A water stress perspective on the UK's water footprint

Grant Allan*† Rhona Lochhead* Scott McGrane*‡

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Abstract

The global water requirements of economic activities have been studied through the concept of the water footprint, which can be captured in multinational Input-Output (IO) frameworks. While useful for looking at aggregate requirements, this paper links the UK's blue and green water footprint with a country-level water stress index. We show that more than half of the UK's blue water footprint was in areas of high water stress, while its green water footprint is more concentrated in areas of lower water stress. These findings show how water stress can be incorporated alongside measures of water footprint. This can be critical in evaluating the success of policies aimed to improve national and international water security and reduce water stress.

Keywords: Water Footprint; Water Stress; Multi-Regional Input-Output Analysis.

JEL Codes: Q56; Q25; C67.

*Fraser of Allander Institute and Department of Economics, University of Strathclyde.
†Corresponding author: Strathclyde Business School, 199 Cathedral Street, Glasgow, Scotland, G4 0QU. Email: grant.j.allan@strath.ac.uk.
‡Stanford Photonics Research Center, Stanford University, 438 Via Pueblo Mall, CA, 94305.

1 Introduction

Water scarcity is a major global concern, with over 50% of the world's population currently facing "extremely high" or "high" levels of water stress (World Resources Institute, 2019)[1]. This is being exacerbated by increasing demand for key goods and services (e.g., water, food and energy), a growing global population, and the challenges posed to water accessibility from the impacts of the ongoing climate emergency (Heal et al., 2020). Traditionally industrial water demand in a country was measured by summing the water withdrawals for all sectors of the economy (A. Hoekstra & Chapagain, 2006), however this fails to account for the international pattern of production, trade and consumption, with the introduction of the concept of virtual water (Allan, 1998) representing water embodied in a nations imports[2].

A water footprint (WF) is the volume of water embedded in the production of goods and services consumed by the population and economic sectors of a particular region (A. Hoekstra & Hung, 2002). Bottom-up methods to calculate WFs rely on detailed descriptions of production life-cycles (e.g. Ercin, Mekonnen, and Hoekstra (2013)), while recent top-down studies have used multinational or Multi Regional Input Output (MRIO) accounts to examine the water requirements of consumption for a country or region, making use of newly developed and internationally consistent economic and environmental accounts[3] (for example, Haddad, Mengoub, and Vale (2020); Lenzen, Moran, Bhaduri, et al. (2013); White, Feng, Sun, and Hubacek (2015); C. Zhang and Anadon (2014)).

Analysing water scarcity using footprint measures has been an area of critical inquiry in light of a growing population and the impacts of climate change on freshwater systems. In the Lifecycle Analysis (LCA) literature, a blue water scarcity index has been proposed which ranges between 0 and 1 for each country (Pfister, Koehler, & Hellweg, 2009; Ridoutt &

[1] These are, respectively, where more than 80% of the available water supply is withdrawn by agriculture, industry and municipalities or where over 40% of the available water supply is withdrawn (World Resources Institute, 2019).

[2] For a recent review of virtual water research, see Sun et al. (2021).

[3] At a global scale albeit with different regional and sectoral disaggregation, this includes the databases from WIOD, EXIOBASE and EORA, amongst others.

Pfister, 2010) and can be used to weight water consumption by country to derive a scarcity-weighted volumetric measure. Using MRIO techniques, Lenzen, Moran, Bhaduri, et al. (2013) weight water (volume) in a country's footprint by a water exploitation index and examine "key flows" of scarce water resources embodied in global trade. This has been criticised by A. Y. Hoekstra (2016) as inconsistent, including its adjustment of the original volumetric basis of the WF and ignoring water stress on green water. We contribute to this discussion by proposed the calculation of a an appropriately weighted water stress index, which can be placed alongside the volumetric measure of a country's global water footprint.

There are a number of studies examining national and regional WFs for the UK. A. Y. Hoekstra and Mekonnen (2016) find the UK suffers from "imported water risk", with half of its global blue[4] water footprint (BWF) originating in countries where the BWF is greater than the maximum sustainable BWF. Hess, Andersson, Mena, and Williams (2015) examine the blue water scarcity footprint of the UK's food consumption, while Hess, Lennard, and Daccache (2015) and Hess, Chatterton, Daccache, and Williams (2016) examine water scarcity across UK regions in potato production and carbohydrate consumption respectively. Using MRIO approaches, Yu, Hubacek, Feng, and Guan (2010) find considerable heterogeneity in the domestic and global water requirements for UK and regional demand, a point also confirmed by Feng et al. (2011). More recently, and broadening the analysis of footprints beyond water, Owen, Scott, and Barrett (2018) calculate energy, emissions and water footprints for the UK. They show that the MRIO approach can be useful in revealing those policies where the UK's (global) resource inputs can be reduced while preserving the economic benefits to its trading partners.

We illustrate our weighted water stress index using a MRIO approach and illustrate this for the case of the UK and in doing so undertake the the first top-down analysis for the UK's global blue and green water footprint and country-specific measures of water stress.

[4]Blue water refers to water "water that has been sourced from surface or groundwater resources and is either evaporated, incorporated into a product or taken from one body of water and returned to another, or returned at a different time" while green water refers to "water from precipitation that is stored in the root zone of the soil and evaporated, transpired or incorporated by plants" (Water Footprint Network, 2011).

In doing so, we can compare a country's own (self) water stress index measure and the (weighted) water stress index of its global blue and green water footprint. Unlike Lenzen, Moran, Bhaduri, et al. (2013), we do not weight volumetric measures for each countries contribution to the UK's footprint, but apply weights from each countries share in the UK's global water footprint to a water stress measure to construct a Water Footprint Stress Index which can sit in parallel to the size of a country's water footprint.

2 Materials and methods

2.1 Material

We use the EORA26 global MRIO database (Lenzen, Kanemoto, Moran, & Geschke, 2012; Lenzen, Moran, Kanemoto, & Geschke, 2013) which contains details database on production, consumption and trade for each of 26 sectors[5] and identifies six final demand categories[6] across 189 countries. Its environmental accounts include information on blue and green water use associated with production and in the direct consumption by final demand categories. Data on water use by sector and country in the same year is provided by the Water Footprint Network (see Lenzen, Moran, Bhaduri, et al. (2013) for details of the source of the water data.)[7]. At time of writing, the latest data relate to 2015.

We measure country-specific water stress by "baseline water stress" measure reported in World Resources Institute (2019). Figure 1 shows the baseline water stress score for all of the 140 countries included in this metric; ranging from 0 – "low water stress" – to 5 – "extremely water stressed"[8]. As in Lenzen, Moran, Bhaduri, et al. (2013), we assume that the water

[5]This was presented in basic prices which is recommended for use in environmentally-extended IO analysis. The 26 sectors are given in Appendix 1.

[6]Specifically, "households", "non-profit institutions", "government", "investment", "inventories" and "acquisitions".

[7]Blue, green and grey water use is provided by the EORA environmental accounts, however we exclude grey water from the analysis.

[8]While the huge range of countries in the EORA database exceeded the number of countries for whom Aqueduct had provided water stress index, this was not a major issue for the UK's blue and green water footprints. With the identification of the UK's water footprint from the EORA database, and then its

stress score for blue and green water in each country is correlated, so that the country water stress is equal for blue and green water. While there is therefore a difference in the initial base years for our data, to our knowledge no time series of national water stress indexes is available or any more recent publicly available water stress index[9].

2.2 Methods

To calculate the UK's blue and green WF we employ MRIO expanded to environmental IO analysis linking water use data at the national/sectoral level. A single-region IO framework given by $x = Lf$, where x is sectoral output, f is final demand and L is the Leontief inverse, is extended by the use of environmental-use coefficients by sector, Ω, so that a vector of environmental impact can be related to final demand via, $M = \hat{\Omega} L f$.[10]

In an illustrative two-country example for water use, for example, the environmental impact in each country is associated with production locally, and the destination of products either as sales to local sectors (as intermediate inputs to production) or local final demand or exported (to either intermediate or final consumption in the other country). In a two-country case therefore:

$$\begin{pmatrix} M_{11} & M_{12} \\ M_{21} & M_{22} \end{pmatrix} = \begin{pmatrix} \hat{\Omega}_1 & 0 \\ 0 & \hat{\Omega}_2 \end{pmatrix} \begin{pmatrix} I - A_{11} & -A_{12} \\ -A_{21} & I - A_{22} \end{pmatrix}^{-1} \begin{pmatrix} f_{11} & f_{12} \\ f_{21} & f_{22} \end{pmatrix} \tag{1}$$

where subscripts denote the producing and consuming country respectively, and I is an Identity matrix. The f matrices represent the final demand for the products of each country,

allocation to countries, we were able to allocate 99.96% of the UK's blue water footprint and 99.80% of the UK's green water footprint in 2015 to a country with a baseline water stress measure. Our measure of water stress compares to those in other studies. For instance, S. Zhang et al. (2019) adopt a water stress indicator from Zhao et al. (2015) which calculates water stress at the province level in China. Our water stress index provides considerable international coverage which aligns well with the country level coverage of the EORA.

[9] For instance, the World Bank measure of "level of water stress" relates to 2014 for most countries and 2015 for some (World Bank, 2021).

[10] As we do our analysis for blue and green water, we use vectors for blue water use per unit of output and green water use per unit of output respectively. $\hat{\Omega}$ denotes a diagonalised matrix with sectoral water-output coefficients on the diagonals and zeros elsewhere.

so that f_{11} is Country 1's demand for the output of Country 1, whereas f_{12} is the final demand from Country 2 for Country 1's output.

Matrices A_{12} and A_{21} reveal the extent of non-local use of products in intermediate consumption (i.e. imports and exports between regions of goods used in production) while matrices f_{12} and f_{21} refer to direct imports by (or exports to) non-local final demand. The matrices of M_{ab} show the water use in country a which is related to final demand in each country b. From these, we can identify the water footprint of Country 1 (M_1) as the sum of $M_{11} + M_{21}$, while the water footprint of Country 2, (M_2), is $M_{12} + M_{22}$.[11]

We calculate a Water Footprint Stress Index for the UK's blue and green water footprint as follows:

$$WSFI_{UK} = \sum_{b=1}^{T} BWS_b \delta_b \tag{2}$$

BWS_b is the "baseline water stress" measure for country b (obtained from World Resources Institute (2019)) and δ_b is country b's contribution to the UK's total blue or green global water footprint (e.g. M_{bUK}/M_{UK}). In addition by identifying the UK's final demand by industry we can calculate 26 separate blue and green water footprints and the respective blue and green water WFSI for each consumption good[12]. This helps to identify which specific product consumed by UK final demand – irrespective of its place of production – is associated with the greatest water stress.[13].

[11]Note that this necessarily means that the water embodied in the production of goods and services consumed outside of the UK is attributed to the consuming country and is not included in the UK's water footprint.

[12]The blue and green water footprints are simply the summation of these 26 separate calculations.

[13]Note that we are not seeking to explain a countries water stress levels - which will reflect a host of resource endowment, geographical, climate and infrastructural issues - by looking at the external demands for goods and services produced (using water resources) in that country, but to identify the location of water stress and the extent to which water stress areas provide inputs to the consumption of goods and services in different countries through the footprint calculation.

3 Results

Table 1 shows that the total blue water footprint of the UK is 8,880 Mm3/yr, and that household consumption comprises the largest category, with 7,353 Mm3/yr, comprised of water embodied in goods and services consumed and also directly, i.e. in washing and cooking. There is a similar pattern across final demand categories for the UK's green water footprint (which totals 86,751), with 84.2% of the UK's footprint attributable to household consumption (slightly higher than 82.8% of the UK's blue water footprint).

Figure 2 shows the cumulative contribution – by country – to the UK's blue and green water footprint by the baseline water stress measure. Several things can be noted. First, we see that almost 60% of the green water footprint is in countries with a water stress index value of lower than 1.4. This is partly due to the UK's green internal (i.e. own) water footprint comprising 21% of its total green water footprint, and the UK's water stress index of 1.397. Second, for the UK's blue water footprint, the UK's internal footprint is only 9% of the total. The large increase in the UK's cumulative blue water footprint above a water stress index of 4.0, largely comprises water use in Pakistan and India (with baseline water stress scores of 4.052 and 4.116) which respectively make up 10.3% and 18.9% of the UK's global blue water footprint. One can thus see how the UK's blue water footprint is particularly dependent on these specific countries.

We calculate the WFSIs of the UK's green and blue water footprint as 1.735 and 2.835 respectively. Interestingly, both indexes are above the UK's own index value of 1.397, and quantifies the extent to which the UK is susceptible to "imported water risk". We therefore find a similar qualitative outcome to the earlier work of A. Y. Hoekstra and Mekonnen (2016).

Figure 3 shows the contribution to the UK's global blue and green water footprint in 2015 from the production of output by sector, as well as the WFSI (blue and green) for that consumption. We can see that consumption of all products has a higher blue water stress index than green water, and also there is considerably heterogeneity across outputs by industry. The UK's demand for the outputs of Sector 5 ("Textiles and wearing apparel") has the highest water stress indexes (both blue and green) at 3.5 and 2.7 respectively, while Sector 2 ("Fishing") has the lowest water stress index.

Additionally, we do not find any relationship between the scale of the UK's water footprint by producing industry and the value of the water stress index. For instance, Sector 12 ("Recycling") has a low contribution to the UK's water footprint, but the second highest blue and green Water Footprint Stress Index, while Sector 1 ("Agriculture") has the third lowest Water Footprint Stress Indexes but is the second largest contributor to the UK's global water footprint.

4 Discussion

We have calculated the latest UK's blue and green water footprint using the EORA MRIO database, and calculated the Water Footprint Stress Index associated with UK consumption irrespective of country of production. While the UK is a relatively water abundant country, we find that both its blue and green WFSI are significantly higher than the same index for the UK. This points to both the UK's dependence for its consumption on water extraction beyond its borders, including in countries which exhibit higher water stress the water abundant UK.

Two points can be made. First, our approach highlights how economic measures of consumption can be linked to environmental consequences, including water use. Changes to rainfall patterns and droughts have become more regular with changes in climate. Critically, changes in climate and rainfall will also have consequences for production and trade, so a simple volumetric measure of global water footprint would not show the extent to which countries external water demands in water scarce regions.[14]

Second, in devising policies to reduce the environmental impacts of economic activity, the water footprint metric recognises the interconnected and international nature of economic

[14] Our argument here is similar to that of Vanham and Mekonnen (2021) against a scarcity-weighted water footprint.

activity, including trade and consumption. Evidence suggests however that policies might not only reduce a country's global footprint, but also have a large effect on demand for environmental resources outside of their own borders (e.g. Moran et al. (2020)). These metrics can help to evaluate the impact that national policies to reducing water consumption could have on economic activities and environmental impacts beyond a country's borders. MRIO techniques can usefully shed light on issues relating to global interconnectedness, such as water use and other environmental impacts at sectoral, national and international levels.

Third, we show how - for a limited degree of sectoral detail - there are large differences in the global water requirements for consumption of different goods and services in a water-abundant country. Reproducing this method with a more highly disaggregated level would allow a more detailed analysis of the water embodied in specific products/commodities and the consumption and production links between countries.

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Declaration of interests

The authors have no interests to declare.

References

Allan, J. A. (1998). Virtual water: a strategic resource. *Ground water*, *36*(4), 545–547.

Ercin, A. E., Mekonnen, M. M., & Hoekstra, A. Y. (2013). Sustainability of national consumption from a water resources perspective: The case study for france. *Ecological Economics*, *88*, 133-147. Retrieved from https://www.sciencedirect.com/science/article/pii/S0921800913000359 (Transaction Costs and Environmental Policy) doi: https://doi.org/10.1016/j.ecolecon.2013.01.015

Feng, K., Hubacek, K., Minx, J., Siu, Y. L., Chapagain, A., Yu, Y., ... Barrett, J. (2011). Spatially explicit analysis of water footprints in the uk. *Water*, *3*(1), 47–63. Retrieved from https://www.mdpi.com/2073-4441/3/1/47 doi: 10.3390/w3010047

Haddad, E. A., Mengoub, F. E., & Vale, V. A. (2020). Water content in trade: a regional analysis for morocco. *Economic Systems Research*, *32*(4), 565-584. Retrieved from https://doi.org/10.1080/09535314.2020.1756228 doi: 10.1080/09535314.2020.1756228

Heal, K. V., Bartosova, A., Hipsey, M. R., Chen, X., Buytaert, W., Li, H.-Y., ... Cudennec, C. (2020). Water quality: the missing dimension of water in the water–energy–food nexus. *Hydrological Sciences Journal*, *0*(ja), null. Retrieved from https://doi.org/10.1080/02626667.2020.1859114 doi: 10.1080/02626667.2020.1859114

Hess, T., Andersson, U., Mena, C., & Williams, A. (2015). The impact of healthier dietary scenarios on the global blue water scarcity footprint of food consumption in the uk. *Food Policy*, *50*, 1-10. Retrieved from https://www.sciencedirect.com/science/article/pii/S0306919214001559 doi: https://doi.org/10.1016/j.foodpol.2014.10.013

Hess, T., Chatterton, J., Daccache, A., & Williams, A. (2016). The impact of changing food choices on the blue water scarcity footprint and greenhouse gas emissions of the british diet: the example of potato, pasta and rice. *Journal of Cleaner Production*, *112*, 4558-4568. Retrieved from https://www.sciencedirect.com/science/article/

pii/S0959652615011993 doi: https://doi.org/10.1016/j.jclepro.2015.08.098

Hess, T., Lennard, A., & Daccache, A. (2015). Comparing local and global water scarcity information in determining the water scarcity footprint of potato cultivation in great britain. *Journal of Cleaner Production*, *87*, 666-674. Retrieved from https://www.sciencedirect.com/science/article/pii/S0959652614011184 doi: https://doi.org/10.1016/j.jclepro.2014.10.075

Hoekstra, A., & Chapagain, A. (2006). Water footprints of nations: water use by people as a function of their consumption pattern. In *Integrated assessment of water resources and global change* (pp. 35–48). Springer.

Hoekstra, A., & Hung, P. (2002). Virtual water trade: a quantification of virtual water flows between nations in relation to international crop trade. *Value of water research report series (*(11).

Hoekstra, A. Y. (2016). A critique on the water-scarcity weighted water footprint in lca. *Ecological Indicators*, *66*, 564-573. Retrieved from https://www.sciencedirect.com/science/article/pii/S1470160X16300474 doi: https://doi.org/10.1016/j.ecolind.2016.02.026

Hoekstra, A. Y., & Mekonnen, M. M. (2016). Imported water risk: the case of the UK. *Environmental Research Letters*, *11*(5), 055002. Retrieved from https://doi.org/10.1088/1748-9326/11/5/055002 doi: 10.1088/1748-9326/11/5/055002

Lenzen, M., Kanemoto, K., Moran, D., & Geschke, A. (2012). Mapping the structure of the world economy. *Environmental Science & Technology*, *46*(15), 8374-8381. Retrieved from https://doi.org/10.1021/es300171x (PMID: 22794089) doi: 10.1021/es300171x

Lenzen, M., Moran, D., Bhaduri, A., Kanemoto, K., Bekchanov, M., Geschke, A., & Foran, B. (2013). International trade of scarce water. *Ecological Economics*, *94*, 78-85. Retrieved from https://www.sciencedirect.com/science/article/pii/S0921800913002176 doi: https://doi.org/10.1016/j.ecolecon.2013.06.018

Lenzen, M., Moran, D., Kanemoto, K., & Geschke, A. (2013). Building eora: A global multi-region input–output database at high country and sector resolution. *Economic Systems Research*, *25*(1), 20-49. Retrieved from https://doi.org/10.1080/09535314.2013.769938 doi: 10.1080/09535314.2013.769938

Moran, D., Wood, R., Hertwich, E., Mattson, K., Rodriguez, J. F. D., Schanes, K., & Barrett, J. (2020). Quantifying the potential for consumer-oriented policy to reduce european and foreign carbon emissions. *Climate Policy*, *20*(sup1), S28-S38. Retrieved from https://doi.org/10.1080/14693062.2018.1551186 doi: 10.1080/14693062.2018.1551186

Owen, A., Scott, K., & Barrett, J. (2018). Identifying critical supply chains and final products: An input-output approach to exploring the energy-water-food nexus. *Applied Energy*, *210*, 632-642. Retrieved from https://www.sciencedirect.com/science/article/pii/S0306261917313466 doi: https://doi.org/10.1016/j.apenergy.2017.09.069

Pfister, S., Koehler, A., & Hellweg, S. (2009). Assessing the environmental impacts of freshwater consumption in lca. *Environmental Science & Technology*, *43*(11), 4098-4104. Retrieved from https://doi.org/10.1021/es802423e (PMID: 19569336) doi: 10.1021/es802423e

Ridoutt, B. G., & Pfister, S. (2010). A revised approach to water footprinting to make transparent the impacts of consumption and production on global freshwater scarcity. *Global Environmental Change*, *20*(1), 113–120.

Sun, J., Yin, Y., Sun, S., Wang, Y., Yu, X., & Yan, K. (2021). Review on research status of virtual water: The perspective of accounting methods, impact assessment and limitations. *Agricultural Water Management*, *243*, 106407. Retrieved from https://www.sciencedirect.com/science/article/pii/S0378377420301293 doi: https://doi.org/10.1016/j.agwat.2020.106407

Vanham, D., & Mekonnen, M. M. (2021). The scarcity-weighted water footprint provides unreliable water sustainability scoring. *Science of The Total Environment*, *756*, 143992. Retrieved from https://www.sciencedirect.com/science/article/pii/S0048969720375239 doi: https://doi.org/10.1016/j.scitotenv.2020.143992

Water Footprint Network. (2011). *What is a water footprint?* Retrieved 2021-09-03, from https://waterfootprint.org/en/water-footprint/what-is-water-footprint/

White, D. J., Feng, K., Sun, L., & Hubacek, K. (2015). A hydro-economic mrio analysis of the haihe river basin's water footprint and water stress. *Ecological Modelling*, *318*, 157-167. Retrieved from https://www.sciencedirect.com/science/article/pii/S0304380015000368 (Ecological management for human-dominated urban and regional ecosystems) doi: https://doi.org/10.1016/j.ecolmodel.2015.01.017

World Bank. (2021). *Level of water stress.* Retrieved 2021-09-03, from https://data.worldbank.org/indicator/ER.H2O.FWIN.ZS

World Resources Institute. (2019). *Aqueduct 3.0 Country Rankings.* Retrieved 2021-09-03, from https://www.wri.org/resources/data-sets/aqueduct-30-country-rankings

Yu, Y., Hubacek, K., Feng, K., & Guan, D. (2010). Assessing regional and global water footprints for the uk. *Ecological Economics*, *69*(5), 1140-1147. Retrieved from https://www.sciencedirect.com/science/article/pii/S0921800909005096 doi: https://doi.org/10.1016/j.ecolecon.2009.12.008

Zhang, C., & Anadon, L. D. (2014). A multi-regional input–output analysis of domestic virtual water trade and provincial water footprint in china. *Ecological Economics*, *100*, 159-172. Retrieved from https://www.sciencedirect.com/science/article/pii/S0921800914000421 doi: https://doi.org/10.1016/j.ecolecon.2014.02.006

Zhang, S., Taiebat, M., Liu, Y., Qu, S., Liang, S., & Xu, M. (2019). Regional water footprints and interregional virtual water transfers in china. *Journal of Cleaner Production*, *228*, 1401-1412. Retrieved from https://www.sciencedirect.com/science/article/pii/S0959652619313897 doi: https://doi.org/10.1016/j.jclepro.2019.04.298

Zhao, X., Liu, J., Liu, Q., Tillotson, M. R., Guan, D., & Hubacek, K. (2015). Physical and virtual water transfers for regional water stress alleviation in china. *Proceedings of the National Academy of Sciences*, *112*(4), 1031–1035. Retrieved from https://www.pnas.org/content/112/4/1031 doi: 10.1073/pnas.1404130112

Tables

Table 1: UK water footprint, blue and green, by final demand driver, in 2015, M m^3

	Global blue water use from UK consumption	Domestic blue water use from direct final demand	**Total blue water**	**Global green water use from UK consumption**	**Total blue and green water footprint**
Households	7,146	207	**7,353**	**73,113**	**80,466**
Non-Profits	63	0	**64**	**573**	**637**
Government	562	0	**562**	**4,927**	**5,489**
Investment	878	0	**878**	**7,974**	**8,852**
Inventories	7	0	**8**	**65**	**73**
Acquisitions	14	0	**15**	**98**	**113**
Total	**8,671**	**209**	**8,880**	**86,751**	**95,631**

Source: Authors' calculations.

Figures

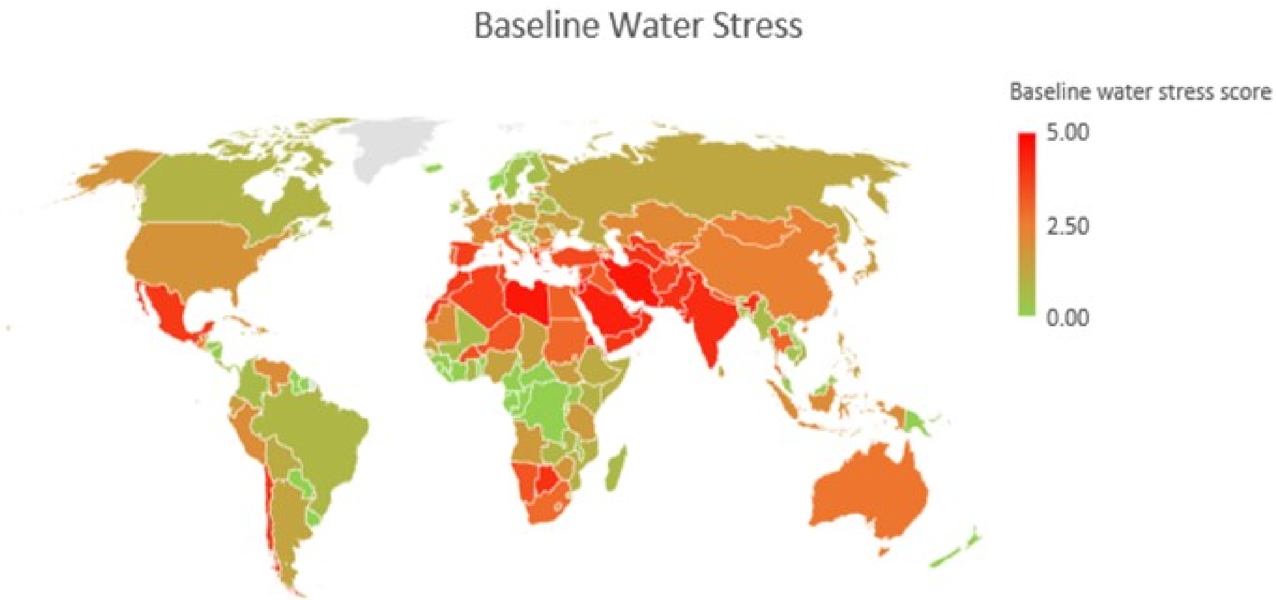

Figure 1: Baseline water stress score by country
Source: WRI Aqueduct, accessed on 1st August 2020.

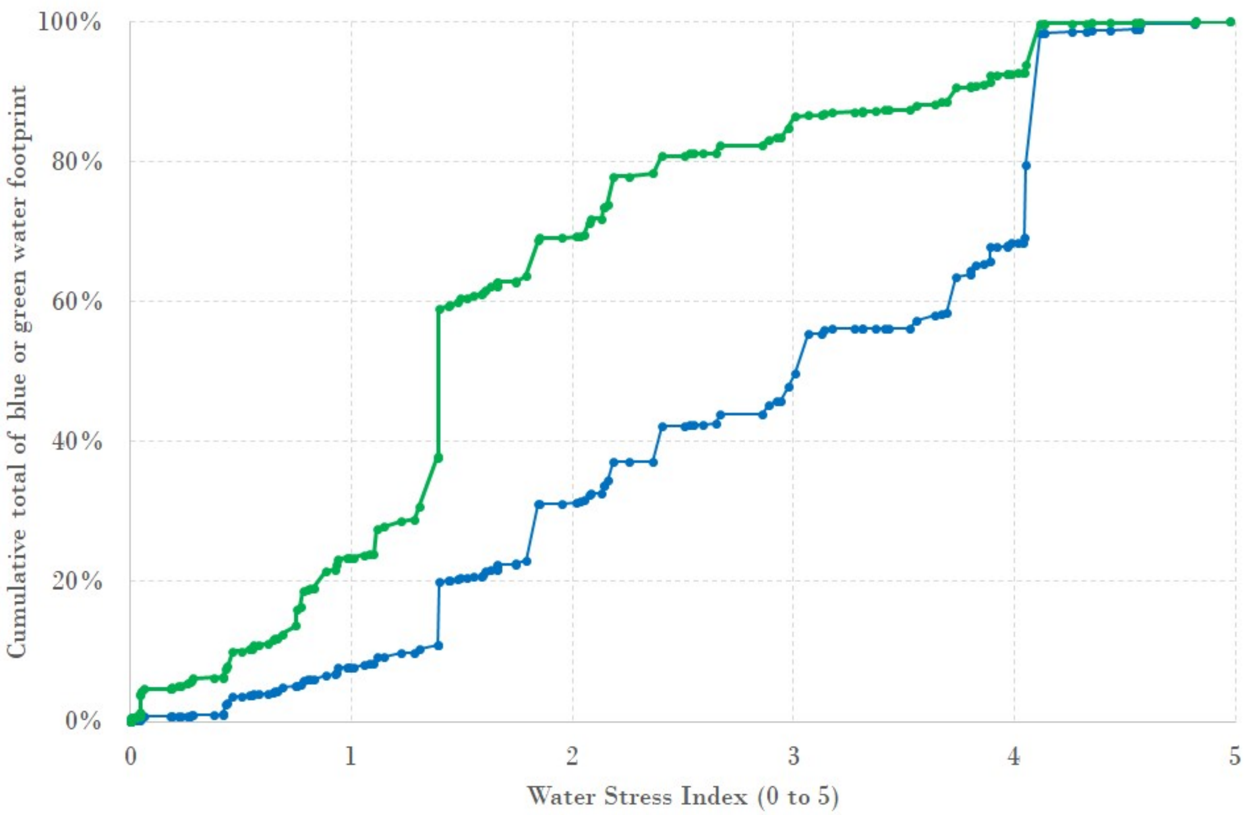

Figure 2: Cumulative UK blue and green water footprints by water stress index, 2015
Source: Authors' calculations.

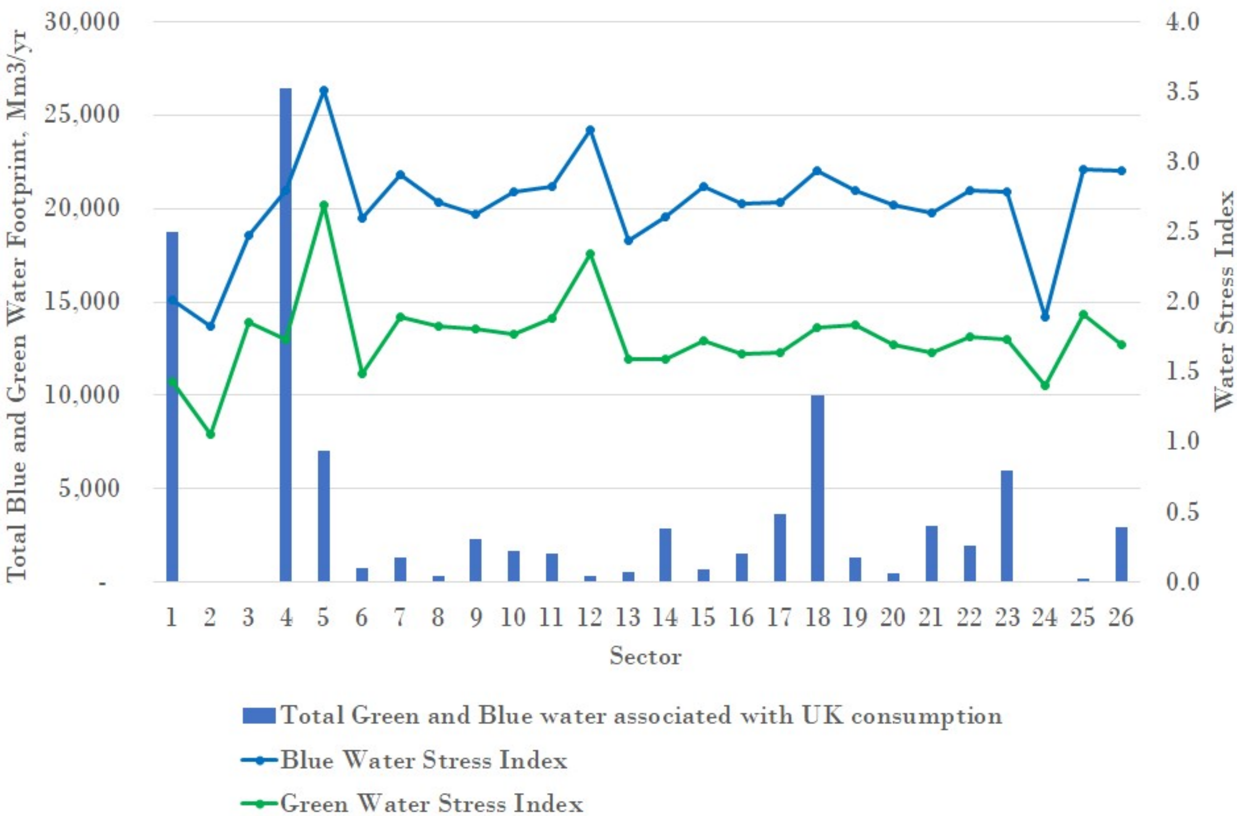

Figure 3: UK's global total water footprint and blue and green water stress indexes by sector of consumption, 2015

Source: Authors' calculations.

Figure captions

Figure 1: Baseline water stress score by country.

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Appendix 1

A.1: Sectoral aggregation in EORA26

Sector number	**Name**
1	Agriculture
2	Fishing
3	Mining and Quarrying
4	Food & Beverages
5	Textiles and Wearing Apparel
6	Wood and Paper
7	Petroleum, Chemical and Non-Metallic Mineral Products
8	Metal Products
9	Electrical and Machinery
10	Transport Equipment
11	Other Manufacturing
12	Recycling
13	Electricity, Gas and Water
14	Construction
15	Maintenance and Repair
16	Wholesale Trade
17	Retail Trade
18	Hotels and Restaurants
19	Transport
20	Post and Telecommunications
21	Financial Intermediation and Business Activities
22	Public Administration
23	Education, Health and Other Services
24	Private Households
25	Others
26	Re-export & Re-import

Source: Lenzen, Moran, Kanemoto, and Geschke (2013)