

The economic impact of climate change and adaptation strategies in the Swiss water sector

Anne-Kathrin FAUST^{a,b}, Camille GONSETH^a, Marc VIELLE^a

^a Research group on the Economics and Management of the Environment (REME), Ecole Polytechnique Fédérale de Lausanne (EPFL)
^b Geneva School of Business Administration (HEG-Ge), University of Applied Sciences of Western Switzerland (HES-SO)



In the near future, Switzerland is predicted to be affected by climate change, that is bound to impact both water demand and water supply in multiple ways. While water demand by households, firms and agriculture increases, water supply decreases (ProClim and OcCC, 2007) as climate change alters the hydrologic cycle and thus the water resources. To best face the challenges that lie ahead, an understanding of the economic impact of climate change and different adaptation strategies in the water sector is essential.

This study is part of a wider research project simulating the economic impact of climate change in Switzerland, mandated by the Federal Office for the Environment (FOEN).



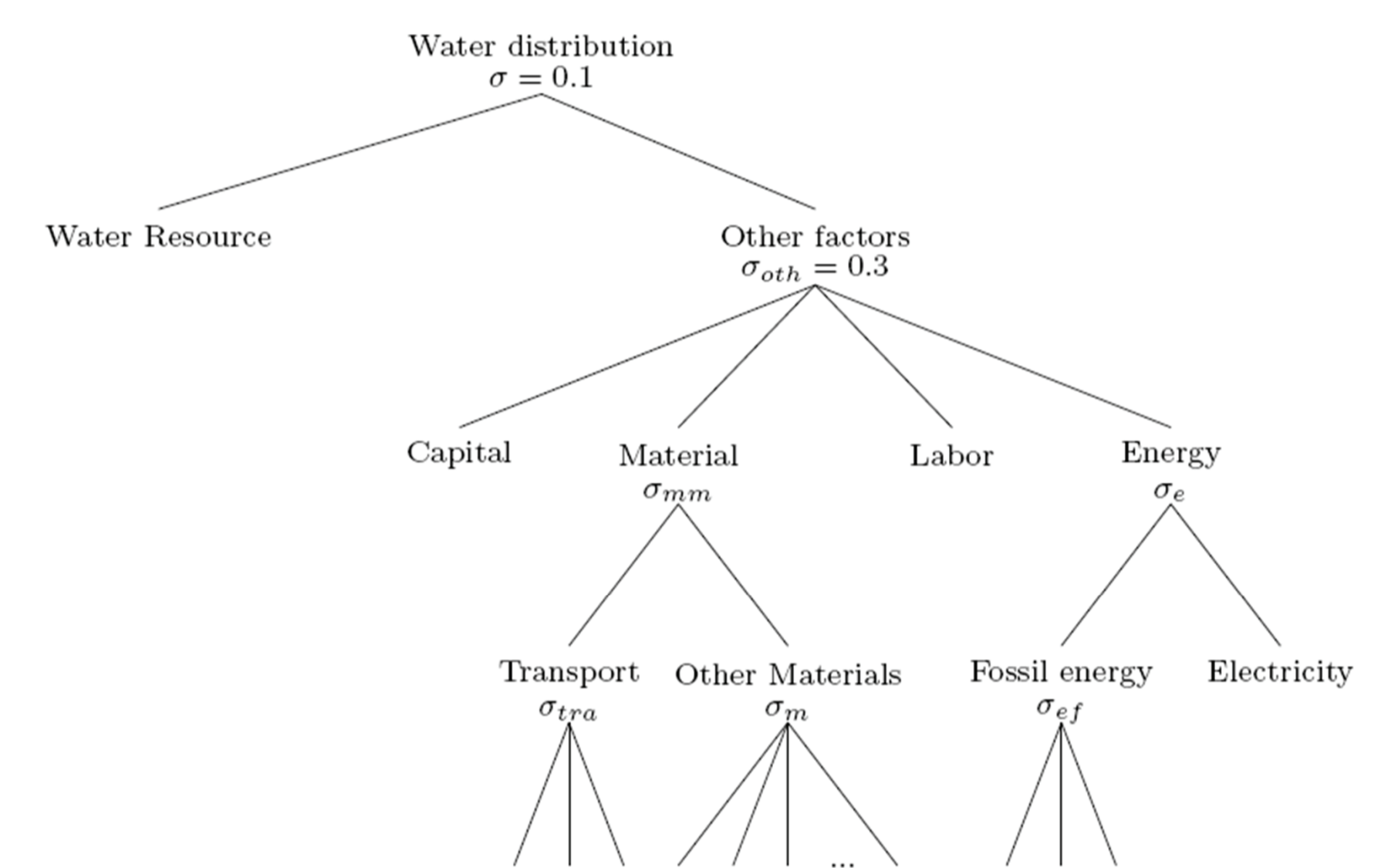
Objective

The estimation of the economic impact of a change in the availability of water resources and chosen adaptation measures in Switzerland.

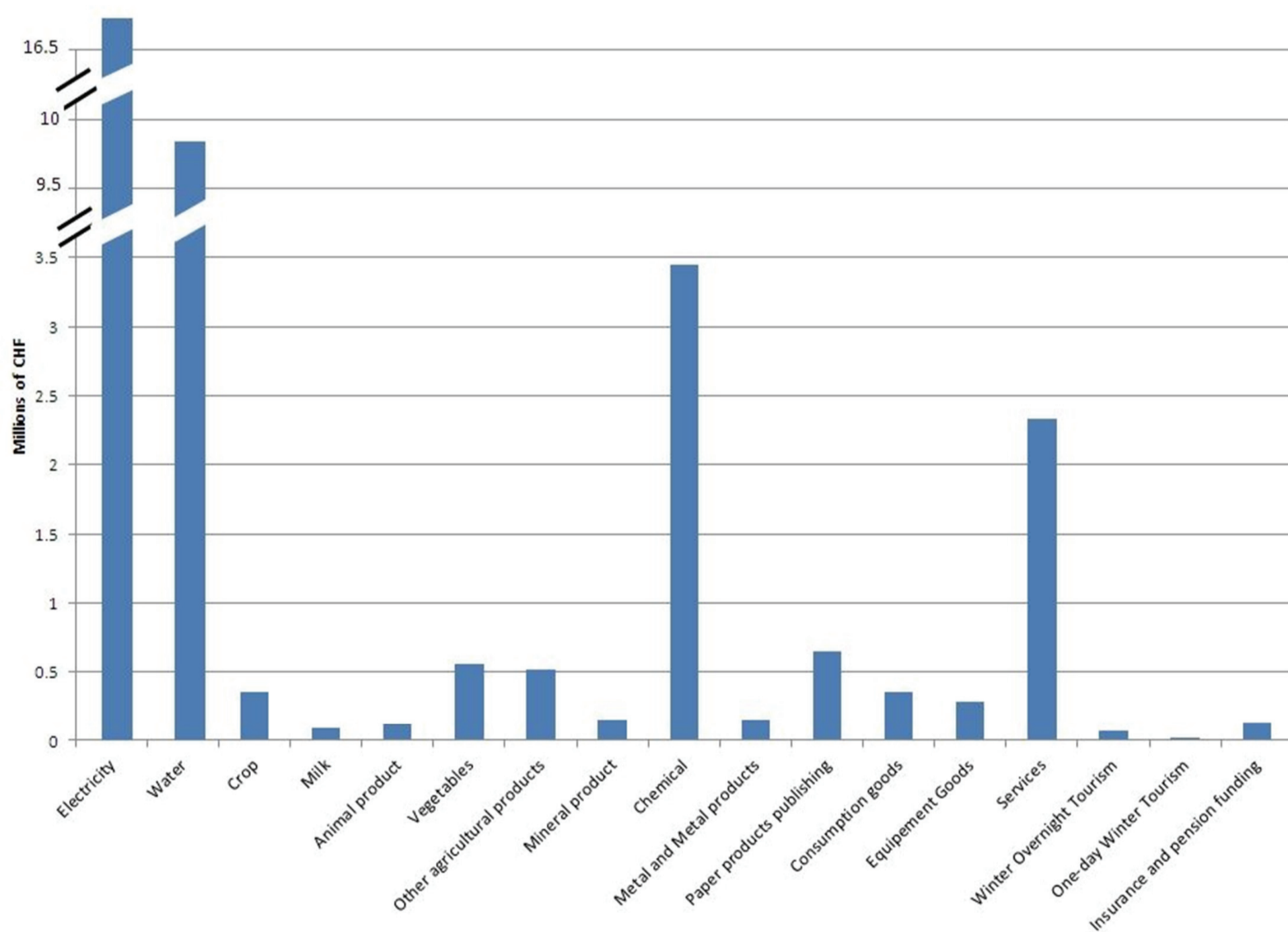
Methodology

This study employs GEMINI-E3, a computable general equilibrium model developed at EPFL. It is a world computable general equilibrium model that is specifically designed for the analysis of climate change and energy policies. This model originally comprises 28 regions, including Switzerland, and 18 different sectors. The sectorial structure of the model is currently being extended at EPFL to be able to assess the economic impact of climate change on particularly sensitive sectors and to study the impact of adaptation measures. This study will concentrate on modelling the water sector in Switzerland and on the inclusion of the water resource as a production factor.

Nested CES structure of the drinking water distribution sector



Raw water use in Switzerland for 2001



1) Introduction of a drinking water distribution sector into GEMINI-E3

The drinking water distribution sector is bound to be sensitive to changes in the availability of raw water resources due to climate change. To be able to assess the economic impact of such changes, a drinking water distribution sector is introduced into GEMINI-E3 and its production structure is defined.

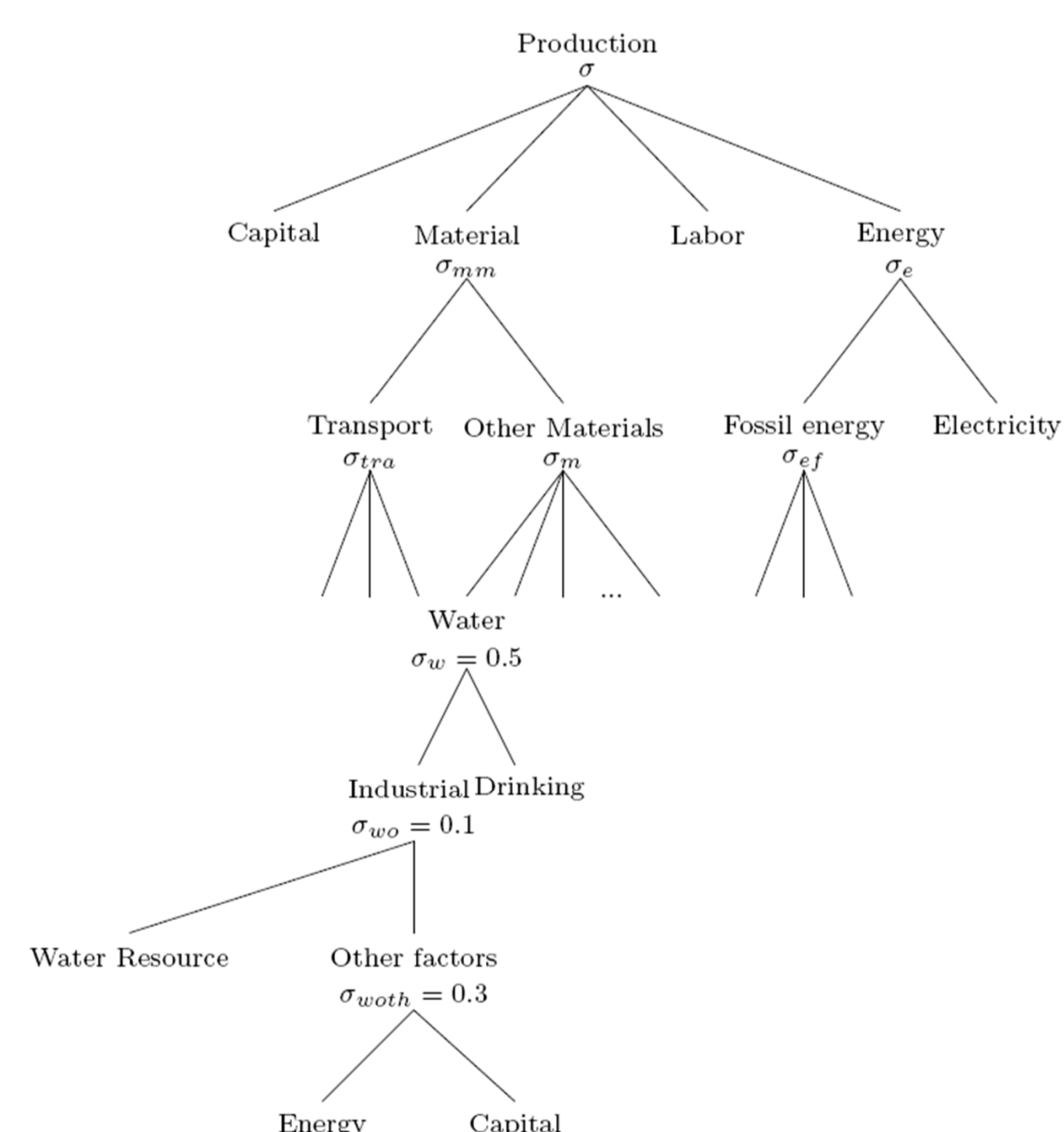
2) Introduction of a raw water resource into GEMINI-E3

To be able to simulate the economic impact of a possible decrease in water availability, a raw water resource has to be introduced into GEMINI-E3. Thus, a line representing raw water use by every sector is introduced into the Social Accounting Matrix, using a set of water volume and price data from multiple sources. The biggest water using sectors are the energy, water distribution, chemical and services sectors.

3) Calibration of GEMINI-E3

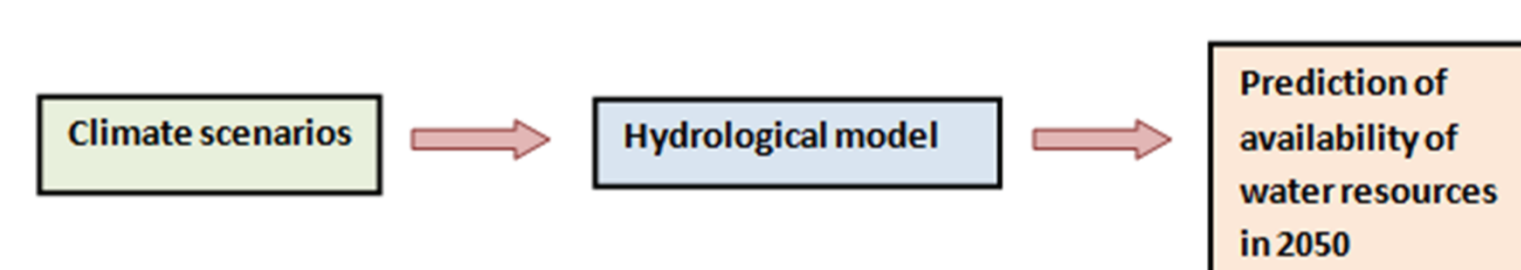
Once the raw water resource has been introduced into GEMINI-E3, the production structures of the different sectors that are using water have to be redefined, with water entering as an input. In our model, the different sectors can choose between two different water inputs: drinking water, that is water distributed by the newly introduced water distribution sector, or industrial water, raw water extracted by the sectors themselves. Elasticities of substitution between inputs illustrate the possibilities to replace one input by another.

Nested CES structure of industrial production



4) Climate change and water resources

To simulate the impact of a change in availability of the water resource, we need a quantitative estimate of future water resources in Switzerland. Two possible solutions:
-Randomly reduce water availability
-Use the results of hydrological models



5) Next step

Simulation of the economic impact of a decrease in water availability on different sectors in Switzerland.

6) References

OcCC/Proclim (2007). *Klimaänderung und die Schweiz 2050. Erwartete Auswirkungen auf Umwelt, Gesellschaft und Wirtschaft*. Hrsg. OcCC / ProClim, Bern.



CONTACT

Anne-Kathrin Faust
EPFL PhD candidate
Haute école de gestion de Genève
Campus de Batelle
Route de Drize 7
CH-1227 Carouge
E-mail: anne-kathrin.faust@epfl.ch