



Human activities have altered the water cycles at local, continental, and global scales. These modifications have far-reaching impacts on biodiversity, food and health security, ecological processes, and climate regulation, ultimately impacting the resilience of both terrestrial and aquatic ecosystems.



CONTROL VARIABLE 1

Maximum amount of consumptive blue water use (Rockström et al.)

PLANETARY BOUNDARY

4000 km³/year

CURRENT VALUE (2023)

1700 km³/year

CONTROL VARIABLE 2

Blue water withdrawal as % of mean monthly river flow (Steffen et al.)

PLANETARY BOUNDARY

Low-flow months: 25%

Medium flow months: 30%

High-flow months: 55%

CURRENT VALUE (2015)

Regional & temporal value

CONTROL VARIABLE 3

Human induced disturbance of blue & green water flow (Richardson et al.)

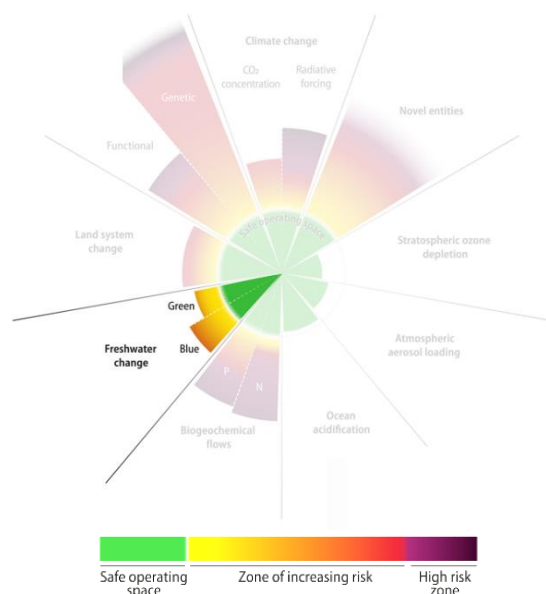
PLANETARY BOUNDARY

10.2% & 11.1%

CURRENT VALUE (2023)

18.2% & 15.8%

FRESHWATER CHANGE



Richardson et al., 2023

PLANETARY PERSPECTIVE

It is imperative to establish a planetary boundary for freshwater resources, as they ensure the preservation of adequate blue water resources for aquatic ecosystems and green water flows for moisture feedback.

Blue water refers to surface and groundwater resources, such as rivers, lakes, and aquifers. Green water is the water stored in soil and vegetation, primarily used by plants through processes like evapotranspiration.

GLOBAL SAFE OPERATING SPACE

Initial efforts to quantify this boundary concentrated solely on blue water resources. Rockström et al. (2009) proposed a global threshold for blue water consumption of 4000 km³/year.

More recently, Richardson et al. (2023) included a regional and temporal scale in the boundary, and also integrated green water resources as a control variable for the freshwater boundary. This boundary assesses deviations on a monthly and regional scale to support the evaluation of water scarcity risks.

CURRENT

The global blue water boundary of 4000 km³/year as defined in 2009 has still not been exceeded in 2023

However, the figure above shows both freshwater boundaries as exceeded at global level. This is due to another control variable being considered by Richardson that accounts for monthly and regional deviations in blue and green water.

Depending on the control variable used, the boundary can be exceeded or not. This highlights the need to understand which control variable is used and what this decision entails.



BELGIAN LEVEL

CONTROL VARIABLE

Maximum amount of consumptive blue water use

THRESHOLD PER CAPITA

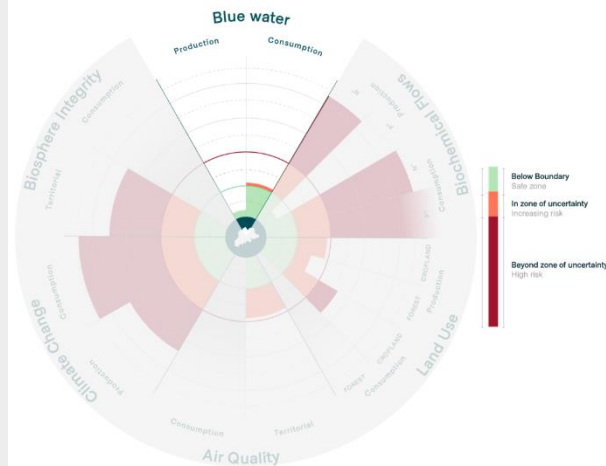
5.91 km³/year

PRODUCTION-BASED FOOTPRINT (2023)

1.41 km³/year

CONSUMPTION-BASED FOOTPRINT (2021)

6.3 km³/year



PRODUCTION-BASED FOOTPRINT

Belgium's production-based footprint is below its "fair share" of the global boundary.

This suggests that Belgium's production activities contribute to a limited extent to the disturbance of the global blue water cycle.

MAIN DATA SOURCES

Regional statistics from the Brussels, Walloon, and Flemish regions have been used to estimate the production-based footprint for Belgium.

For consumption-based blue water consumption, data were extracted from Exiobase v3.8.2, a multi-regional input-output model.

BELGIAN BOUNDARIES

The consumption of blue water serves as the control variable for the freshwater boundary. This control variable has a global threshold of 4000 km³/year, which has not been overshoot yet.

The global boundary was downscaled at the Belgian level using three allocation methods.

For simplicity's sake, results on the left illustrates only the per capita - threshold of 5.91 km³/year that must not be exceeded to remain in the safe operating space.

CONSUMPTION-BASED FOOTPRINT

From a consumption-based perspective, Belgium consumes slightly more than its per capita allocation, with 6.3 km³/year. This includes mostly virtual water, that is consumed for the production of imported goods.

DISCLAIMERS

The chosen control variable can contribute to evaluate Belgium's impact on the global blue water cycle. It lacks, however, the regional and temporal granularity to assess water scarcity risks.

Moreover, future water-related risks due to climate change are not accounted for, despite expectations of increased water scarcity.

Which water use is considered i.e. consumed water versus withdrawn water, impacts the results significantly. In this case, consumed water is considered, as withdrawn water is returned to the ecosystems

KEY MESSAGES

The Planetary Boundary framework does not capture the risk of hydric stress. However, this issue is crucial in Belgium. Incorporating seasonal and regional fluctuations is essential for enhancing risk assessment.

Belgian imports and consumption exceed its fair share of the global freshwater boundary. This pressure can be relaxed through adapting consumption patterns or import decisions.