

Indicator Fact Sheet

(WQ01c) Water exploitation index

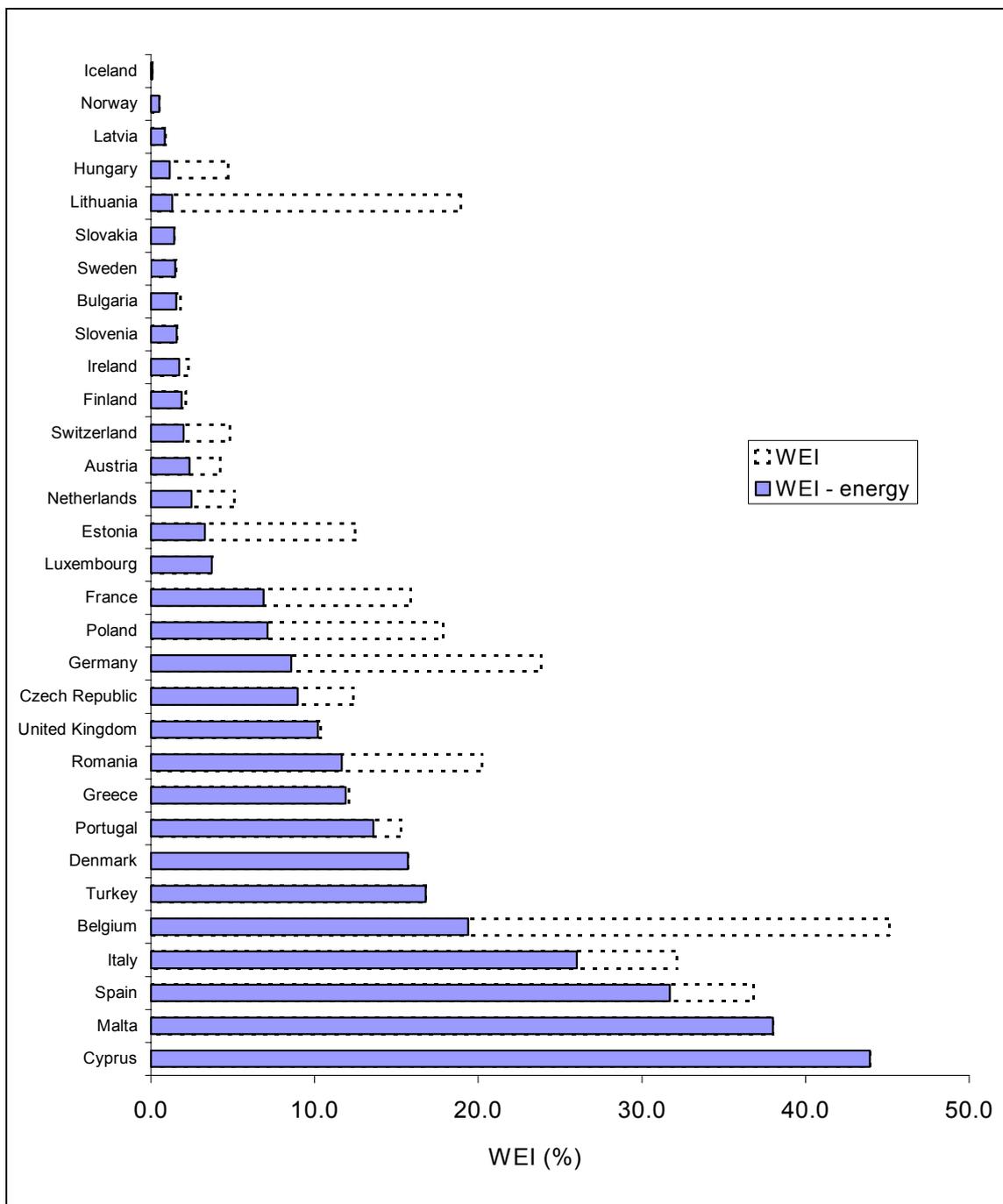
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Key message

- 18% of Europe's population live in countries that are water stressed.

Water exploitation index across Europe





Note: Solid bar: Water exploitation index without water abstraction for energy cooling; dotted bar: WEI based on total water abstraction.

Source: Eurostat, New Cronos database. WEI less than 10% - non-stressed; WEI between 10 and 20% - low stress; WEI greater than 20% - stressed

Results and assessment

Policy relevance:

This indicator can identify whether the rates of abstractions in countries are sustainable over the long term. Although no legal targets are defined, the implementation of the Water Framework Directive will have an important impact. One of its objectives is to promote sustainable use based on a long-term protection of available water resources. Also, one of the environmental objectives of the same directive is to ensure a balance between abstraction and recharge of groundwater, with the aim to achieve good groundwater status.

Policy context:

In Europe, the Water Framework Directive (2000/60/EC) and the Sixth Environment Action Programme for the EU (2001-2010) aim to encourage resource efficiency through more sustainable consumption patterns. Abstraction rates must be sustainable in order to ensure the protection and management of water resources and related ecosystems. Thus this index provides an overview of those countries where freshwater resources are more strained by water abstractions and thus at a higher risk of suffering the consequences of water stress.

Environmental context:

The *water exploitation index (WEI)*, or *withdrawal ratio*, in a country is defined as the mean annual total abstraction of fresh water divided by the long-term average freshwater resources. It describes how the total water abstraction puts pressure on water resources. Thus it identifies those countries having high abstraction in relation to their resources and therefore are prone to suffer problems of water stress. The long-term average *freshwater resource* is derived from the long-term average precipitation minus the long-term average evapotranspiration plus the long-term average inflow from neighbouring countries.

According to the literature, the warning threshold can be 20%, which distinguishes a nonstressed region from a stressed one. Severe water stress can occur for $WEI > 40\%$, which indicates strong competition for water, which does not necessarily trigger frequent water crises. Some experts believe that 40% is too low a threshold, and that water resources can be used much more intensely, up to a 60%. Others believe that freshwater ecosystems cannot remain healthy if the waters in a river basin are abstracted as intensely as indicated by $WEI > 40\%$ (Alcamo et al., 2000).

Assessment:

A total of 20 countries (50 % of Europe's population) can be considered as non-stressed, lying mainly in central and northern Europe. Nine countries can be considered as having low water stress (32 % of Europe's population). These include Romania, Belgium and Denmark and southern countries (Greece, Turkey and Portugal). Finally, there are four countries (Cyprus, Malta, Italy and Spain) which are considered to be water stressed (18 % of Europe's population). Water stressed countries can face the problem of groundwater over-abstractions and the consequent water table depletion and salt-water intrusion in coastal aquifers.

The country with the least freshwater resources is Malta (50 Mm³/year), and Yugoslavia (208.5 km³/year), Turkey (234 km³/year) and Norway (393 km³/year) are the most favoured countries.

Inflows from boundary watersheds can add significant percentage up to the freshwater resources in a country, either as surface flow or as groundwater flow. In most cases, the availability of these external resources are regulated on treaties between the water-sharing countries. The correct allocation of the flow along borders is decisive in the water balance, since it is the main source of discrepancies when comparing data of water balances in neighbouring countries, particularly for those along the Rhine, Danube and Oder rivers. The AC and Balkan countries of the Danube basin have the highest dependency on external resources (above 70%

of their total resources). In western Europe the Netherlands has the highest dependency (88%), followed by Luxembourg and Portugal.

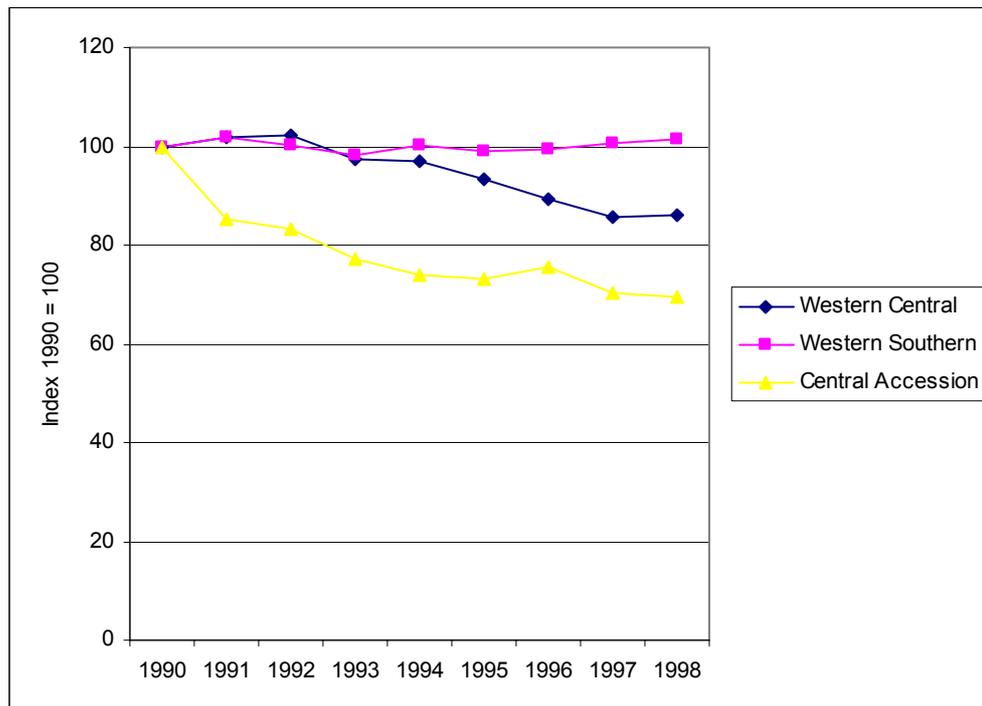
Sub-indicators

Trend in total water abstractions

Key message

☺ Total water abstraction has decreased over the last decade in most regions of Europe with the exception of western southern Europe where it has been constant

Trends in water abstraction in different regions of Europe



Notes:

Western Central: Austria, Belgium, Denmark, Germany, France, Luxembourg, Netherlands, UK

Western Southern: France, Greece, Italy, Portugal, Spain

Central Accession: Bulgaria, Czech Rep. Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Rep., Slovenia

Source: Eurostat, New Cronos database

Assessment for the sub-indicator

The total water abstraction in Europe is about 353 km³/year, which means that 10 % of Europe's total freshwater resources is abstracted.

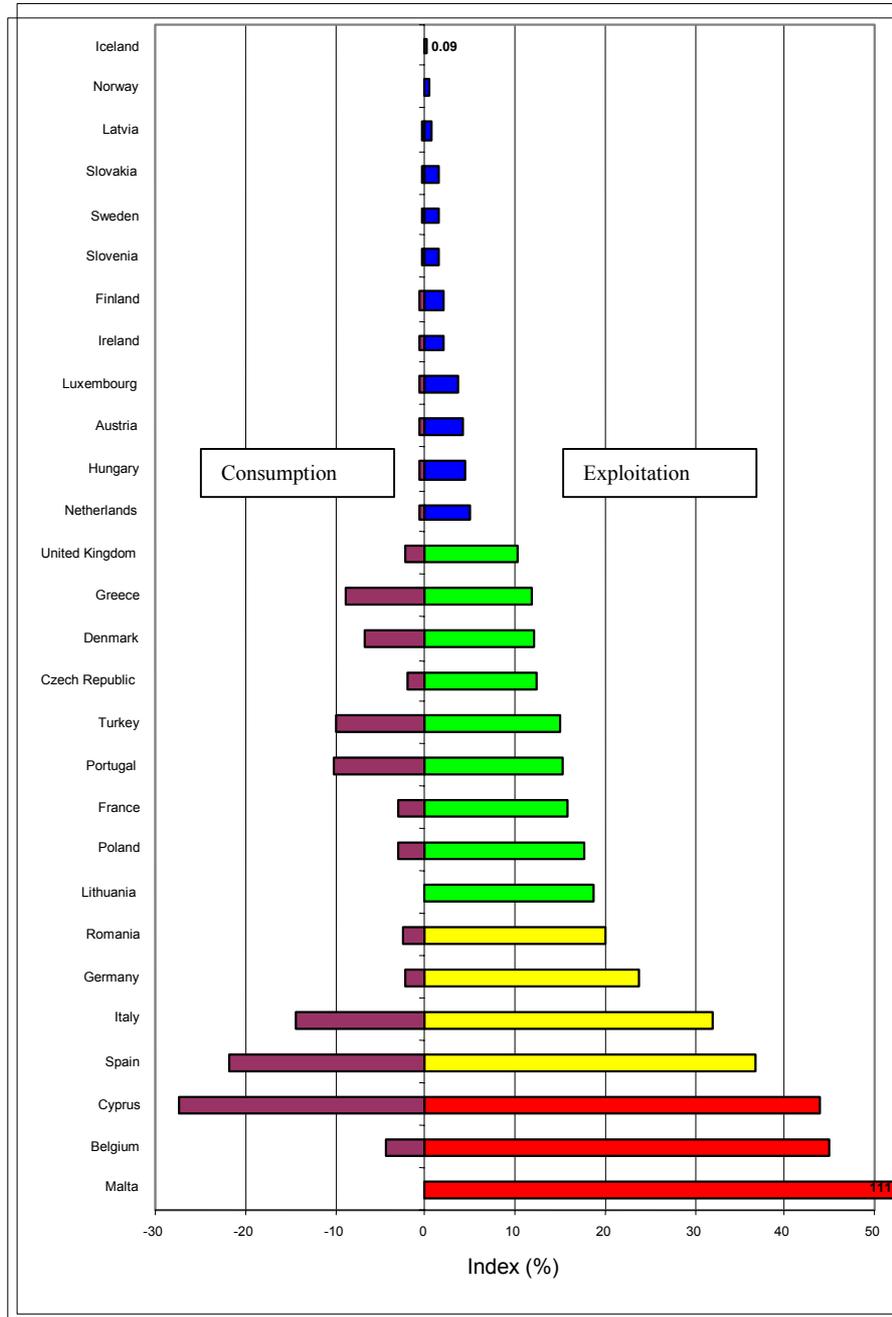
Total water abstraction decreased during the 1990s by 30 % in central Accession countries while in the western southern European countries it has been constant.

Water consumption index

Key message

● The countries that have the highest agricultural water use have the highest consumption indexes, consuming in some cases over 10 % of their annual available resource

Consumption and exploitation indexes in European countries



Notes:

Malta has an exploitation index of over 100 indicating that it uses a volume of water that exceeds its annual freshwater resources. This is because more than half of Malta's water supply comes from desalinated brackish water which is not included in the calculation of its freshwater resources.

Source: Eurostat, New Cronos database.

Assessment for the sub-indicator

Water consumption index is the total consumption divided by the long term freshwater resources of a country. This index highlights those regions where higher consumptive uses are predominant.



For the purpose of this assessment it has been assumed that 80 % of total water abstracted for agriculture, 20 % for urban use, 20 % for industry and 5 % for energy production is consumed and not returned to the water bodies from where it was abstracted.

These figures have been widely accepted, though they may vary by about 5 to 10 % depending on the sectors and other factors. For example, actual consumption in agriculture, the largest water-consuming sector, depends on climatic conditions, crop composition and irrigation techniques. Energy is the least consuming sector, returning 95-97 % of the abstracted water.

The average water consumption index in Europe is 3 %. This index falls to 1 % for some central western and accession countries, and Nordic countries. The highest consumption indexes are found in those countries where agriculture water use predominates such as Cyprus, Malta, Spain, Italy, Portugal and Greece. Even though countries such as Germany and Belgium have high exploitation indexes, their consumption indexes are relatively low, reflecting the predominant water uses in those countries i.e. water for energy production.

References

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Data

Spreadsheet:

WEI_RevJune03.xls

Meta data

Technical information

1. Data source: Eurostat, New Cronos database.
2. Description of data: Freshwater resources and total abstractions data in Mm³/ year
3. Geographical coverage: New Cronos database for Western and AC countries.



4. Temporal coverage: From 1993 onwards
5. Methodology and frequency of data collection: Yearly data requested.
6. Methodology of data manipulation, including making 'early estimates': Data estimation has been done by linear interpolation. If the gap is for on year only, it can be filled with the nearest value.

Quality information

7. Strength and weakness (at data level): The data need to be considered with reservations due to the lack of a common European definitions and procedure to estimate water demands and consumption and freshwater resources. In addition, data from 1997, 1998 and 1999 are not available for all the countries considered and data series from 1993 are not completed. Data at national level could not reflect water stress situations at local level. Current work is being carried out between EUROSTAT and EEA to standardise definitions and methodologies for data estimation.
8. Reliability, accuracy, robustness, uncertainty (at data level): Some cautions should be taken when comparing countries due to different definitions and procedures to estimate water use (e.g. some including cooling water other do not) and freshwater resources. .
9. Overall scoring (give 1 to 3 points: 1=no major problems, 3=major reservations):

Relevancy: 3

Accuracy: 1 (in particular for freshwater resources in some countries)

Comparability over time: 3 (long term freshwater resources require averaging over at least 20 years)

Comparability over space: 2

Further work required

1. Further work required for data level and indicator level: It is necessary to have better indicators of the evolution of freshwater resources in each country (i.e. by using information on trends in discharges of some representative gauging stations per country). If groundwater abstractions are considered separate from surface water abstractions, it would be necessary to have some indicators on the evolution of the groundwater resource (i.e. by using information on head levels of selected piezometers per country). Better estimates of water abstractions could be developed considering the uses involved in each economic sector.
2. Further work required at spatial scale: There are notable differences between water uses in countries. Thus the assessment of the indicators should be based at national scale as minimum requirement, although it would be much better to have data at basin scale when and where available.