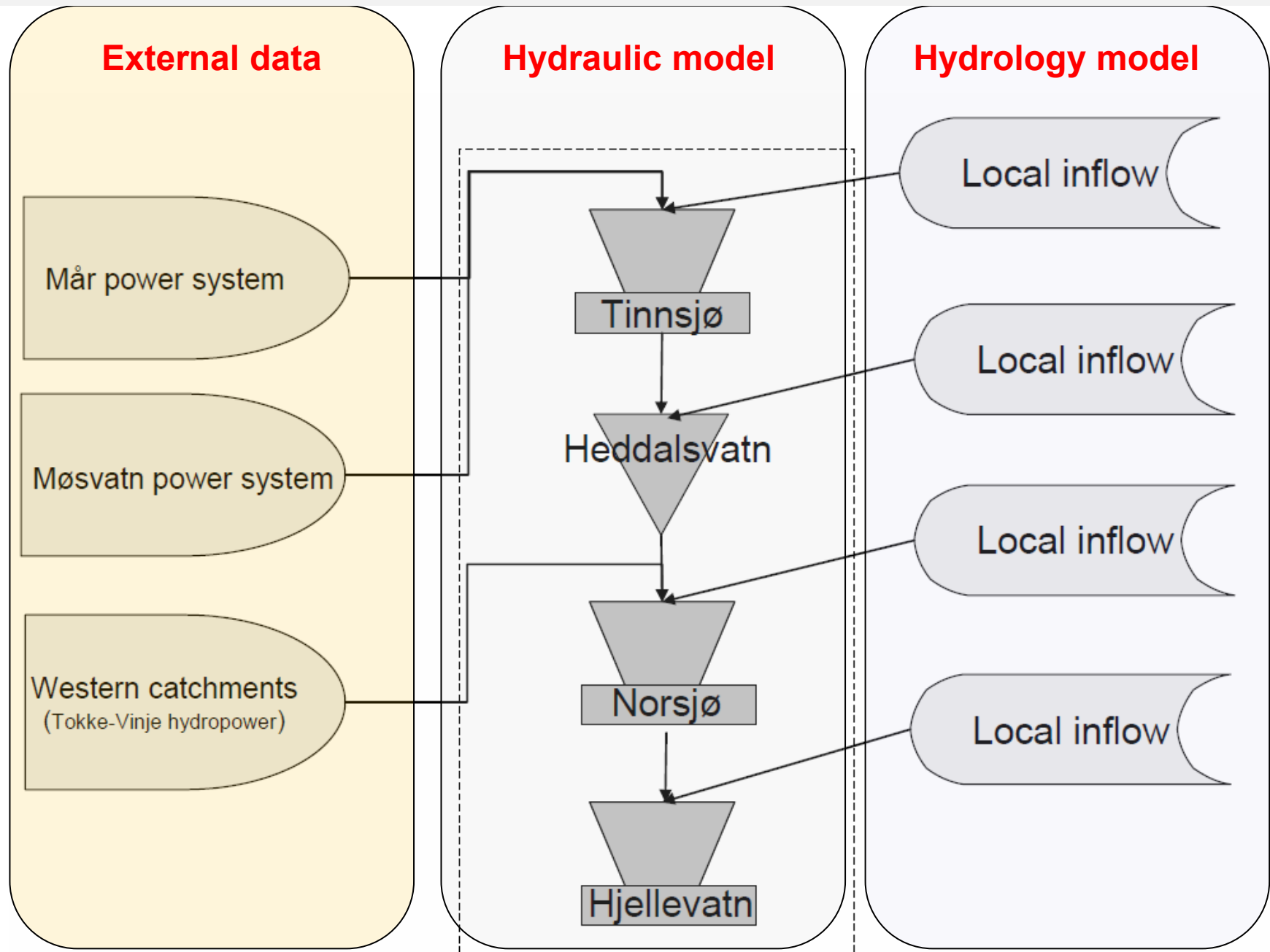
Focus area for the flood model



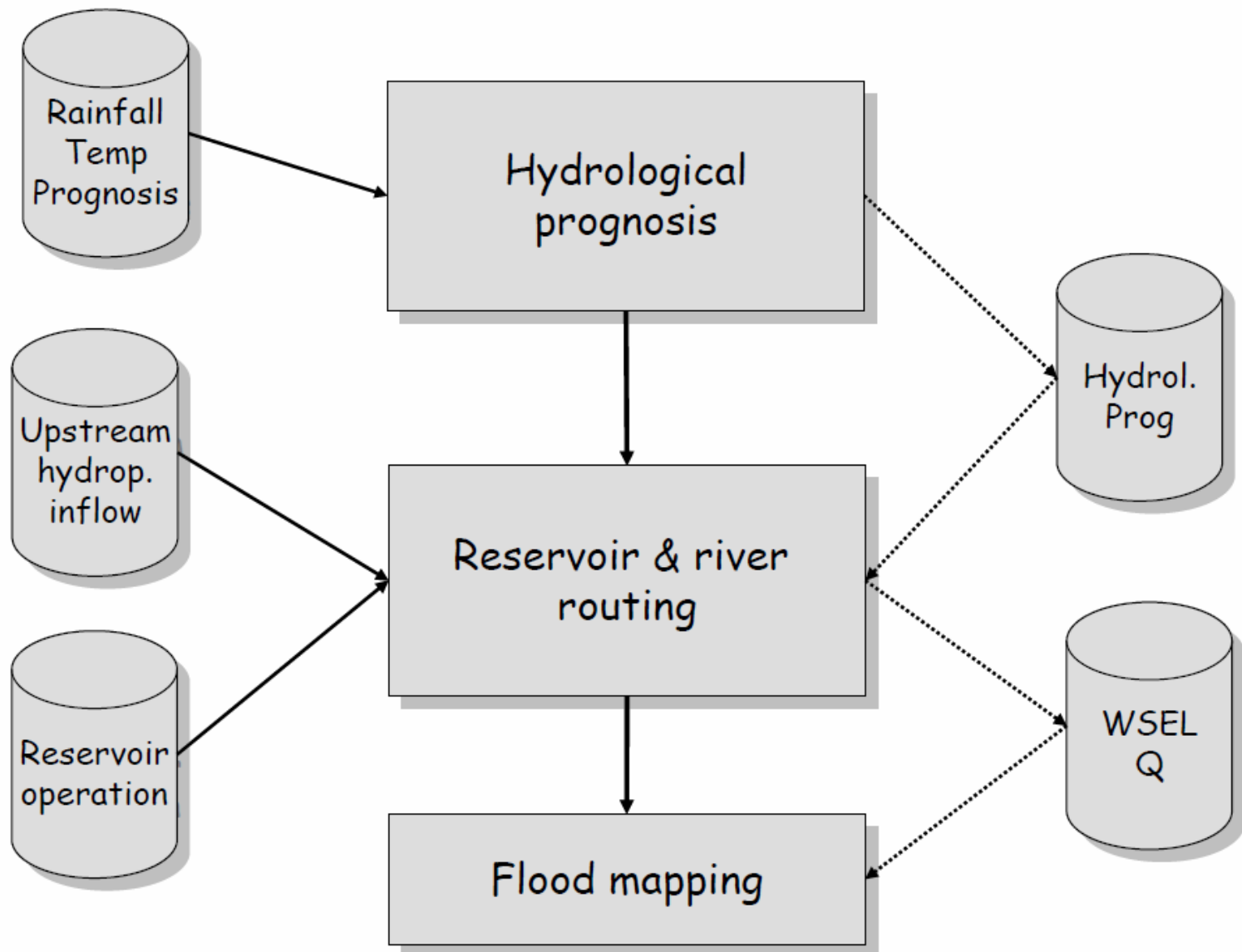
Flood forecasting model system



Flood forecasting model system



Flood forecasting model system

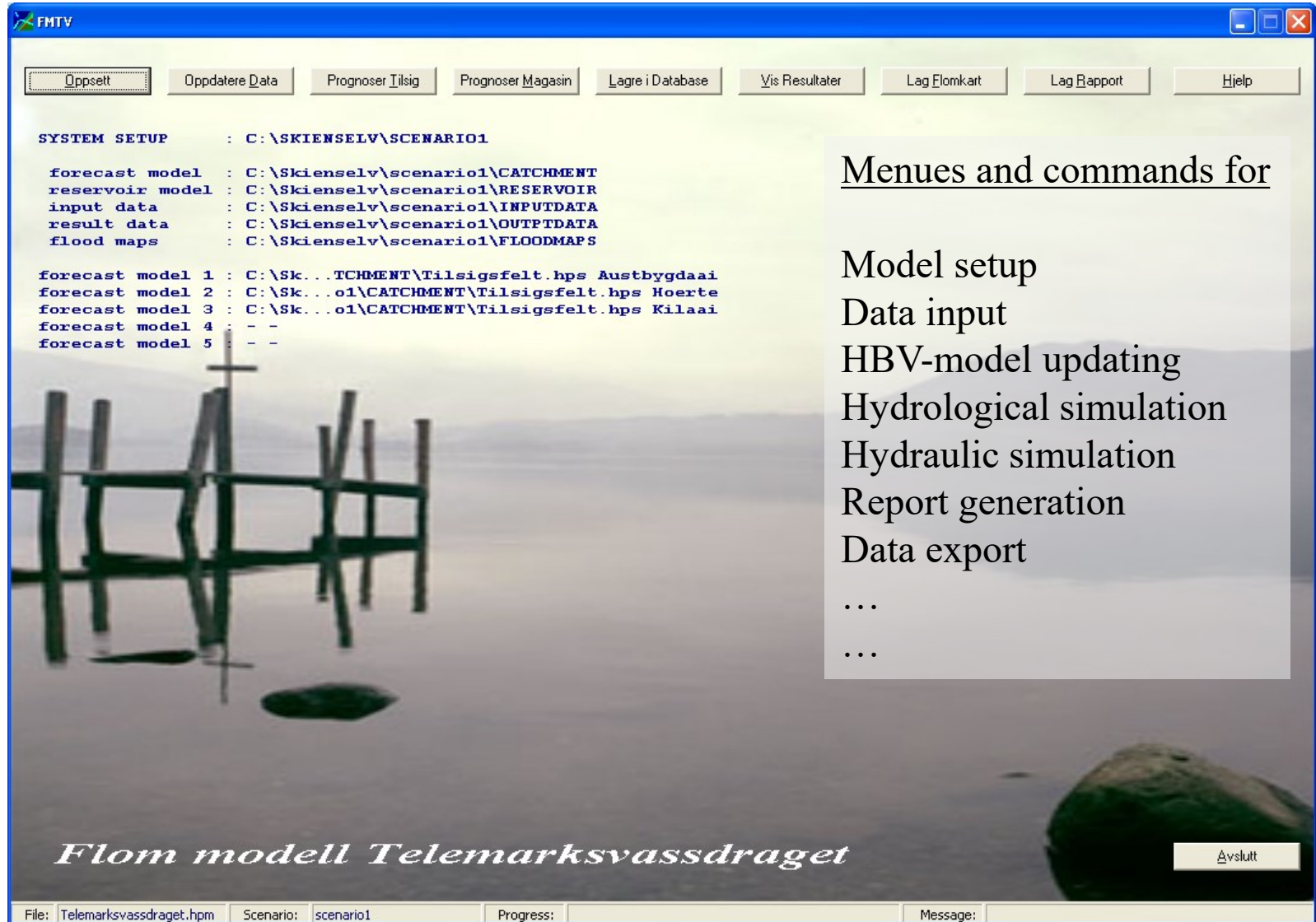


Model is operated from one common user interface



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Menues and commands for

Model setup

Data input

HBV-model updating

Hydrological simulation

Hydraulic simulation

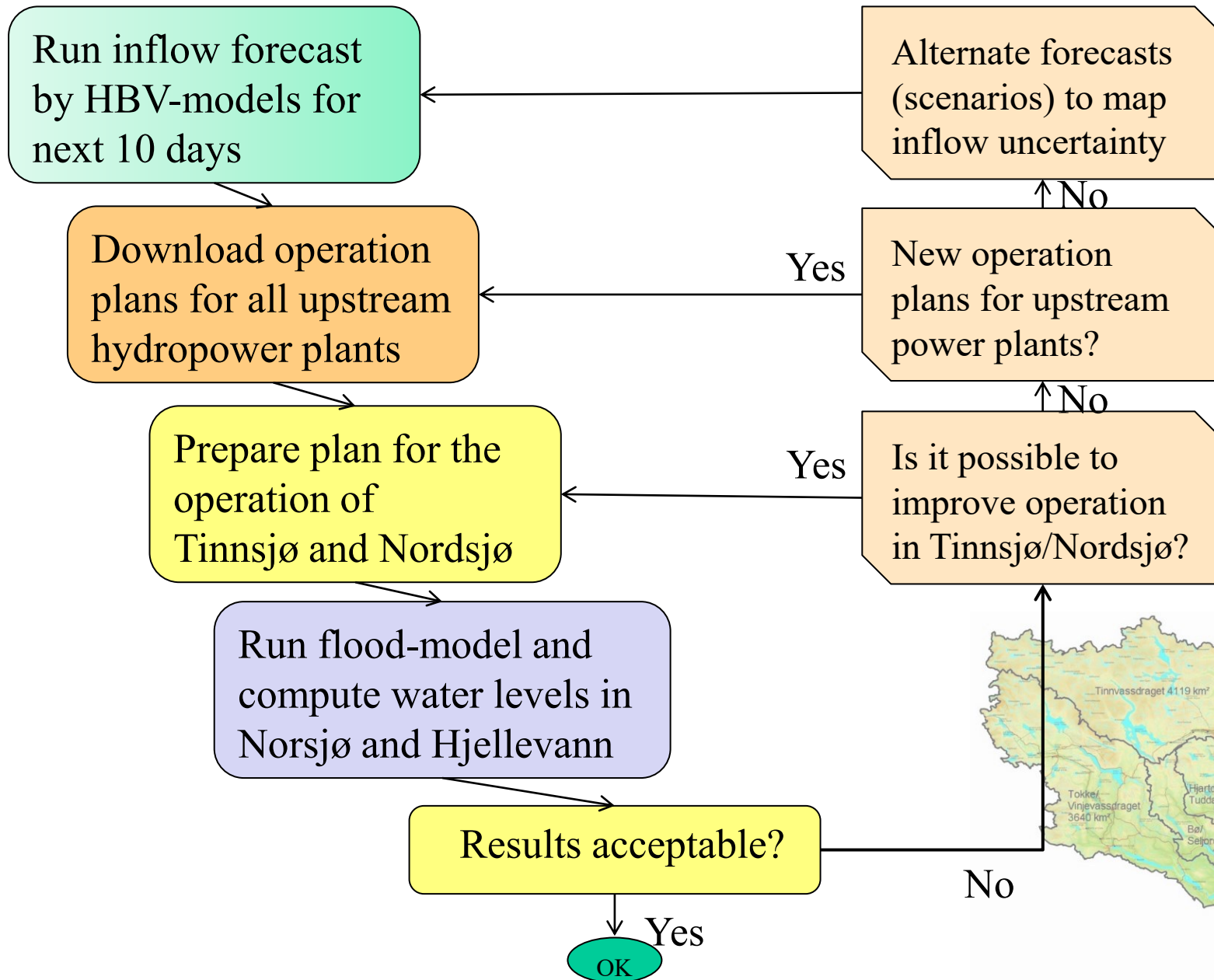
Report generation

Data export

...

...

Typical workflow for model use and operation



Summary – Telemark flood model

- Significant flood risk in the river basin in downstream areas
 - Many large flood events recently – high media focus
 - Flood damage can be mitigated by hydropower reservoirs
 - Conflicts between flood mitigation and power generation
- Difficult to find optimal operation for reservoirs
The Telemark flood model was developed as a tool
- Tested during several years of operation since 2008
«Acid test» during the 2015 flood «Petra»
 - Good results, but also some weaknesses observed

Client: Øst-Telemark Brukseierforening (ØTB)