

## EUROPE'S GLOBAL WATER RISK



*New IMPRES approaches boost the operational efficiency and help reduce the European economy's vulnerability to hydro-meteorological extremes occurring worldwide, in particular drought and flood events.*

Impacts of extreme weather events and climate change on European economic sectors, such as agri-food and manufacturing, have traditionally been addressed locally. Impacts within the European borders have been assessed through sectoral risk assessments, including an analysis of related policies. However, sources of vulnerabilities of many sectors to extreme weather events often lie outside Europe. In a globalized, highly connected world, dependence on raw material imports, demand/supply relations and trade balance are intensifying. Climate change impacts outside the European borders are expected to increase economic risks for agri-food importers in the Member States. The effects manifest in various ways, including biophysical impacts on remote agricultural production resulting in unexpected supply shortages, damage or delays to supply-chain infrastructure, changes in overseas production and world commodity prices.



IMPRES research shows that this vulnerability has not yet been addressed adequately in climate adaptation, bilateral trade and international development policies. IMPRES focused on mapping dependencies of the European economy on water resources outside its borders and assesses the vulnerabilities of these dependencies to water scarcity and droughts as well as flood damages, both now and under changing climate conditions.

Activities within IMPRES highlight sectoral dependencies throughout the European region, but also consider EU-wide strategies, such as the Climate Adaptation Strategy and the EU's trade policies.



### PRODUCT PRESENTATION

*The IMPRES project developed two innovative approaches to help European economy dealing with hydrological extremes:*

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**WATE:** *WATER, Trade and Economy tool*
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**Acclimate** – *A unique model of loss-propagation in a global supply network*

## WATE – WATER, TRADE AND ECONOMY TOOL

WATE, developed by FutureWater, is used to assess water dependencies of economic sectors and their supply chains' vulnerability to droughts and water scarcity.

### More specifically, the tool displays

- Water used in agricultural production globally, including soil moisture and irrigation requirements for many different crops and processed products
- Trade of agri-food commodities and virtual water for agri-food products between nations
- Water scarcity and drought severity in crop producing regions and their changes under climate change
- Water footprint calculations for production, consumption and imports/exports.

The input requirements for the tool range from trade statistics and agricultural yields to climate and

hydrological projections, water use statistics (industrial, domestic and irrigation) as well as agricultural production statistics and locations.

### WATE allows the compilation of

- Agricultural import dependency maps
- Water dependency maps (virtual water imports) showing the water used to produce imported products
- Maps of imports' vulnerability to drought severity and water scarcity in different time periods (e.g. historical, climate change), and country profiles of water dependencies and vulnerabilities.

WATE has been commercialized in terms of consultancy services on climate change impacts. A consultancy start-up, R2Water, was founded to commercialize the approach and tool.

## ACCLIMATE – A GLOBAL MERCHANDISE NETWORK MODEL

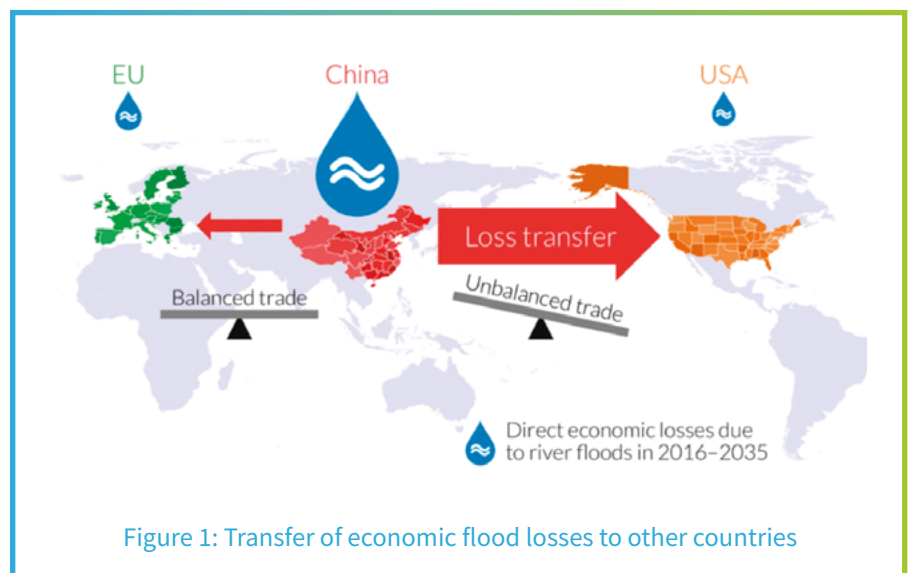
Acclimate is a loss propagation and agent-based model developed at Potsdam Institute for Climate Impact Research (PIK). It is designed to analyse cascades of economic losses induced by climate shocks (primarily floods) in a global supply network. The tool simulates indirect and direct effects along global supply chains for time scales of days to months after flood events. Using national sectors as agents, the model can be applied to study the global propagation of losses induced by idealized disasters. Input data to feed the model was provided by e.g. FLOPROS: an evolving global database of flood protection standards that gives explicit information on current flood protection at the global level (developed at the Institute for Environmental Studies (IVM)).

### ACCLIMATE assesses reasonable leverage points and identifies dynamic bottlenecks

Within IMPREX, the model was further developed to incorporate the output of fluvial flood simulations as direct losses. In addition, it advanced the state of the art in modelling indirect losses of disasters by explicitly allowing the incorporation of downstream impacts and mitigation actions to (unanticipated) shock events. Acclimate has the potential to consider other drivers than flood damages. Further activities will focus on global impacts caused by heat waves and hurricanes.

Figure 1 presents the assessment process of the trade shifts due to global flooding events using Acclimate. China is projected to have the largest direct flood losses. While the USA will suffer indirectly along its supply chains due to its unbalanced trade relationship with China, the EU is much better prepared for future global flood losses.

The Zeean project, financed by the German ministry BMBF, aims to further develop Acclimate into a tool that models and predicts the indirect impacts on the supply chain attributed to local production failures taking into account all relevant interdependencies within the global network.



## COMPETITIVE EDGE

- *The products presented here enable a new perspective on regional and national trade and economy policies. By explicitly displaying projections of indirect and direct future losses, IMPREX illustrates the EU's large susceptibilities to climate effects outside its borders and provides quantified information on supply-chain risks to multi-national actors, economic sectors and consumers.*
- *IMPREX further increases understanding of supply chain dependencies in terms of water use. Vulnerabilities of the European economy on global production and supply of goods caused by hydrological extremes were detected.*

## USE CASE SCENARIO

ChocolateDreams is a modern cocoa processing plant and chocolate producer based in the Netherlands. The company relies on cocoa produced in Ivory Coast, where flood events occur on a regular basis and droughts frequently strain business procedures. In recent years, flooding on cocoa plantations and prolonged drought have led to a significant reduction in main crop harvest. Delays and failure of deliveries affected not only local producers but also European companies, such as ChocolateDreams.

To analyse dependencies and vulnerabilities to weather extremes under changing climate conditions on the one hand and to effectively adopt adaptation measures to business risks on the other hand, the company uses the commercial services offered by R2water, a company created by partners during IMPREX, and ran through a multi-stage consultation process. This way, the company intends to be prepared for planned business expansion. Import's vulnerability of imports to extreme events is elaborated for current and future climate conditions. A comprehensive risk assessment focuses not only on first-tier suppliers, but also takes the entire supply chain into account. R2water provides better access to information on climate change impacts and the associated financial risks while displaying potential production loss risks at seasonal to climate time scales. Relying on international commodity supplies, the company's dependencies are mapped to better understand water-related vulnerabilities and secure business.



Lessons learned within IMPREX include the need for increased adaptive capacity and resilience. ChocolateDreams intends to develop business strategies that further promote the mitigation of negative consequences of remote climate extremes. Associated risks need to be taken into account when developing future bilateral relations with trade partners and suppliers. The company also wants to channel investments into measures that will increase resilience and strengthen water governance to ensure sustainable production in key producing regions. Concrete adaptation measures may include working with supplying farmers to enhance water use efficiency and soil protection as well as improving production efficiency and the use of idle capacities.





## ~ POLICY RELEVANCE

IMPRES' work shows that the private sector, individual member state governments and the EU community have an important role to play in supporting relevant producers in developing countries to ensure that climate change impacts are effectively mitigated. To assist producers and importers and to increase awareness of the risks that climate change poses to the agri-food business, EU policies and business strategies should consider that the EU's economy is highly dependent on goods produced in regions that are vulnerable to water related impacts.

**For further information please visit [www.impres.eu](http://www.impres.eu) and check out our interactive product demonstrator!**

## ~ CONTACT INFORMATION

**WATE:** Ertug Ercin, FutureWater, R2Water, [ercin@r2water.nl](mailto:ercin@r2water.nl)

**ACCLIMATE:** PIK - Anders Levermann, Sven Willner, [sven.willner@pik-potsdam.de](mailto:sven.willner@pik-potsdam.de)

### **IMPRES Coordination and Contact:**

Bart van den Hurk  
Deltares  
P.O. Box 177, 2600 MH Delft, The Netherlands  
[Bart.vandenHurk@deltares.nl](mailto:Bart.vandenHurk@deltares.nl)

Janet Wijngaard  
Royal Netherlands Meteorological Institute  
P.O. Box 201,3730 AE De Bilt, The Netherlands  
[janet.wijngaard@knmi.nl](mailto:janet.wijngaard@knmi.nl)

This factsheet was compiled by adelphi based on the work done within the context of the research project IMPRES and interviews of involved users. Special contributions were made by Ertug Ercin (R2Water and FutureWater), Sven Willner (PIK) and Bart van den Hurk (Deltares). Graphic design by Arctik.

**Visit [www.impres.eu](http://www.impres.eu) and engage with us!**



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IMPRES is designed to help reduce Europe's vulnerability to hydrological extremes by achieving a better understanding of the intensity and frequency of potential disrupting events. Enhancing our forecasting capability will increase the resilience of European society as a whole, while reducing costs for strategic sectors and regions at the same time. The research project brings together 23 partners from 9 countries and has received funding from the European Union's Horizon 2020.