

Climate change and water management planning in the Czech Republic

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Introduction

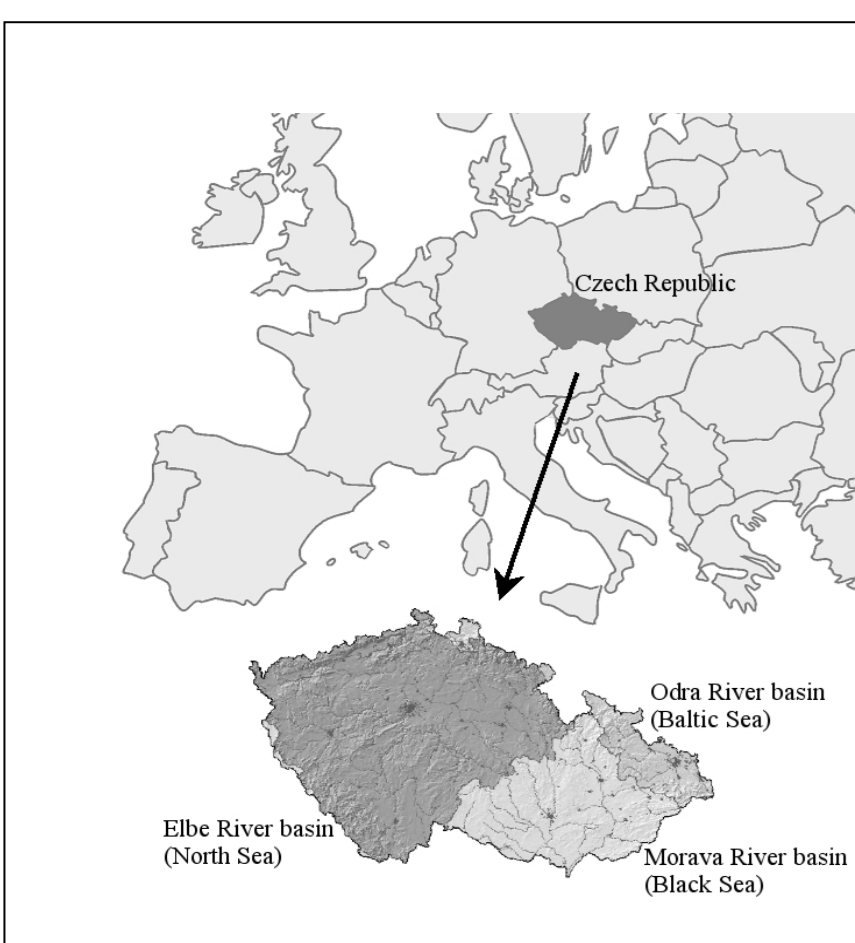
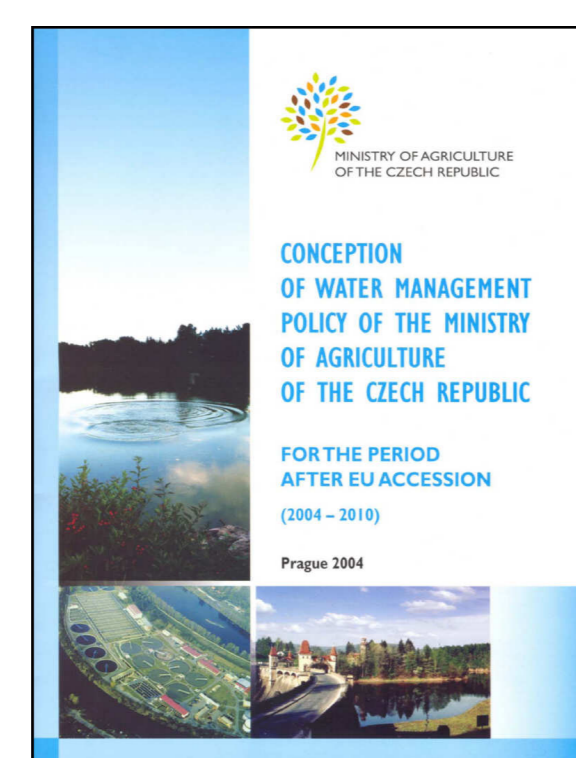
Since adoption of Water Framework Directive in 2000, the EU activities concerning water legislation are increasingly aimed at ensuring that water planning processes will take into account droughts, floods and climate change impacts. These activities are addressed in Directive on floods, Communication addressing water scarcity and droughts and adoption of a green paper on Adapting to climate change in Europe – options for EU action.

Water planning system in the Czech Republic

Long tradition of water management planning in the Czech Republic has been reflected in the fact that planning for meeting the requirements of WFD involves not only protection of water as a component of the environment but also flood protection and water use (supply) issues. New water management planning has been launched in 2003. It is coordinated by Ministry of Agriculture in co-operation with the Ministry of Environment, Ministry of Health, Ministry of Transport, Ministry of Defence (central water authorities) and with the Ministry of Interior and Ministry of Regional Development. All these ministries have to meet the principles of the EU Water Framework Directive. In the period after accession of the Czech Republic to the EU it represents the main tool for enforcing the water management policy, whose aims are to improve the quality and quantity of water, to support the sustainable use of water, to resolve the problems of transboundary rivers, to protect the aquatic and connected terrestrial ecosystems and wetlands and to ensure protection against floods and other harmful impacts of water.

Combination of hydrological and water management model as a tool for water planning

For the planning purposes, Water Research Institute in Prague has developed a water management model, which integrates hydrological inputs and water management issues in a river basin scale. This model has been interlinked with a hydrological model, which simulates river flows and other hydrological series from series of meteorological variables and therefore the whole system is applied also for water management simulation, planning and decision making for hydrological conditions affected by climate change.



Basic geographic conditions of the Czech Republic

Central European country
 The area is 78 860 km²
 Population is 10.3 million
 Located on the water divide of three seas
 All main watercourses drain water into the territories of neighbouring countries
 Water resources depend completely on atmospheric precipitation

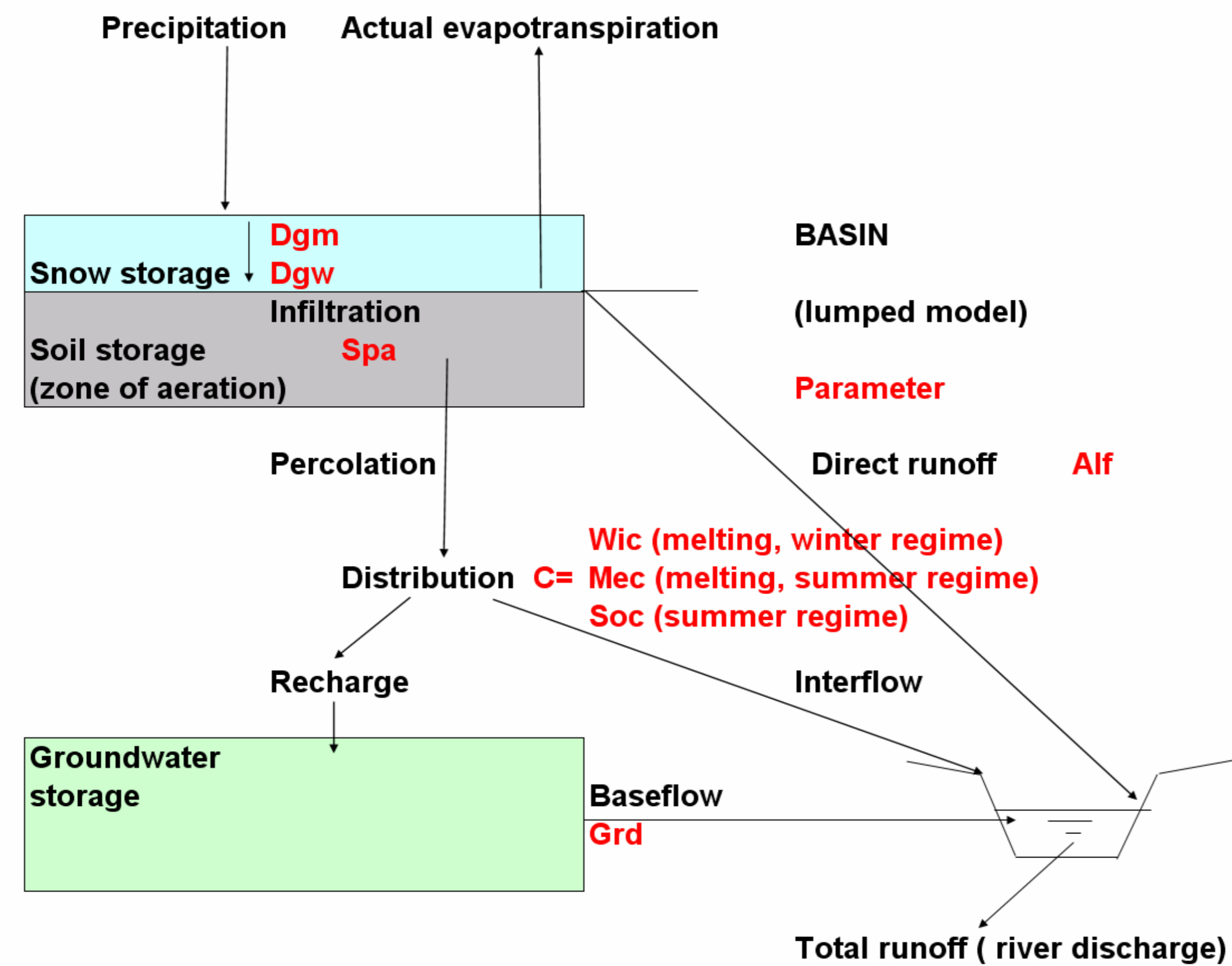
Hydrological model

T.G.M. Water Research Institute in Prague developed BILAN model, which simulates water balance components in a basin in monthly step
 Input series: monthly series of basin precipitation, air temperature, relative air humidity and runoff

Output series: time series of monthly potential evapotranspiration, actual evapotranspiration, infiltration to the soil, recharge from the soil to the aquifer, the amount of water that is stored in the snow pack, the soil and aquifer, and the total runoff, which consists of three components - direct runoff, interflow and base flow

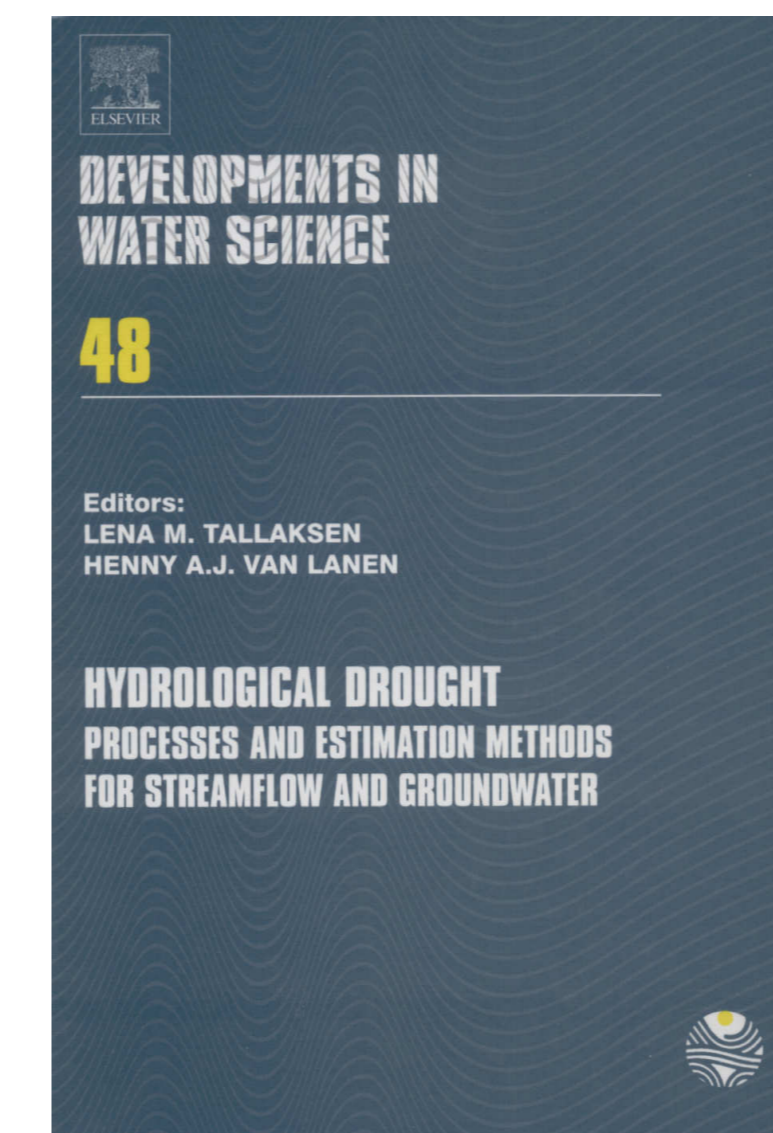
The eight parameters of the model are calibrated by using an optimisation algorithm aimed at attaining the best fit between the observed and simulated runoff series

Structure of Bilan model



Description and availability of Bilan

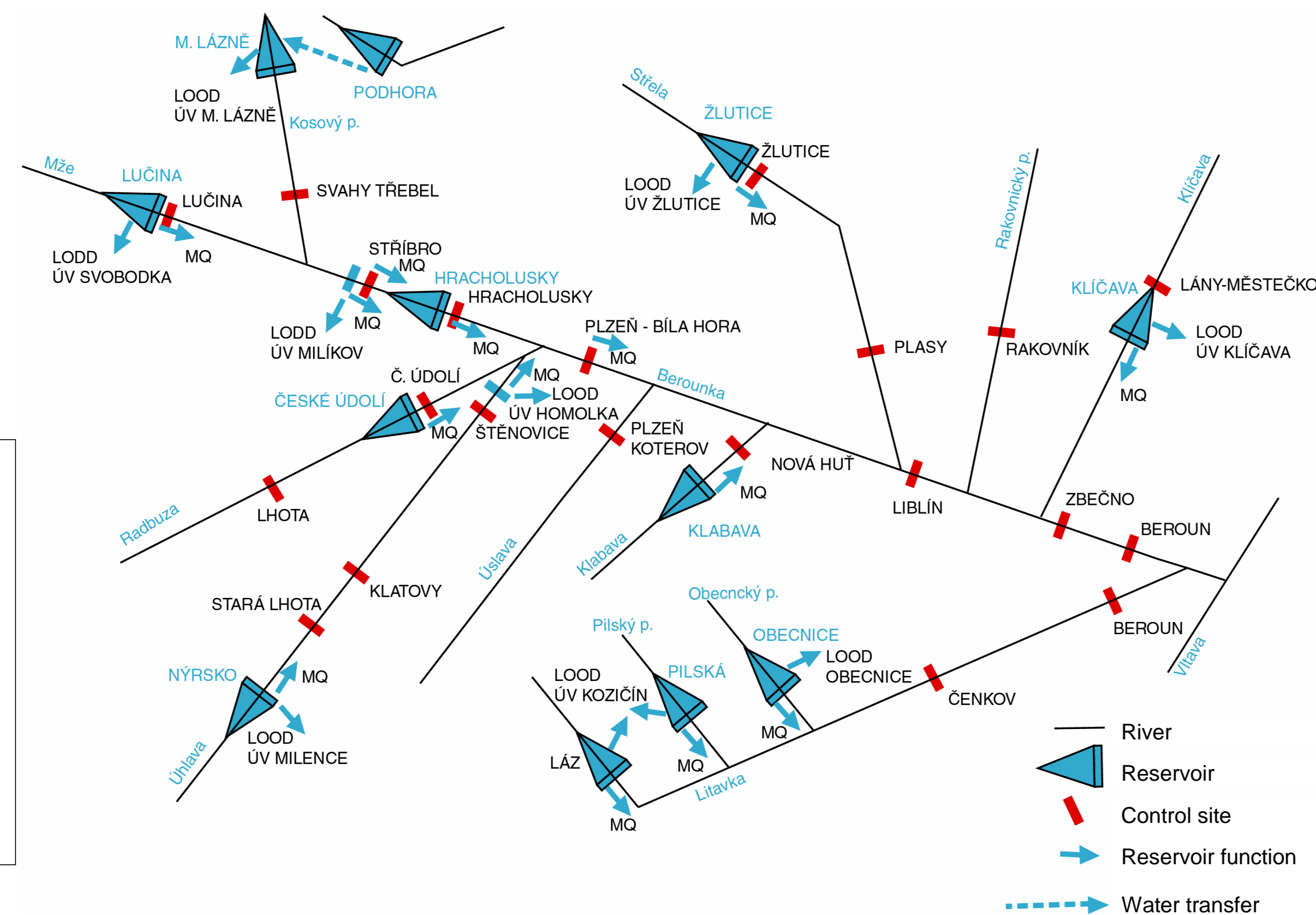
Bilan is described (and available on CD) in Tallaksen, L., Lannen, H. (editors) 2004. Hydrological drought - processes and estimation methods for streamflow and groundwater. Developments in water science, 48, Elsevier.



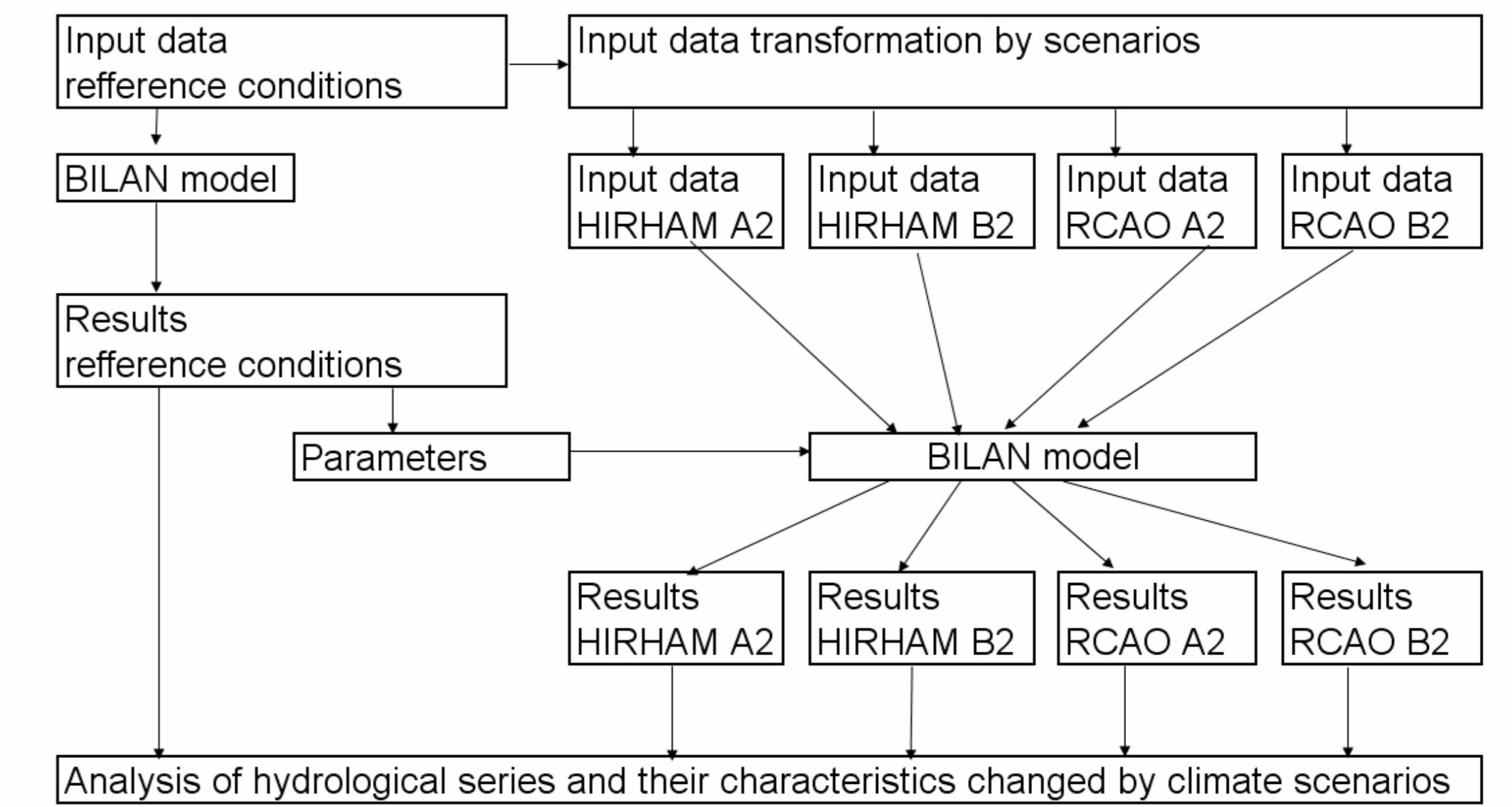
Water management model

In the water management model, the river basin is described as a network of branches (river reaches, channels) and nodes (confluences, reservoirs, water abstraction and waste water discharge locations, and other sites). The water management is simulated by using flow series, demands for water use (abstractions, waste water discharges, flow regime requirements, such as minimum ecological flows, limits of water levels in reservoirs and other requirements), technical characteristics (storage capacities of reservoirs, capacities of river channels), and operation rules for flow regulation and water supply of individual users.

The simulated data include time series of flows (affected by the regulation and water use), water storages and water levels in reservoirs and simulated water abstractions and waste water discharges. The time series are statistically analysed and the availability of water resources is assessed in terms of probability.

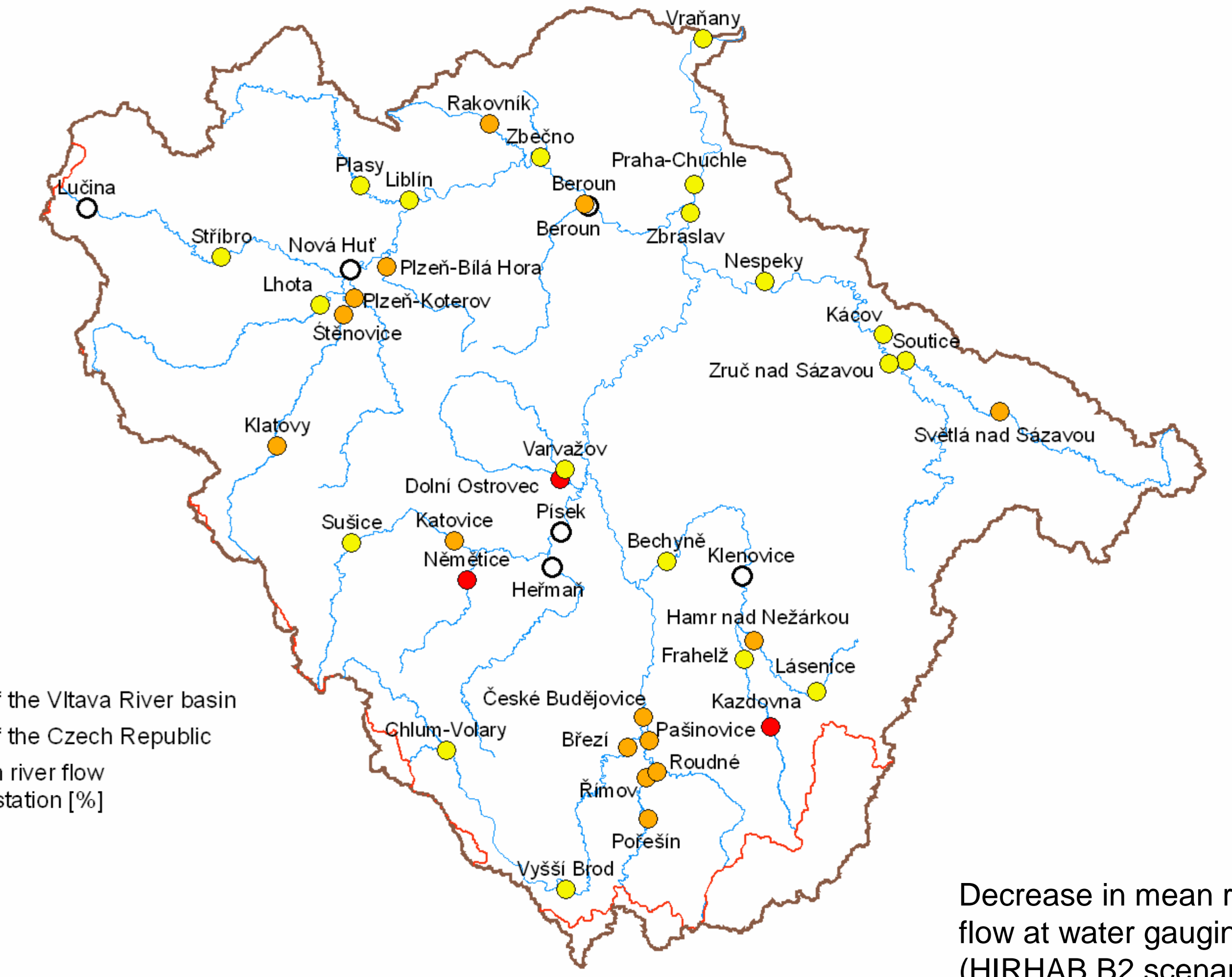


Climate change scenarios

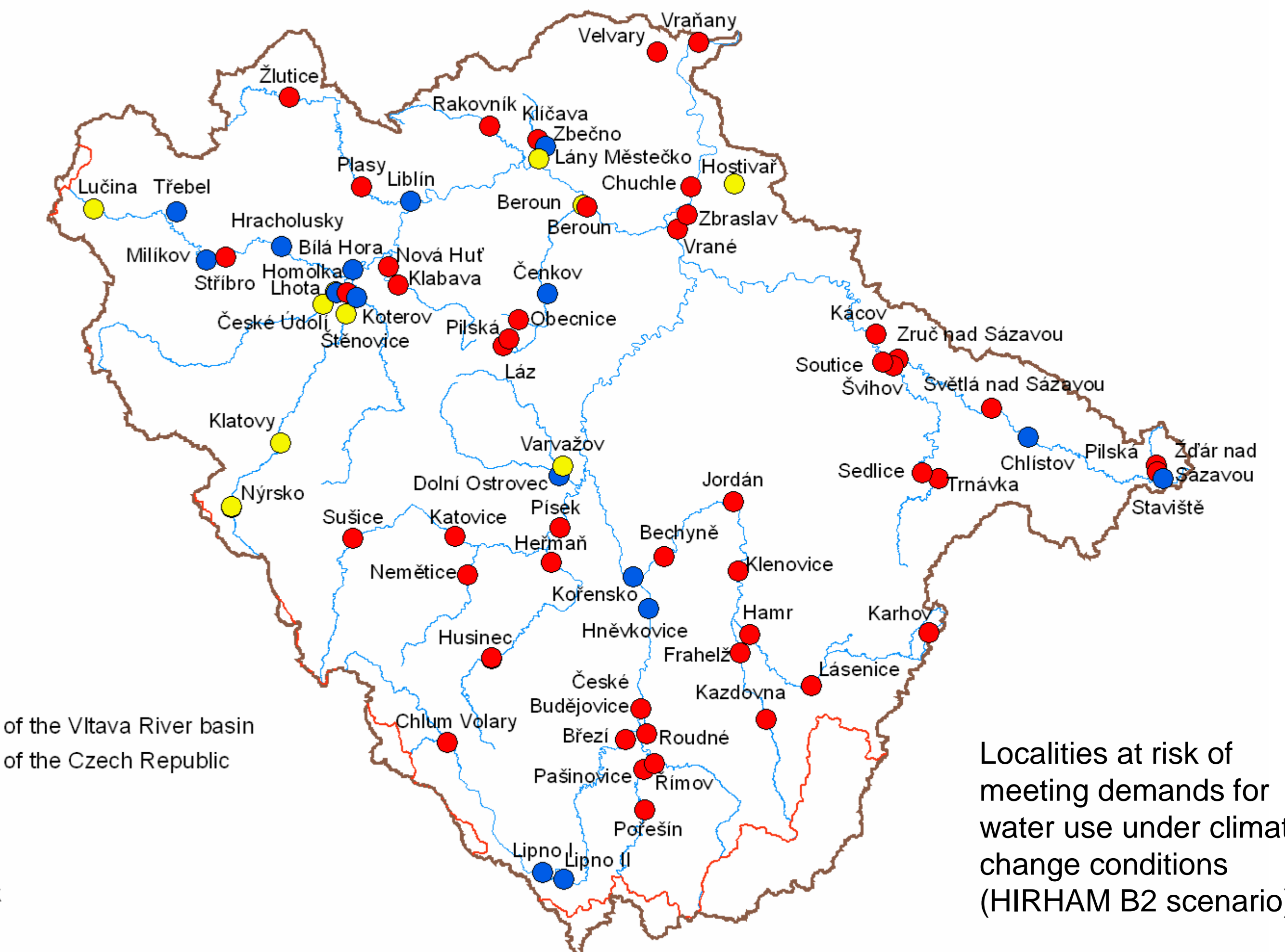


The climate change scenarios are applied by adapting the original time series of air temperature, precipitation and water vapour pressure in the individual months and subsequent flow simulation by BILAN model

Vltava River basin



Decrease in mean river flow at water gauging station (HIRHAM B2 scenario)



Localities at risk of meeting demands for water use under climate change conditions (HIRHAM B2 scenario)