THE GLASGOW DECLARATION FOR
fair water footprints

Towards Fair Water Footprints:

Understanding the water footprints of the Global North and dependency on water use in the Global South

- New research reveals that **high-income economies of the Global North are profoundly dependent on water use beyond their borders** to produce the food, clothes and goods they consume.[1]

- **Typically, between 40% and 80%, but as much as 94% of their water footprints are external**, and this dependency is steadily increasing.

- External water footprints can be traced via crops, commodities and products to **economies and river basins of production in the Global South which face extreme water insecurity** and climate vulnerability.

- **Half of the external 'blue' water footprint of the Global North is assessed as being unsustainable**. Analysis suggests that drawing water from rivers, lakes, and aquifers to produce crops and goods for the Global North is a primary driver of resource depletion, ecosystem degradation, and conflict. As well as **locking communities into climate vulnerability, such high levels of unsustainable use threaten the viability of these strategically important supply chains.**

- The **significant implications of these findings for 'producer' and 'consumer' nations, global equity, and climate resilience** are presented in this briefing, alongside the immediate priorities they impose for individual and collective action to ensure a fairer water future.

Priorities for the Water Action Agenda

1. Investigation, research, and accountability monitoring so that water injustice and unsustainable use within supply chains is pinpointed and acted upon, supported by an *SDG6 Accountability Facility*

2. Business, retailers and investors associated with unsustainable or at-risk supply chains must now proactively demonstrate credible water stewardship and engage in collective action to guarantee shared water security

3. Intergovernmental collaboration between consumer and producer nations, targeted aid and technical assistance for water security which prioritises those most vulnerable

4. Systemic change in global financing, trade, procurement to ensure that water footprints support rather than undermine SDG6 delivery including via the Fair Water Footprints Initiative

5. Establish a new transnational water governance regime and a new *UN Convention for Equitable and Sustainable Water Use* to set binding rules, mitigate risks, and arbitrate fair use of the water upon which we all depend

[1] **Full report:** Chapagain, A.K. and Mekonnen, M.M. (2023), Understanding the water footprints of the Global North and dependency on water use in the Global South. Water Witness International.

WATER WITNESS

Background to the study

Tackling the global water crisis sits alongside the climate emergency as one of the greatest challenges facing humanity. Without radical international action for shared water and climate security it is anticipated that by 2050, five billion people will lack access to water at least once a month[2], 700 million people may be displaced by intense water stress[3], water-related losses will supress GDP by up to 10%[4], and the loss of freshwater species and ecosystems, already at devastating rates, will accelerate[5].

In light of these grim prognoses, an improved understanding of our water footprints and their implications for global water, climate and food security are immediate priorities. Water footprint methodology emerged through the work of Tony Allan and Arjen Hoekstra and allows the volume of water required to produce food, clothing and other goods to be calculated and traced across supply chains of production. Assessing the water footprints of companies and nations brings new opportunities and obligations to ensure sustainable use, and to address the impacts of consumption on often distant communities, ecosystems, and economies.

The Glasgow Declaration for Fair Water Footprints launched at COP26 is a global leadership collaboration working to ensure sustainable, resilient, and equitable water use by 2030. It recognises that where water is used responsibly within supply chains, water footprints are an important driver of jobs, trade, and growth. Unlike carbon footprints water footprints don't always need to be reduced. The strategic priority for our water footprints to be 'fair'[6] - defined as demonstrating zero pollution, sustainable withdrawal, universal access to safe water, sanitation, and hygiene (WASH), protection of nature, and resilience to droughts and floods. With commitment already in place from 28 governments, leading multi-nationals, investors, civil society, researchers, and networks, the growing Fair Water Footprints coalition offers a unique opportunity to establish accountability for water and its stewardship as the global business norm.

Helpful definitions:

Water footprint: The water footprint of a product is an empirical indicator of how much water is consumed, when and where, measured over the whole supply chain of the product. As a multi-dimensional indicator, it makes explicit the volume, type (evapotranspiration of rainwater, consumption of surface or groundwater, or pollution), location and timing of water use. The water footprint of an individual, business or nation is defined as the total volume of freshwater that is used to produce the goods and services consumed.

Blue water footprint: the surface and ground water abstracted and consumed from rivers, lakes, reservoirs and aquifers to produce goods. This runoff flow can be used for all sorts of purposes, including irrigation, washing, processing, and cooling.

Green water footprint: use of the rainwater that is stored as soil moisture and consumed before it becomes runoff flow. It is the evaporative flow used for crop growth and maintaining natural ecosystems. The green water footprint measures the part of the total evaporative flow which is appropriated for human purposes.

Grey water footprint is the volume of freshwater required to assimilate or dilute a pollutant load in a freshwater body, based on natural background concentrations and ambient water quality. It provides an indicator of water appropriation through pollution.

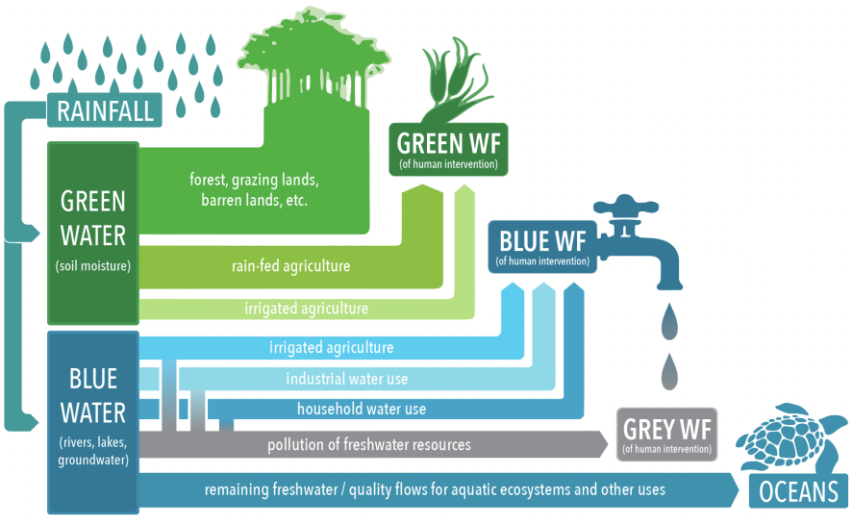


Figure 1. Understanding water footprints. Adapted from WWF, AfDB (2012). Africa Ecological Footprint Report 2012

[2] WMO, 2022. State of Global Water Resources report informs on rivers, land water storage and glaciers.
[3] UN High Level Panel on Water, 2022. https://www.un.org/pga/76/2022/08/30/high-level-panel-on-harnessing-global-development-agendas-on-the-road-to-2023-during-the-world-water-week/
[4] World Bank Group. (2016). 'High and Dry : Climate Change, Water, and the Economy'
[5] IPBES, 2019. Summary for policymakers. https://doi.org/10.5281/zenodo.3553579
[6]Note that unlike carbon, a water footprint doesn't always need to be reduced where water is plentiful or used within sustainable limits.

Methodology and approach

To inform debate and target action towards Fair Water Footprints, a new study was undertaken to provide comprehensive and up-to-date analysis of the water footprints associated with crop, livestock and industrial production, global trade and consumption. It examines the degree to which consumer nations in the Global North are dependent on water use in the Global South to meet their growing needs and considers the sustainability of this 'external' water footprint.

Helpful definitions:

Water footprint of national consumption and production: The 'water footprint of a nation', or 'of national consumption' should not be confused with the 'water footprint of national production'. The former refers to the total volume of water consumed directly or indirectly by the inhabitants of the nation, whereas the later refers to the volume of water used within the national territory to produce goods and services that may or may not be used within the nation (i.e., some is exported).

Virtual water: In the early 1990s, Professor Tony Allan introduced the concept of 'virtual water' as a tool to describe the 'virtual' water flows exported from a region in the form of water-intensive commodities (Allan, 1993). The volume of virtual water 'hidden' or 'embodied' in a particular product is defined as the volume of water used in the production process of that product.

Water security: Shared water security is considered to be the ultimate goal of water governance and management, and has been defined as 'th*e reliable availability of an acceptable quantity and quality of water for production, livelihoods, health and ecosystems, coupled with an acceptable level of risk from hazards including drought, flooding, pollution and conflicts.'* (Grey and Sadoff, 2007)[10]

Water stewardship: Water stewardship defines the role that responsible water-users such as business should play and is defined as '*the use of water that is socially and culturally equitable, environmentally sustainable, and economically beneficial, achieved through a stakeholder-inclusive process that includes both site- and catchment-based actions'* (AWS, 2019).[11]

Fair Water Footprints: Unlike carbon footprints, water footprints do not always need to be reduced. The priority is for a water footprint to be 'fair' so that it 'does no harm' and contributes to resilient, sustainable, and inclusive development by demonstrating: zero pollution, sustainable withdrawals, universal WASH access, protection of nature and resilience to droughts and floods. (Hepworth, 2021)**.**[12]

The objective is to trigger systemic change and collective action for shared water security in strategically important, high-risk supply chains by stakeholders in both consuming and producing nations. The work helps to communicate the need for action, and to realise the full potential of the Fair Water Footprint initiative in accelerating Sustainable Development Goal 6 and a more just and secure global future.

The study draws on new data between 2000-2020 and applies established water footprint accounting methodology[7] to update the global data set[8]. Data on international trade, crop production, industrial and domestic water use have been drawn from the United Nations International Trade Database (COMTRADE), FAOSTAT, and AQUASTAT respectively. Climate data to calculate crop production is based on a historical 30-year climate record used in the 1996-2000 study. Data associated with mining, extractives, floriculture, livestock feed and some manufactured goods remain stubbornly opaque and hard to analyse. Assessment of blue water footprint sustainability applies a presumptive environmental flow requirement to estimate the sustainable yield of locally available water (see Mekonnen and Hoekstra, 2020)[9].

Limitations within the data and method are set out in the full report, and whilst these can be improved, the overall analysis provides the best available estimate of the water footprints of nations, their interdependencies, and sustainability to date.

[7] Drawn from the Water Footprint Assessment Manual (Hoekstra et al. 2011)
[8] Prior to this analysis datasets on the water footprint of nations were limited to the time period 1996 to 2005
[9] Mekonnen, M. M., and Hoekstra, A. Y. (2020) Blue water footprint linked to national consumption and international trade is unsustainable. Nature Food, 1(12), 792-800. doi:10.1038/s43016-020-00198-1.
[10] Grey, D. and Sadoff, C.W. (2007). Sink or swim? Water security for growth and development. 545–571. doi:10.2166/wp.2007.021.
[11]Global Water Stewardship Standard, V2.0, AWS https://a4ws.org/

Key findings

1. **Dependency on external water use by economies in the Global North is significant, in terms of volume, and as a proportion of the water footprint of consumption, representing between 14% (USA) to 94% (Netherlands) of total water needs.**[12] The total water footprints of the economies studied are very large, with the EU27 exceeding half a trillion cubic metres/year, and the USA approaching 1 trillion cubic metres/year - roughly equivalent to the annual flow of the Mississippi and the Yangtze, respectively. The 'external' portions of these reflect a strikingly high level of dependency on water use in other nations. Figure 2 shows the proportion of each nation's water footprint which is external, alongside the total water footprint of consumption per capita.

Figure 2. Comparing external and total water footprints of consumption per capita for selected Global North economies, 2016-2020

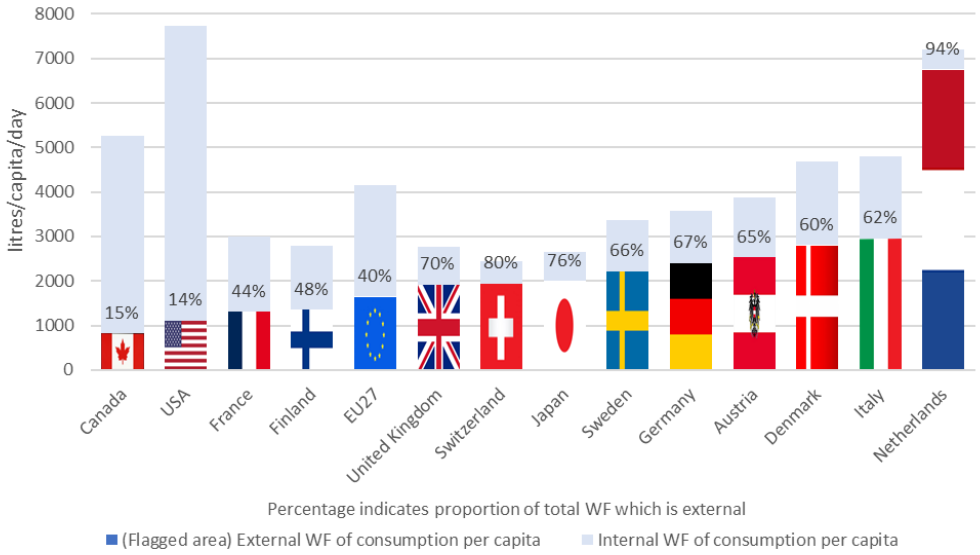


Figure 3 shows external water footprints by volume to emphasise that while some proportional dependencies on external water are low, the large size of these footprints means they still involve enormous volumes of water use. The USA's external footprint, at 132,665 Mm^3/year, is by far the largest by volume of all countries analysed, despite representing only 14% of the USA's total needs.

Figure 3. Relative scale of external water footprints of consumption by volume for selected Global North economies (Mm^3/year), 2016-2020

[12] For the period 2016-2020.

2. **Per capita dependency on external water footprints in the Global North is noteworthy, ranging from between 818 litres per person per day for Canada, to almost 7000 litres per person per day for the Netherlands (6748 l/h/d)** (see Figure 2). To aid comprehension, these figures can be converted into 'bathtubs' of water (approx. 100 litres) and compared to direct consumption of domestic water. For example, whilst a household of four in the UK will typically consume six bathtubs of water each day directly in their homes,[13] they consume 77 bathtubs of water each day outside the UK via the food, clothes, and goods they consume. The figure for the Netherlands is especially striking, with each household consuming 270 bathtubs of water each day – 52 times as much as their domestic use – outside of the Netherlands.[14]

3. **The overall trend is one of a steadily growing external water footprint for Global North economies and increasing dependency on water use beyond their borders to secure the needs of their populations (See Figures 4 and 5).** Over the period 2000-2020, whilst dependency on external water has declined marginally for Canada, Finland, and the UK, the overall trend is upwards, by as much as 7% for Sweden, and by 4% for each of the USA, Germany, and Switzerland, as well as the Global North as a whole.

Figure 4. Total external water footprint of Global North economies studied by volume, 2000-2020

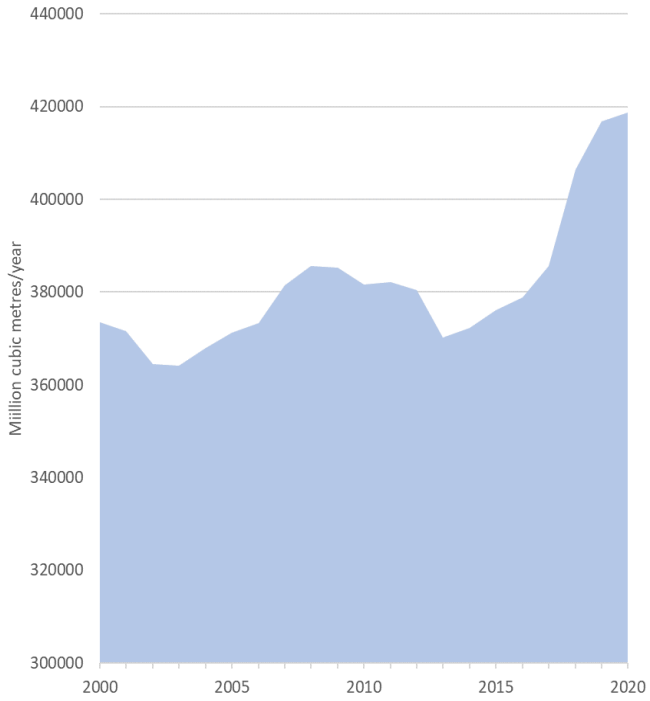
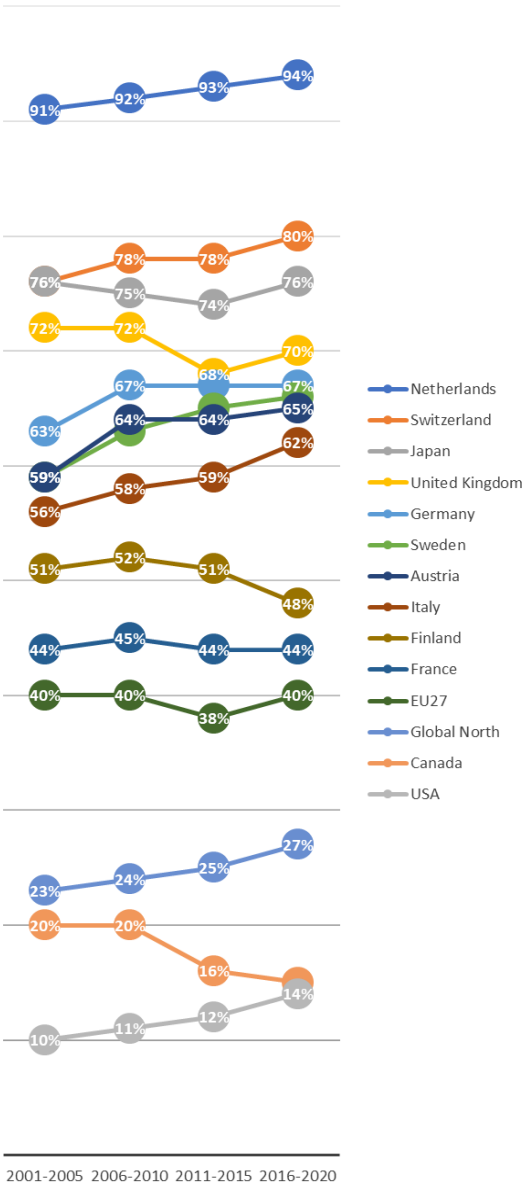


Figure 5. External water footprint as a percentage of total water footprint, 2000-2020

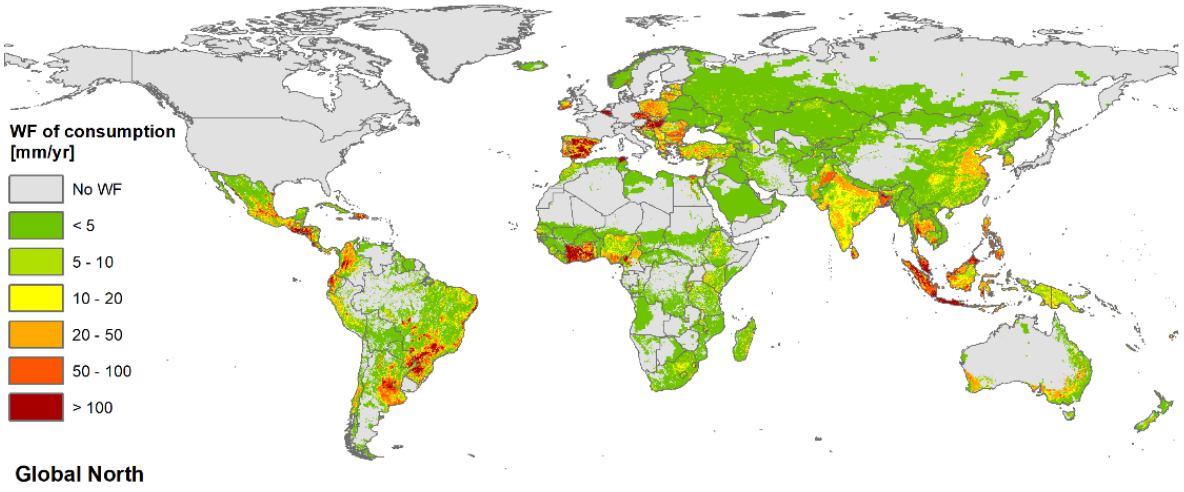


[13] Based on UK Environment Agency figures of average consumption of 142 l/h/d (2021)

[14] Studies have consistently reported a high total and external water footprint for the Netherlands. e.g. Hoekstra & Chapagain, 2007 and, van Oel et al. 2009. The new study helps to explain this. Alongside high population density (highest of any major European state), high consumption and consequent high dependency on imports, we find particularly high virtual water imports through cocoa, palm oil and coffee. These may be re-exported as processed tertiary products not captured in this study, but given the economic benefits accrued there remains strong rationale for ensuring responsible water use in these supply chains. A more in-depth analysis and review of import and export data reported to the UN is warranted.

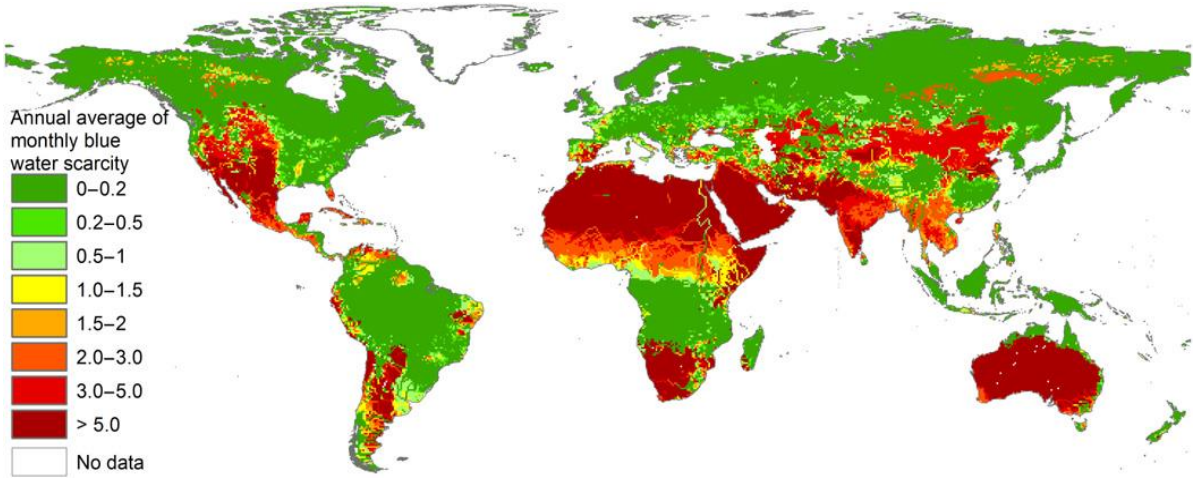
4. **Tracing the external water footprints of high-income economies to geographies of production reveals the pan-global nature of the water use which supports strategically important supply chains.** Figure 6 shows this geographical spread of the external water footprint of the 14 Global North economies analysed. It includes water use for crop, livestock, and industrial production across nations facing water scarcity and extreme water insecurity in the Global South (see Figure 7).

Figure 6. External water footprint of consumption of the selected Global North economies.



In Figure 6 (above), colours indicate levels of water use for export to the Global North with greens and reds indicating low and high levels of use, respectively. In Figure 7 (below), green grid cells represent areas which are not subject to water scarcity on an annual basis, whereas yellow, orange and progressively darker shades of red correspond to higher degrees of blue water scarcity.

Figure 7. Annual average of monthly blue water scarcity. Hoekstra and Mekonnen, 2016.[15]

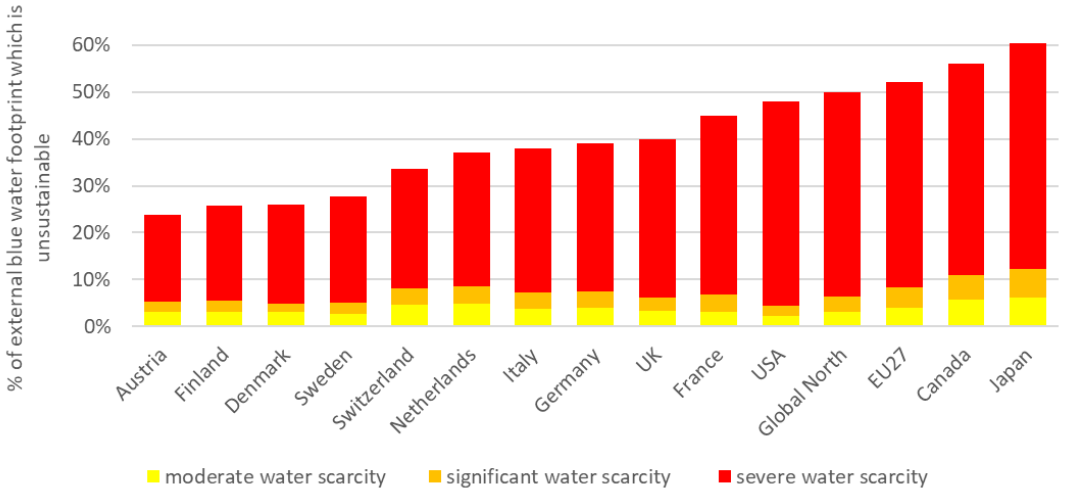


[15] Hoekstra and Mekonnen (2016) Environ. Res. Lett. 11 055002DOI 10.1088/1748-9326/11/5/055002

5. **Assessment of the blue portion of external water footprints of high-income economies suggests that 50% of this water use is unsustainable, likely driving resource depletion, ecosystem degradation, water scarcity, conflict, and climate vulnerability.** The blue water footprint represents the volume of surface and groundwater abstracted and consumed from rivers, lakes, reservoirs, and aquifers, and is considered to be unsustainable when it violates environmental flow needs and depletes aquifers. Water footprint assessment uses a presumed environmental flow requirement of 80% of natural flow as a proxy, with progressively higher exceedances defined as moderate, significant and severe blue water scarcity. Overexploitation of blue water undermines the ability of communities, ecosystems and economies to cope with climate change and shocks and threatens the future viability of production and associated jobs, revenue and trade.

   While the proportion of unsustainable use within the external blue water footprints of Global North economies varies considerably, all are alarmingly high. Based on 2016-2020 data, countries can be ranked based on the degree of unsustainable use: Japan (61%), Canada (56%), USA (48%), France (45%), UK (40%), Germany (39%), Italy (38%), Netherlands (37%), Switzerland (34%), Sweden (28%), Denmark (26%), Finland (26%), and Austria (24%) (See Figure 8). If we examine the EU as a whole, the majority (52%) of its external blue water footprint is unsustainable. Almost all (92%) of this unsustainable use falls in places facing significant or severe blue water scarcity. It is important to understand the absolute size of the unsustainable footprints at hand. For example, the USA's unsustainable external blue water footprint amounts to 3510 Mm^3/year – 20 times that of Sweden.

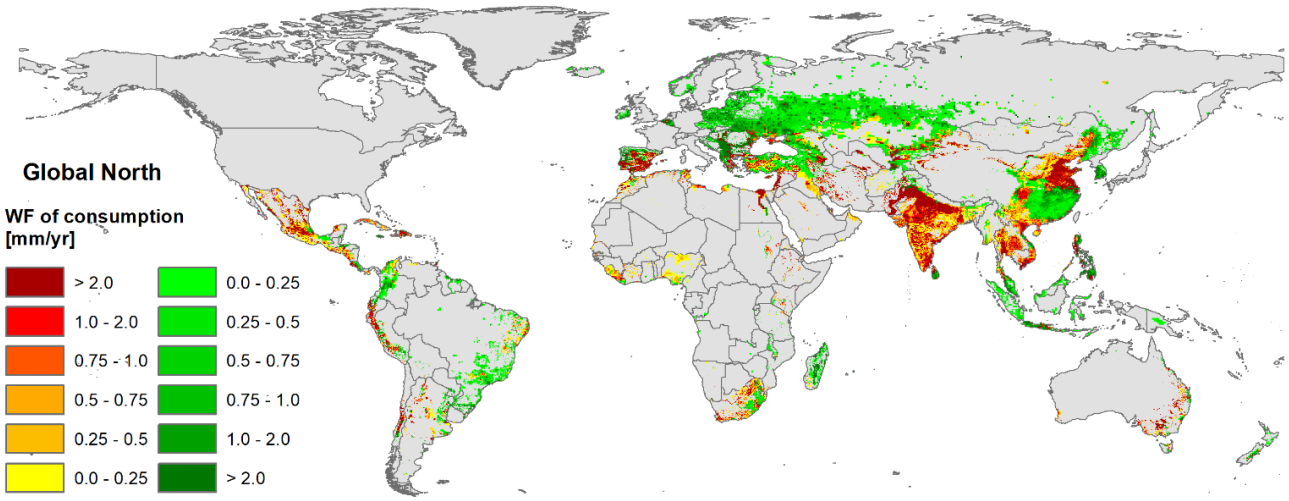
Figure 8. Proportion of blue external water footprints of Global North economies assessed to be unsustainable, in geographies facing moderate, significant or severe water scarcity (2016-2020)



6. **Tracing the products, places and agencies responsible for these virtual water flows helps to target action for more resilient supply chains, and sustainable production and consumption.** The nature and source of the unsustainable blue water footprint for each economy is analysed and mapped in the full report to guide bilateral and multilateral action across sectors and geographies of concern. Figure 9 shows the sustainability of the external blue water footprint of the Global North economies studied and the hotspots of unsustainable production across each continent. The top 10 products associated with unsustainable blue water footprints are cotton (35%), olives (10%), citrus fruit (9%), (rice 7%), barley (4%), sugarcane (4%), grapes (4%), soybean (3%), industrial products (3%) and castor beans (2%).

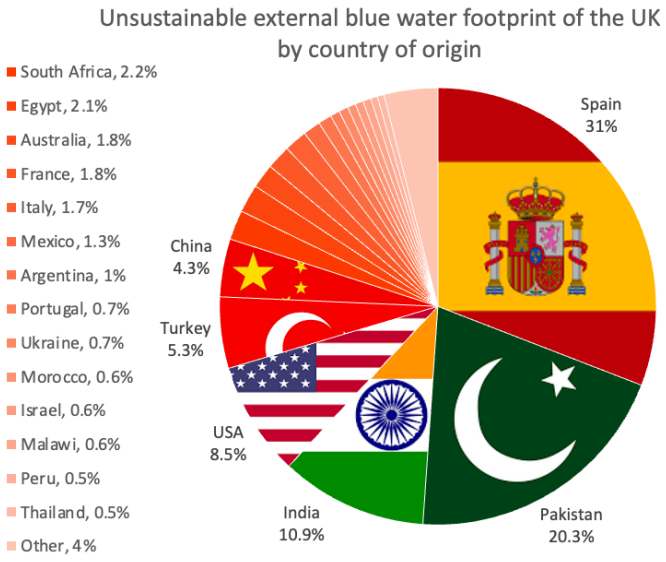
   In Figure 9, the grid squares shaded yellow to dark red indicate progressively more extreme levels of unsustainable water use ranging from moderate to severe water scarcity. This high-level mapping highlights priority countries and river basins for further investigation and action. Maps provide guidance only, as there is potential for unsustainable water use which exceeds sustainable yields in all geographies- included those shaded green - just as sustainable use is possible within water scarce contexts via abstraction in line with seasonal availability and water storage. Nevertheless, Figure 9 provides a useful illustration of the extent of problematic water use within global supply chains.

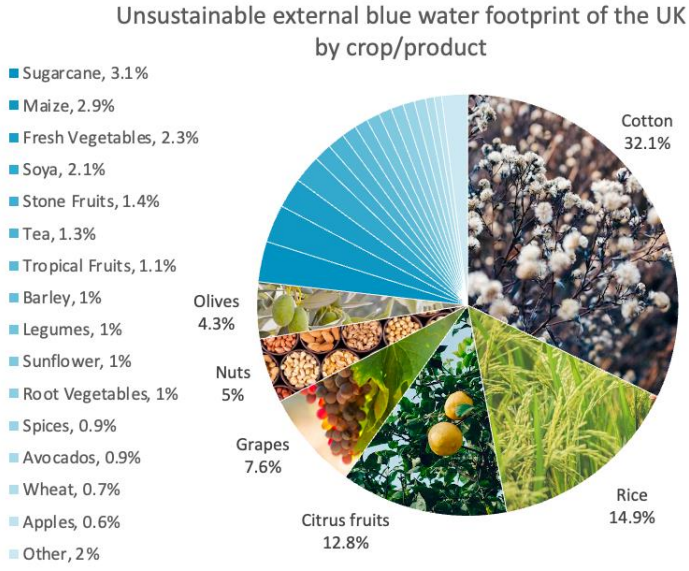
Figure 9. Sustainability of the external blue water footprint of Global North economies



Disaggregating the data reveals 'virtual water' trading partners, locations of production, and crop and product types associated with unsustainable use. For example, for the UK, priority countries of production are set out in Figure 10, and sectors and products of particular concern in Figure 11. This is also for guidance only because data for some highly polluting and thirsty supply chains remain problematic (for example, metals, floriculture, aquaculture, meat and livestock feed).

Figures 10 (left) and 11 (right). Trading partners and products associated with the UK's unsustainable external blue water footprint (2016-2020).





7. **The analysis helps 'producer economies' of the Global South to understand the priority trading partners, places, and products within their water footprints of production.** To illustrate this, details of virtual water exports for four selected countries, Kenya, Madagascar, Malawi and Peru are set out in Table 1. Figure 12 provides a closer look at patterns of water use for crop export production within selected regions. Maps indicating the geographical distribution of the water footprint of production have been developed for each county (Figure 13) to support further investigation, and policy and practical action to ensure they are based on sustainable, resilient and equitable use.

Figure 12. Locations associated with unsustainable water use (yellow to dark red) within the blue water footprint of crop production in the Global South.

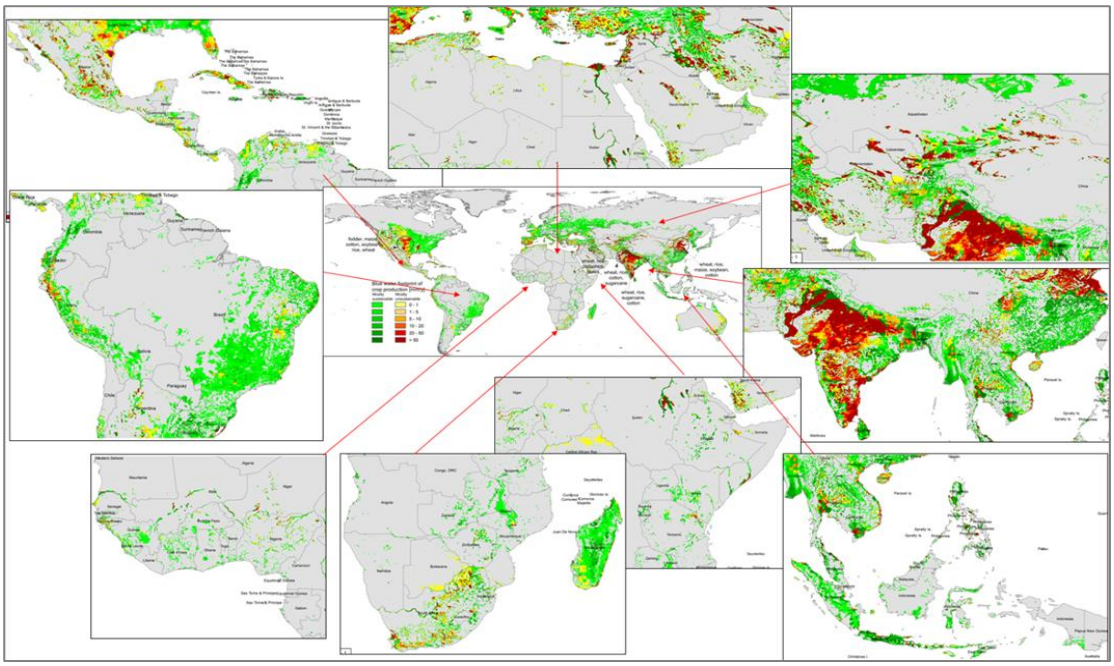


Figure 13. Water footprint of production in Peru (TL), Kenya (TR), Madagascar (BL), and Malawi (BR).

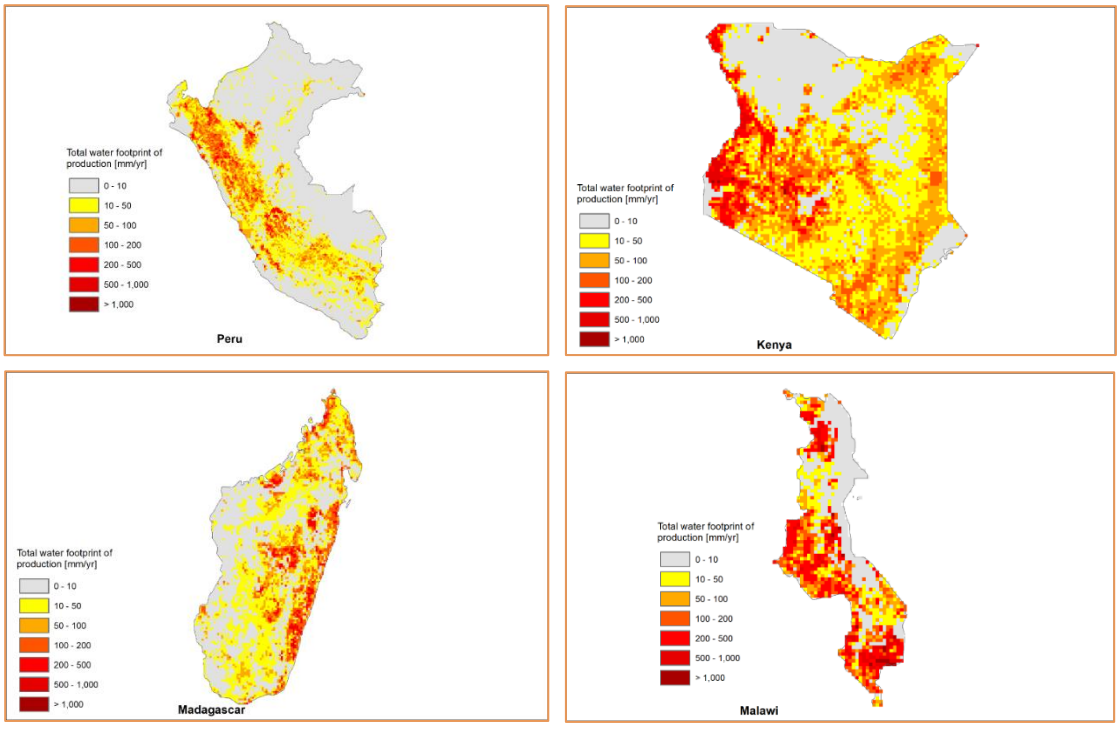


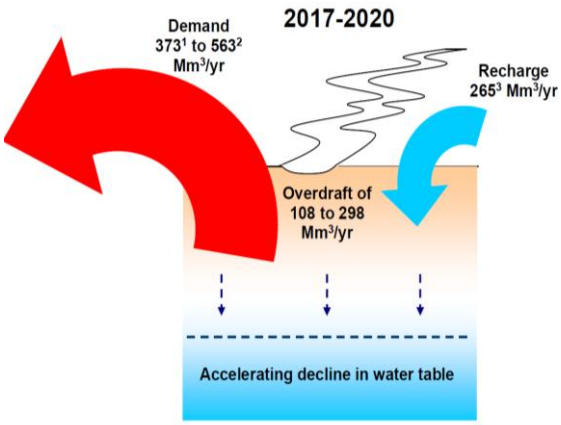
Table 1: Total volume of virtual water export related to the export of agricultural products from Kenya, Madagascar, Malawi, and Peru, by the water use type (blue, green and grey), top importing countries, and top export products.

Exporting country	Type	Total virtual water export (Mm^3/yr)	Top 20 countries	Top 20 products
Kenya	Green	4419	Pakistan-17.7%, Egypt-9%, USA-8.4%, United Kingdom-7.8%, India-6.2%, UAE-5.2%, Germany-4.7%, Afghanistan-2.6%, Russia-2.5%, Indonesia-2.4%, Sweden-2.3%, Uganda-2.1%, Rep. of Korea-2%, Sudan-1.6%, Switzerland-1.6%, Yemen-1.6%, Saudi Arabia-1.5%, Kazakhstan-1.4%, Spain-1.3%, Finland-1.3%	Tea-51.1%, Coffee, Green-28.3%, Seed Cotton-4.8%, Cocoa Beans-3.3%, Livestock-2.1%, Beans, Dry-1.9%, Oil Palm Fruit-1.4%, Pulses -1.3%, Tobacco Leaves-1.3%, Barley-0.7%, Avocados-0.7%, Jute-0.3%, Maize-0.3%, Mangoes-0.2%, Cereals -0.2%, Pineapples-0.2%, Sesame-0.2%, Sugar Cane-0.1%, Citrus Fruit -0.1%, Beans, Gr 0.1%
	Blue	72	USA-28%, Germany-10.4%, India-10.2%, Sweden-5.2%, Rep. of Korea-4.4%, UAE-3.8%, Switzerland-3.4%, Finland-2.9%, United Kingdom-2.6%, Netherlands-1.8%, Norway-1.7%, Australia-1.6%, Uganda-1.5%, France-1.4%, Tanzania-1.3%, Belgium-1.2%, Japan-1.1%, Canada-1%, Saudi Arabia-1%, Pakistan-0.9%	Coffee, Green-63.2%, Seed Cotton-22%, Livestock-4.8%, Tea-2.8%, Industry-1.2%, Avocados-0.7%, Cereals nes-0.4%, Citrus Fruit-0.4%, Sugar Beet 0.4%, Vegetables Fresh -0.4%, Sesame -0.4%, Grapes-0.3%, Jute-0.2%, Carrots-0.2%, Oilseeds nes-0.2%, Onions+Shallots,-0.2%, Spices -0.2%, Sugar Cane-0.2%, Peas, Green-0.1%, Olives-0.1%
	Grey	119	India-12.1%, Pakistan-11.8%, USA-10.8%, Egypt-6.6%, UAE-6.4%, Uganda-6.3%, United Kingdom-6.2%, Germany-4%, Tanzania-2.3%, Rep. of Korea-1.9%, Sweden-1.9%, Afghanistan-1.9%, Russia-1.8%, Rwanda-1.8%, Switzerland-1.3%, Sudan-1.2%, Yemen-1.1%, Finland-1.1%, Kazakhstan-1.1%, Netherlands-1%	Tea-37.1%, Coffee, Green-23.2%, Industry-11.8%, Pulses nes-11.1%, Seed Cotton-7.6%, Oil Palm Fruit-1.8%, Cocoa Beans-1%, Tobacco Leaves-1%, Peas, Dry-0.9%, Jute-0.9%, Barley-0.7%, Avocados-0.4%, Potatoes-0.3%, Beans, Green-0.3%, Sugar Beets-0.2%, Pineapples-0.2%, Peas, Green-0.2%, Grapes-0.2%, Mangoes-0.1%, Wheat-0.1%
Madagascar	Green	1538	USA-17.9%, India-14.7%, France-12.6%, Indonesia-10%, Singapore-8.7%, Germany-6.1%, Switzerland-3.7%, Netherlands-2.8%, Mauritius-2.4%, Malaysia-1.9%, Canada-1.9%, South Africa-1.6%, UAE-1.5%, Spain-1.2%, Morocco-1.2%, Australia-1.2%, Japan-1.2%, Pakistan-1%, Italy-0.7%, Belarus-0.6%	Cloves, Whole+Stems-37%, Vanilla-28.2%, Cocoa Beans-13.9%, Seed Cotton-10.7%, Coffee, Green-2.4%, Pepper, -1.2%, Beans, Dry-1.1%, Fruit Fresh nes-1%, Cinnamon (Canella)-0.9%, Pulses nes-0.8%, Sugar Cane-0.6%, Onions+Shallots-0.3%, Lettuce-0.2%, Groundnuts in Shell-0.2%, Pears-0.2%, Peaches Nectarines-0.2%, Maize-0.2%, Tobacco Leaves-0.1%, Pineapple-0.1%, Broad Beans,-0.1%
	Blue	327	USA-42.3%, France-18.6%, Germany-10.7%, Mauritius-4.3%, Canada-4.1%, Australia-3.3%, Netherlands-2.7%, South Africa-2.4%, Japan-2.1%, Poland-1.4%, Switzerland-1.2%, Spain-1.1%, United Kingdom-0.7%, India-0.5%, Kenya-0.5%, Austria-0.4%, Rep. of Korea-0.4%, Ireland-0.3%, UAE-0.3%, Belgium-0.3%	Vanilla-81.7%, Seed Cotton-17%, Industry-0.5%, Sugar Cane-0.4%, Broad Beans, Dry-0.1%, Sugar Beets-0.1%
	Grey	31	USA-22.8%, France-12.5%, Japan-7.5%, UAE-7.5%, South Africa-7%, China-5.3%, Mauritius-4.3%, Rep. of Korea-4.3%, Spain-4%, India-3.9%, Taiwan-3%, Germany-2.6%, Sweden-1.9%, Netherlands-1.5%, Kenya-0.9%, Ireland-0.9%, United Kingdom-0.8%, Indonesia-0.8%, Switzerland-0.8%, Singapore-0.7%	Industry-52.3%, Seed Cotton-45.5%, Broad Beans, Dry-1.1%, Sugar Beets-0.4%, Sugar Cane-0.2%, Tobacco Leaves-0.1%, Chick-Peas-0.1%, Chillies & Peppers, Green-0.1%, Nuts nes-0.1%, Barley-0.1%
Malawi	Green	1111	Germany-10.8%, South Africa-10%, Tanzania-8.1%, Russia-7.4%, Zimbabwe-6.8%, USA-5.5%, Poland-5.2%, Kenya-4.7%, United Kingdom-3.9%, Egypt-3.4%, Ukraine-3.2%, Belgium-2.2%, Rep. of Korea-2.1%, Turkey-2%, China-1.7%, France-1.7%, India-1.4%, Mauritius-1.3%, UAE-1.3%, Netherlands-1.1%	Tobacco Leaves-52.8%, Tea-13.8%, Groundnuts in Shell-11.4%, Soybeans-10.2%, Seed Cotton-3.9%, Sugar Cane-2.4%, Sunflower Seed-1.5%, Sesame Seed-1.1%, Pimento, Allspice-0.6%, Maize-0.6%, Coffee, Green-0.3%, Pulses nes-0.3%, Sugar Beets-0.2%, Beans, Dry-0.2%, Peas, Dry-0.1%, Cereals nes-0.1%, Lentils-0.1%, Rice, Paddy-0.1%, Sorghum-0.1%
	Blue	174	South Africa-29.4%, United Kingdom-20.2%, USA-12.4%, Tanzania-7.4%, Germany-6.7%, Poland-3.6%, Rwanda-2.7%, Zimbabwe-2.3%, Kenya-1.7%, China-1.6%, Burundi-1.3%, UAE-1.1%, India-0.9%, Japan-0.9%, Saudi Arabia-0.8%, Russia-0.8%, Botswana-0.8%, Pakistan-0.7%, Egypt-0.6%, Belgium-0.4%	Tea-76.9%, Sugar Cane-16.4%, Soybeans-2.3%, Coffee, Green-1.8%, Pimento, Allspice-1.3%, Sugar Beets-0.5%, Sesame Seed-0.4%, Pulses nes-0.2%,
	Grey	86	Germany-15.4%, Russian-11.7%, Poland-7.3%, USA-5.4%, Egypt-5.3%, Ukraine-5.1%, Tanzania-3.7%, Zimbabwe-3.7%, Belgium-3.4%, Rep. of Korea-3.4%, Kenya-2.8%, Turkey-2.8%, France-2.7%, South Africa-2.4%, UAE-2.2%, China-2%, Netherlands-1.8%, Portugal-1.5%, Indonesia-1.4%, Japan-1.2%	Tobacco Leaves-84.6%, Groundnuts in Shell-5.7%, Soybeans-2.4%, Sugar Cane-2.1%, Industry-1.2%, Pulses nes-1.2%, Sugar Beets-0.9%, Sesame Seed-0.7%, Coffee, Green-0.5%, Maize-0.5%, Rice, Paddy-0.2%, Broad Beans
Peru	Green	4309	USA-23.7%, Germany-16.3%, Netherlands-8.7%, Colombia-7.3%, Italy-3.4%, Spain-3.3%, France-3%, Sweden-2.6%, United Kingdom-2.6%, Belgium-2.5%, Chile-2.3%, Rep. of Korea-2.3%, Canada-2.3%, Indonesia-2%, Mexico-1.9%, Switzerland-1.4%, Malaysia-1.3%, Japan-1.1%, Russia-1%, Ecuador-0.8%	Coffee, Green-45.5%, Cocoa Beans-25.4%, Avocados-3.4%, Oil Palm Fruit-3.4%, Bananas-3.4%, Mangoes-2%, Livestock-1.8%, Ginger-1.7%, Grapes-1.7%, Pimento, Allspice-1.7%, Asparagus-1.3%, Seed Cotton-1.2%, Sugar Cane-1%, Onions +Shallots, Green-0.9%, Fruit Fresh nes-0.8%, Olives-0.6%, Oilseeds nes-0.4%, Maize-0.3%, Barley-0.3%, Beans, Dry-0.3%
	Blue	620	USA-29.1%, Colombia-11.3%, Netherlands-11.2%, Spain-7.5%, Germany-4.7%, United Kingdom-4.3%, Chile-4.1%, Ecuador-3.1%, Mexico-2.9%, France-2.8%, Canada-2.5%, Russia-1.7%, Bolivia-1.6%, Brazil-1.4%, Switzerland-0.9%, China-0.9%, China, Hong Kong SAR-0.7%, Japan-0.7%, Italy-0.6%, Saudi Arabia-0.6%	Mangoes-15.5%, Avocados-14.6%, Seed Cotton-12.6%, Sugar Cane-9.7%, Pimento, Allspice-8.8%, Asparagus-8.1%, Fruit Fresh nes-5.4%, Bananas-3.8%, Citrus Fruit nes-2%, Cranberries-1.9%, Olives-1.8%, Onions+Shallots, Green-1.8%, Rice, Paddy-1.4%, Cereals nes-1.4%, Beans, Dry-1.3%, Oranges-1%, Livestock-0.9%, Barley-0.8%, Tang.Mand.Clement.Satsuma-0.7%, Vegetables Fresh nes-0.7%
	Grey	376	USA-24.8%, Colombia-11.8%, Germany-10.7%, Netherlands-8%, Chile-4.3%, Spain-3.7%, Ecuador-2.6%, United Kingdom-2.5%, Italy-2.4%, Canada-2.4%, France-2.4%, Mexico-1.8%, Belgium-1.6%, Indonesia-1.6%, Rep. of Korea-1.5%, Brazil-1.5%, Sweden-1.5%, China-1.3%, Bolivia-1.2%, Switzerland-1.1%	Coffee, Green-24.8%, Cocoa Beans-19.5%, Seed Cotton-8.6%, Oil Palm Fruit-8.3%, Avocados-4.9%, Industry-3.6%, Grapes-3.4%, Onions +Shallots, Green-2.9%, Sugar Cane-2.7%, Mangoes-2.4%, Cranberries-1.9%, Bananas-1.9%, Asparagus-1.8%, Olives-1.6%, Pimento, Allspice-1.2%, Ginger-1.1%, Fruit Fresh nes-1.1%, Beans, Dry-0.9%, Groundnuts in Shell-0.7%, Rice, Paddy-0.7%

8. **Ground-truthing provides confidence in the findings, with unequivocal evidence that water use to produce export crops and products for Global North economies is driving unsustainable and inequitable water use and extreme climate vulnerability in producer countries.** (See Figure 14).

Figure 14. Evidence of impacts associated with external water footprints of the Global North in selected Global South countries

PERU



In Peru, production of asparagus, avocados, and fresh produce for supermarkets in the USA and Europe drives rapid aquifer depletion (>1m/year), severe conflict between users, and water scarcity for many thousands of people in the Ica Valley. Mining for export markets causes severe pollution, vulnerability to climate shocks and resource conflict (Progressio 2010; OECD 2021; Water Witness 2023, in-press)

KENYA

Kenya sees significant disparities in levels of access to water between local communities and the farms producing flowers and fresh produce for European supermarkets in Naivasha and Ewaso Ng'iro Basins. This has led to extreme water and climate insecurity, inadequate WASH access, cholera and acute hunger. Pollution and over-abstraction threaten globally important wetlands and ecosystems (Water Witness 2023, in-press)

MADAGASCAR

Madagascar is the largest exporter of manufactured clothing to the EU and USA from sub-Saharan Africa. It faces WASH under-provision, poverty and extreme climate vulnerability exacerbated by water conflict, competition and pollution by export apparel and mining sectors upon which the economy and jobs increasingly depend. (Water Witness, 2022).

MALAWI

Malawi's key export sectors of sugar, tea, and tobacco share high levels of water insecurity with local communities, and the sugar sector in particular is implicated in water conflict and has been shown to exacerbate water-related disasters and flood impacts for communities. (Water Witness/MoWS, 2022)

Implications of the findings

The updated analysis of the water footprint of nations and their interdependencies has major implications for global water, food and climate security, realisation of the human right to water and sanitation, and delivery of the Sustainable Development Goals. Despite limitations within the methodology and data, the updated assessment provides a stark picture of the nature and scale of the appropriation of water to serve often distant societies and economies. It shows how:

- **High-income economies across the Global North and the well-being of their citizens are heavily dependent on water use in other countries to meet their needs for food, clothing and other goods.** Most European nations, and Japan depend on external water use to meet typically 40% to 80%, and as much as 94% (Netherlands) of consumption needs.
- **These external water footprints can be traced to countries in the Global South where significant volumes of water are used to produce crops, raw materials and goods for export.** Many of these 'producer' nations and their citizens face extreme water insecurity as result of economic and physical water scarcity, stubborn governance, infrastructure, and investment challenges, exacerbated by increasingly severe and frequent climate extremes and the climate emergency.
- **Large volumes of water use within these external water footprints, ranging from 24% (Austria) to 61% (Japan) are assessed to be unsustainable, and most of this is found to land where there is severe water scarcity.** Assessment using water footprint methodology applies a presumptive environmental flow requirement and finds that the 'blue' water use to meet the needs of 'consumer' nations often exceeds this, potentially pushing catchments and aquifers of production into degradation, depletion, drought, conflict, and vulnerability. Whilst high-level assessments using blue water scarcity as a proxy should be considered as approximations rather than unequivocal judgements, they are valuable in flagging risks and the need for further scrutiny.[16]
- **For producer nations in the Global South, these findings should cause alarm, since they suggest that water use in priority sectors for growth, job creation and export revenue are also driving water insecurity, ecosystem collapse and vulnerability to climate change, undermining the health and wellbeing of citizens and future economic prospects**. They signal the urgent need to redouble efforts to implement Integrated Water Resource Management (IWRM) and to allocate water in equitable and sustainable ways to meet the needs of the economy, people and the environment. They also underscore the need for new approaches to policy, practice and financing to ensure that the beneficiaries of water use in their countries contribute more meaningfully to improved water management and the shared water security upon which they also depend.
- **For consumer nations in the Global North, these findings should also cause great alarm, since they reveal that strategically important supply chains are highly precarious, and that the wellbeing and food security of their citizens are both dependent on, and actively undermining water security around the world**. Facilitating shared water security in the places where these water footprints land is in the self-interest of consumer nations to protect supply chains from disruption, spiralling costs and questions about their legitimacy. There is also an ethical obligation, and an opportunity, for new forms of collaboration to strengthen policy, law, and practice on water so that trade between nations doesn't come at the cost of water crises and injustice.

[16] Conclusive assessment of sustainability will always require locally verified, ground-truthed data which considers the context and temporal nature of impacts. For example, it is possible for water use in places of scarcity to be sustainable where abstraction is managed in line with the hydrological yield and downstream flow requirements, or seasonal water storage. Equally, water footprints in places of water plenty can be unsustainable through multiple impact pathways: over-abstraction, uncontrolled or diffuse pollution, or impacts on ecosystems.

Priorities for the Water Action Agenda

In light of these findings, 5 priorities for urgent action emerge:

1. **Businesses, retailers, and investors associated with supply chains and footprints characterised as unsustainable or at risk must now proactively demonstrate responsible water use and engage in collective action for shared water security.** Multiple safeguarding tools, standards, and disclosure frameworks are available to guide and reward accountable water stewardship, though their effective use remains limited to only a handful of leading enterprises. Accountability for a fair water footprint and transparent evidence that supply chains 'do no harm' - through zero pollution, sustainable withdrawal, universal access to WASH, protection of nature and climate resilience - must become the business norm for all those operating in contexts of water insecurity.

2. **Investigation, research, and monitoring is required to ensure that water injustice and unsustainable use within our water footprints is pinpointed and acted upon**. The analysis supports the prioritisation of accountability monitoring by civil society, researchers, media and affected communities. Adequate resources and technical support for this work must be provided via a 'SDG6 Accountability Facility'. A global 'Fair Water Footprint Observatory' to track water footprint dependencies and impacts, share lessons, and sharpen methodologies and data is also urgently needed, and will help communicate and trigger behavioural change by *all* stakeholders, including consumers. Better evidence of how consumption exacerbates or alleviates vulnerability will help to formulate and track effective responses.

3. **Establish and maintain intergovernmental collaboration between consumer and producer nations, and technical assistance for shared water security which prioritises those most vulnerable.** Widespread and ongoing cuts to aid for water security must be reversed and a range of context-based approaches deployed to ensure that water use in export sectors is based on sustainable, equitable and resilient use. As well as support for the 'nuts and bolts' of water resource management emphasis must be placed on strengthening incentives for responsible stewardship, such as mandatory due diligence and disclosure by business and financiers, and enforceable conditions in trade agreements and export/import licencing. Ensuring that water is properly valued, priced, and paid for by producers and consumers will be vital and the Global Commission on the Economics of Water's (GCEW) 2023 findings will be valuable in this regard.

4. **Impacts of unsustainable water footprints and their role in exacerbating vulnerability or building resilience to climate change are of global significance and require a significant global response.** The Glasgow Declaration for Fair Water Footprints launched at COP26 by 28 founding Signatories from producer and consumer nations is a decisive step towards addressing the market and governance failures which drive unsustainable water use in global supply chains. Opportunities for innovative collective action and systemic change are already emerging. Rapid recruitment of new partners to this leadership effort, nurturing collaboration between affected and influential stakeholders, and tenacious leadership to navigate competing interests will be essential to realising these.

5. **Ultimately, these findings illustrate the need for a new transnational water governance regime, empowered to set ground rules, mitigate risks, and arbitrate fair use of the water upon which we all depend.** They raise urgent questions regarding global equity and sustainability. For example, citizens in the Netherlands consume over 6000 litres of water per day, whilst citizens in countries they source this water from struggle to access even 60 litres per day. Such glaring disparities and their implications for social and economic progress, displacement, and stability demand immediate political attention. The Fair Water Footprint Signatories have signalled the need for a new UN Convention on Sustainable Water Use in the Global Economy to backstop political prioritisation, accountability, and systemic change, such as modified trade agreements. This is likely to be a pivotal step towards a fairer and more secure water future for all.

Helpful definitions:

Global North and Global South: The concepts of Global North and Global South are used to describe groupings of countries along the lines of socio-economic and political characteristics. The Global South is a term generally used to identify countries in the regions of Latin America, Africa, Asia and Oceania. Most of humanity resides in the Global South, characterised by low-middle income economies. The 'Global North' has been used to describe groupings of high-income economies in the northern hemisphere (sometimes including Australia and New Zealand).

For the purposes of this analysis the '**Global North'** is used to describe the economies analysed which are: the European Union, United Kingdom, Austria, Switzerland, the Netherlands, Germany, France, Italy, Finland, Sweden, Denmark, Japan, the USA, and Canada.

'Global South' countries selected for analysis are: Africa (Cote d'Ivoire, Democratic Republic of Congo, Egypt, Ethiopia, Gabon, Kenya, Lesotho, Morocco, Tanzania, Mauritius, Madagascar, Malawi, South Africa, Zimbabwe, and Zambia), Latin America (Argentina, Bolivia, Brazil, Chile, Guatemala, Columbia, Mexico, Peru, Costa Rica, and Panama), and South-East Asia (Bangladesh, Cambodia, China, Laos, Myanmar, Thailand, Vietnam, Indonesia, Pakistan, and the Philippines).

The scope of analysis has been based on the degree to which the selected nations shape or are affected by virtual water flows, current and potential status as Fair Water Footprint partners, and expedient use of resources available to the study. The scope of analysis will be expanded in future iterations of this work.

Front image: Expansion of the agrarian frontier into the deserts of Ica to grow export crops (blueberries) for European, US and Chinese consumers. Water Witness 2022.

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