SCARCE WATER USE

December 2021

True pricing method for agri-food products

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Impact-specific module for true price assessment

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[4] For more information on the *PPS True and Fair Price for Sustainable Products*, please refer to https://www.wur.nl/nl/project/Echte-en-eerlijke-prijs-voor-duurzame-producten.htm

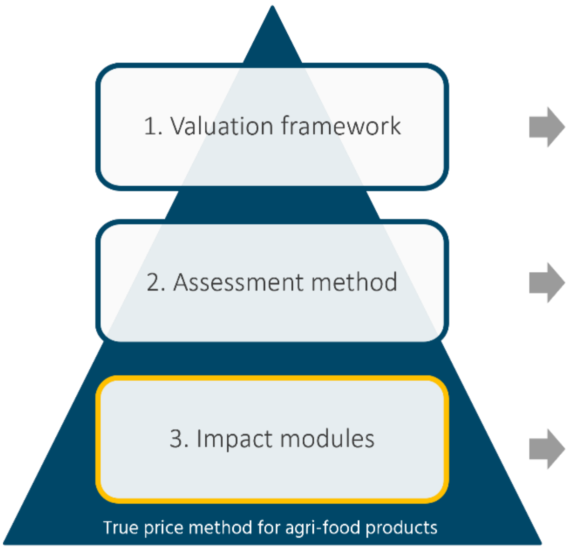
Relation to other components of the true price methodology for agri-food products

This ***Scarce water use - Impact-specific module for true price assessment*** *was developed by True Price and Wageningen Economic Research within the PPS True and Fair Price for Sustainable Products.*

This document contains the key methodological aspects to measure and value one impact of agri-food products and value chains: scarce water use.

This impact-specific module is complemented by five other ***Natural capital modules*** *and seven* ***Social and human capital modules****. The other natural capital modules are: 1) Contribution to climate change; 2) Land use, land use change, biodiversity and ecosystem services; 3) Air, soil and water pollution; 4) Soil degradation; 5) Fossil fuel and other non-renewable material depletion. These impact-specific modules are preceded by the* ***Valuation framework for true pricing of agri-food products****, which contains the theoretical framework, normative foundations and valuation guidelines, and the* ***Assessment Method for True Pricing of Agri-Food products****, which contains modelling guidance and requirements for scoping, data and reporting (Figure 1).*

Together, these documents present a method that can be used for true pricing of agri-food products, and potentially other products as well.



Content	Audience
Theoretical framework, normative foundations, definitions and valuation guidelines based on the True Price principles	Experts & method developers
Steps and requirements for implementation (completeness, accuracy, data, reporting, …)	Experts & practitioners
Definitions, footprint indicators, monetization factors and data guidelines for specific impacts (e.g. climate change, health & safety, water use …)	Experts & practitioners

Figure 1: Components of the true price methodology for agri-food products. This document is one of the impact modules.

Table of Contents

1. Introduction

This document provides a method module for the assessment of the true price of an agricultural or horticultural product, within the public-private partnership ‘Echte en Eerlijke Prijs’. It contains the key methodological aspects to measure and value scarce water use for agri-food products and their value chains.

This module must be used together with the **True Pricing Assessment Method for Agri-food Products** (Galgani et al., forthcoming). As for other impacts in true pricing, the methodology is based on Life Cycle Assessment (LCA).

This module is organised as follows: Section 2 defines the impact Scarce water use. Section 3 discusses the rationale for including this impact in a true price assessment. Section 4 provides guidance for the scoping phase. Section 5 summarises the relevant footprint indicator. Section 6 gives an overview of the modelling approach for the impact, as well as insight into associated data requirements. Section 7 provides the monetisation approach. Lastly, Section 8 provides a first overview of key items for further research and limitations. In addition, two annexes with additional information on the link with rights in international agreements and (normalised) WWF conversion factors are provided at the end of the document.

2. Definitions

Scarce water use is an environmental impact of agri-food products. It is defined as follows:

- **Scarce water use** concerns the use of blue water in such a way that the water is evaporated, incorporated into products, transferred to other watersheds or disposed into the sea, in areas where **blue water** is scarce (Falkenmark & Rockstrom, 2004). Water that is used as such is not available anymore in the watershed of origin for humans nor for ecosystems (Huijbregts et al., 2016). Scarcity of water depends on the watershed of origin and the geographical context (WWF, 2020a).
- **Blue water** refers to fresh surface and groundwater, specifically, the water in freshwater lakes, rivers, and aquifers (Hoekstra et al., 2011). Other components of the water footprint are green and grey water. **Green water** is defined as ‘*the precipitation on land that does not run off or recharge the groundwater but is stored in the soil or temporarily stays on top of the soil or vegetation. Eventually, this part of precipitation evaporates or transpires through plants. Green water can be made productive for crop growth*’ (Hoekstra et al., 2011). **Grey water**, in the context of water footprint, refers to the amount of water that would be required to safely dilute water pollutants which can be associated with the production of a product over its full supply chain (Hoekstra et al., 2011). Green and grey water are not connected to the impact of Scarce water use.

In short, scarce water use represents the impact of water use in the production of products in regions where water is scarce. Scarcity implies an imbalance between ‘supply’ and ‘demand’. Specifically, it underlines a shortage of supply relative to the demand, varying according to local conditions (FAO, 2020). This can mean either scarcity in availability due to physical shortage – physical scarcity, or scarcity in access due to the failure of institutions to ensure a regular supply or due to a lack of adequate infrastructure - economic scarcity (FAO, 2013, p.6; UNESCO, UN-Water, 2020; WWF, 2020a). This method focuses on physical scarcity, a function of the volume of water use or demand relative to the volume of water available in a given area[5].

This impact is in line with the Blue Water Footprint methodology. It is also comparable with the impact category of ‘water use’ or ‘resource depletion – water’ in LCA guidelines (European Commission, 2013; Huijbregts et al., 2016; Frischknecht & Jolliet, 2016). However, compatibility of the method with the AWARE[6] methodology is an important item for further research.

3. Background and rationale for including as part of the true price

Water use is a primary driver of global food security and economic welfare. Water is at the core of the global economy. It is essential not only for agriculture, but also for all businesses and households: to drink, cool, clean or use as an ingredient (WWF, 2020a).

When water is scarce – that is, when there is not enough water to meet all demands or when there is a lack of human capacity to satisfy that demand (FAO, 2013) – excessive water use also has negative impacts on the environment, the economy, food security and human health. Impacts on the environment are mainly the consequence of disappearing wetlands and damaged ecosystems (WWF, 2020a). Mining and agricultural sectors, in turn, are heavily dependent on water and are directly (economically) affected when water is unavailable (Berrittella et al., 2007; Aitken, et al., 2016). This affects both the economy as a whole and food security specifically (Hanjra & Qureshi, 2010). Last, scarce water use affects human health through infectious diseases caused by (domestic) water scarcity (Motoshita et al., 2011). In short, scarce water use can put access to water at risk and may result in environmental and social damages.

Water use is commonly included among environmental sustainability indicators for products in Life Cycle Assessment (European Commission, 2013; Huijbregts et al., 2016). Here we focus on the depletion of scarce water. The inclusion of consideration of local scarcity in the assessment of this impact is in line with the water use method of the UNEP SETAC Life Cycle Initiative (Frischknecht & Jolliet, 2016).

Even though the cost of scarcity could be internalised in the market through water prices, in practice it is not. Therefore, we consider the use of scarce water as an external cost: perfect water markets are rare in practice and water scarcity has large societal implications, both from a human as well as an ecosystem health perspective. The choice to account for scarce water use as a negative externality of production in true pricing is furthermore guided by internationally accepted agreements on water and the rights of current and future generations[7].

Considering the arguments above, economic actors have a responsibility to limit scarce water use in processes that are under their control.

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[5] ‘*Water scarcity refers to the physical abundance or lack of freshwater resources which can result in significant impacts to business such as production/supply chain disruption, higher operating costs and growth constraints. Water scarcity is human-driven, and it is generally calculated as a function of the volume of water use/demand relative to the volume of water available in a given area. However, water scarcity does not consider whether water is accessible and/or fit for use, as defined by the UN Global Compact CEO Water Mandate (2014).*’ (WWF, 2020b)

[6] https://wulca-waterlca.org/

[7] For more information on the link between water use and rights see Annex A: Link with internationally accepted agreements on the rights of current and future generations. For more background on the link between rights and true pricing see the Valuation Framework for True Price Assessment of Agri-food Products (Galgani et al., 2021a)

4. Guidance for the scoping phase of a true price assessment

In a typical scoping phase of a true price assessment, the researcher should identify all relevant processes in the lifecycle of the product (or steps in its value chain). This involves assessing which intermediate products are produced and what inputs are required. After that, it must be determined which impact must be quantified for each process in the lifecycle – a so-called materiality assessment - by identifying all relevant processes that are expected to contribute more significantly to the total impact. This helps the analysis as it focusses attention on these sectors and processes in subsequent steps.

All agricultural processes that require water, such as irrigation, are potentially material when assessing scarce water use, in any geographical context where some degree of water scarcity exists[8]. There are many definitions of water scarcity, or water stress. It is important to point out that water scarcity is not only aridity. Physical scarcity depends both on water availability and water demand in a region, and aridity influences water availability. Therefore, the degree of scarcity in various countries can be counter intuitive as, for example, even a humid country like The Netherlands is considered to have a significant degree of water scarcity since abstraction for agricultural and industrial use is very high.

Non-agricultural processes such as industrial processes that involve water use are also material. For the rest, existing Life Cycle Assessment (LCA) studies, water footprint studies or databases that provide information on scarce water use for the specific product being studied or for similar products can be used to assess materiality in a more quantitative way for each step in the product life cycle.

5. Footprint indicator

Scarce water use corresponds to a single footprint indicator with the same name, measured in m^3 of scarce water Table 1.

Table 1: Overview of Scarce water use

Footprint indicator(s)	**Unit**	**Modelling approach**
Scarce water use	m^3/unit output (scarcity adjusted)	Blue Water Footprint (Hoekstra et al., 2011), Water scarcity – quantity (WWF, 2020c)

6. Modelling approach

6.1. Scarce water use

Scarce water use is calculated for each process in scope as a scarcity adjusted blue water footprint, using the following formula:

[8] Water risk is assessed at the country level using Annex B: Normalised Water Scarcity Factors, and at the sub-country level using the underlying source (WWF, 2020b)

$$\text{WUSE} = \text{BLUEWUSE} * \text{SCARCITY} \quad (1)$$

Where WUSE is scarce water use (in *m³/unit output)*, BLUEWUSE is blue water use (in *m³/unit* output) and SCARCITY is the water scarcity factor. Blue water use can be quantified based on the blue water methodology of the Water Footprint Network (Hoekstra et al., 2011). It represents water consumption.

The water scarcity factor represents the extent to which water in the area where the process takes place should be considered scarce. It is a value between 0 and 1 where 0 means no scarcity and 1 means maximum scarcity. Country-specific factors are derived from the WWF water risk 'physical scarcity' indicator, which is available for most countries (WWF, 2020c). This indicator is considered a good source as it is based on a combination of various existing water indices that cover different aspects of physical scarcity, including the World Resource Institute's Baseline Water Stress index, the Global Aridity Index, the Water Footprint Network's Blue Water Scarcity, LCA characterisation factors from the AWARE model, the Standardized Precipitation and Evaporation Index as well as water depletion and drought models. More information on how the WWF indicators are derived and what each of the indexes utilised entail, can be found in the relevant methodology documentation (WWF, 2020b, p. 8-11).

Country-specific WWF 'physical scarcity' risk scores going from 1 to 5 are normalised in this method, based on the lowest and highest indicator scores of all available countries, resulting in water scarcity factors per country that go from 0 (least scarce) to 1 (most scarce). Annex B: Normalised Water Scarcity Factors, gives an overview of the normalised water scarcity factors, as well as the formula utilised to derive them based on WWF data. These scarcity factors are national averages but can also be disaggregated to sub-country values based on the same database. The blue water footprint on which this method relies is a commonly used indicator in business and policy. Further research on the relation between scarce water use calculated with this method and that calculated with the AWARE methodology, which is common practice in LCA, is a recommended item for further research.

6.2. Data requirements

Based on the modelling approach described above, the following datapoints are needed f*or each process in the lifecycle* where this impact is in scope:

- Blue water use per unit of output (m^3/unit output). This is equivalent to consumptive use of blue water, which is water from surface or groundwater sources. 'Consumptive water use' includes four cases (Hoekstra et al., 2009, p.20)[9]:
  - water that evaporates;
  - water that is incorporated into the product;
  - water that does not return to the same catchment area (e.g., that is returned to another catchment area or to the sea);
  - water that does not return in the same period (e.g., when consumed in a scarce period and returned in a wet period).
- Water scarcity factors for the specific water basin or country (WWF, 2020c; country factors are provided in Annex B: Normalised Water Scarcity Factors).

Blue water use can be quantified for example using primary data describing the considered agricultural supply chain, LCA databases, results of existing LCA or blue water footprint studies. Overarching data

[9] Each of these components can be measured. However, if this is not possible, for example for manufacturing processes, the researcher can rely on existing databases containing data on consumptive water per unit of output.

requirements are specified in the Assessment Method for True Pricing of Agri-Food Products (Galgani et al., forthcoming).

7. Monetisation

The monetisation factor for scarce water use is presented in Table 2. Value is expressed at 2020 price level.

The monetisation factor represents a restoration cost which expresses the annualised cost of desalination, including the cost of operation and maintenance, electrical and thermal energy, as well as the cost of covering and repaying initial capital and operational costs of desalination (World Bank, 2012). The average of the total annualized costs of desalination for Mediterranean Sea, Red Sea and Gulf water is used as a global average. Multiple effect distillation and seawater reverse osmosis are the two desalination technologies taken into account, and their costs are based on feasibility studies for large projects (assuming project life of 25 years, discount rate of 6 percent and unsubsidized energy cost). According to World Bank (2012), energy costs were calculated based on the opportunity cost of fuel at the international price and fuel escalation cost of 5 percent per annum (World Bank, 2012, p. 11).

Table 2: Monetisation factor of Scarce water use (2020 price level)

Indicator	Unit	Monetisation factor
Scarce water use	EUR/m^3	1.29

Restoration cost is the most appropriate monetisation approach. The damages associated with scarce water use are considered reversible as it is possible to replenish blue water supply using technologies such as desalination. The monetisation factor is considered equal for all countries as local conditions of water scarcity are taken into account in the quantification step[10]. This is a simplified valuation approach and further research is required in order to develop location specific monetisation.

The chosen monetisation factor has some limitations: the cost to restore blue water stocks is likely to fluctuate over geographies and desalination would not be the preferred option to do so everywhere. Also, desalination is a very expensive option to handle water shortages, and therefore it is probably an over-estimation of the costs.

Ultimately water valuation is a difficult topic and more research is needed. For comparison, looking at the Netherlands, direct costs of water use for irrigation are estimated at 0.21 euro per m^3 (excluding investment costs, in 2020)[11], while a shadow price for water using the Total Economic Value method is estimated at 3.50 USD (2015, comparable to 3.30 euro 2020) by the Corporate Bonds Water Credit Risk Tool, of which two thirds represent domestic supply values, and the rest agricultural value, human health value and environmental impacts (Ridley & Boland, 2015).

In case water is not replenished, or in some cases even if water is replenished at a later stage, there are other impacts on people and the environment that are caused by scarce water use, such as impacts on human health and loss of ecosystem services. Estimation of this damage would be another approach to

[10] This approach is not uncommon: The water impact method by researchers from the Harvard Business School (Serafeim et al., 2020) similarly estimate a global price adjusted by the AWARE model for scarcity (WULCA, n.d.) and Waterfund's Global Water Price (Waterfund, 2018).

[11] https://www.stowa.nl/deltafacts/zoetwatervoorziening/droogte/beregening

monetisation of water scarcity. The damage-based approach may for example use the ReCiPe methodology, which is used in other modules of this methodology, using characterisation factors for impacts of water consumption on human health and ecosystem (Huijbregts et al., 2016) and the relevant valuation approach (Galgani et al., 2021b). These costs may be lower.

Finally, the remediation cost of scarce water use could be expanded to include the external costs of desalination, as this is an energy intensive process. For example, a 2013 study on the environmental externalities of sectors found that the water supply industry has a climate change cost of 0.2 to 1.4 times its revenue (Natural Capital Coalition, 2013, Appendix 7.1.1).

8. Limitations and items for further development

8.1. Limitations

- Water scarcity is not the only relevant factor. Drought and variation in supply are other important factors, which affect the variation in availability of water. This implies that also the timing of water use is relevant. There may be water shortages in some periods but not in others, and there may be damage of excess water. In any case, water use for irrigation in agriculture is expected to be done in months of low water availability.
- The WWF indicators are country-specific scarcity risk scores based on a semi-quantitative assessment. While they are based on quantitative water index datasets, the final scores are qualitative indicators. Moreover, WWF factors were not developed for true cost accounting purposes, but for risk assessment. In LCA, the AWARE methodology is the so-called consensus methodology in the UNEP SETAC Life Cycle Initiative, on a water scarcity midpoint method and for water scarcity footprint assessments. However, at the time of this publication it is not clear how the AWARE indicator can be used in a true price methodology and more research is needed.
- The WWF indicators included in this module represent normalised, aggregated, country-specific scarcity risk factors, representing 25 industries. However, the online Water Risk Filter tool allows registered users to estimate the overall physical risk score of an agricultural commodity in a specific location (WWF, 2020b).
- Monetising scarce water use through desalinisation costs might not be the most accurate estimate of restoration cost for regions where desalinisation is less relevant, such as the Netherlands. As mentioned previously, this is probably an over-estimation of the costs in some contexts. Within the true price methodology for agri-food products, a conservative valuation approach is applied to all impacts, making them comparable to each other. Alternatives to this include, expected production losses or expenditures needed to compensate for the lack of water, for example expenditures to buffer water over time, expenditures on sprinkling irrigation or expenditures to reduce water use. Consequences on biodiversity, both for drought and excess water are also relevant. Finally, the direct influence of water scarcity to wellbeing and human health can be included. However, desalination is a reasonable estimate, when a conservative monetisation approach is adopted.

8.2. Items for further development

- Comparison with other LCA water use methodologies (Frischknecht & Jolliet, 2016, European Commission 2013, Boulay et al., 2018). AWARE is used as a standard for many LCA applications and may provide more intuitive results on water scarcity. It may be relevant to evaluate to what extent the impact on water scarcity as calculated with the AWARE approach can be monetised and become the standard approach for true pricing.

- Database development:
    - Average water footprints of crops.
    - Water basin specific scarcity factors
    - Replacement cost of water by country
- Tackling the fluctuations of water scarcity over time and including consequences of excess water. This will require more detailed LCA data also because these are normally about yearly water use.
- Improvement of the monetisation factor for the restoration cost of water, including review of most suitable abatement cost estimates for different regions; addition of a human health damage factor to the costing method if this is applicable (see e.g., Huijbregts et al., 2016, p. 86); inclusion of external costs. For many regions investments and other costs to buffer water, and costs of lower productivity, might be relevant to derive the monetisation factor.

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Annex A: Link with internationally accepted agreements on the rights of current and future generations

Relevant rights are the right to a clean and healthy environment of current and future generations, the right to safe and clean drinking water and sanitation, and the right to have access to the natural resources of the earth for future generations. International agreements and goals on sustainable development recognise the importance of access to water for present and future generations as follows:

- The unsustainable management and use of natural resources, therefore including water, and the decline in services provided by ecosystems may interfere with the enjoyment of a safe, clean, healthy and sustainable environment, and environmental damage can have negative implications, both direct and indirect, for the effective enjoyment of all human rights. (UN General Assembly, 2018).
- ‘Ensure availability and sustainable management of water and sanitation for all’ - *The Sustainable Development Goals, Goal 6* (UN General Assembly, 2015).
- ‘The right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights’ - *Resolution adopted by the UN General Assembly on 28 July 2010 64/292, The human right to water and sanitation* (UN General Assembly, 2010).

Annex B: Normalised Water Scarcity Factors

The country specific water scarcity factors are normalised based on the following equation which makes use of the WWF scarcity scores (WWF, 2020b):

(2) $$\text{SCARCITY} = \frac{SCARCITY_{WWF,c} - SCARCITY_{WWF,min}}{SCARCITY_{WWF,max} - SCARCITY_{WWF,min}}$$

Where SCARCITY is the normalised water scarcity score for a specific country (as used in Equation 1), $SCARCITY_{WWF,c}$ is the WWF scarcity score for country *c*, $SCARCITY_{WWF,min}$ is the lowest WWF scarcity score and $SCARCITY_{WWF,max}$ is the highest WWF scarcity score.

Using the scores available at the time of writing this module, the normalised scarcity scores for a specific country could be obtained through the following equation[12,13]:

(3) $$\text{SCARCITY} = \frac{SCARCITY_{WWF,c} - 1.40}{3.27}$$

Table 3: (Normalised) WWF water scarcity factors

#	Country	Water scarcity – physical scarcity index (WWF, 2020b)	Water scarcity factors - normalised
1	Israel	4.67	1.000
2	Palestine	4.63	0.988
3	Qatar	4.47	0.939
4	Jordan	4.45	0.933
5	Lebanon	4.44	0.930
6	Egypt	4.30	0.887
7	Kuwait	4.23	0.865
8	Andorra	4.19	0.853
9	United Arab Emirates	4.12	0.832
10	Malta	4.10	0.826
11	Libyan Arab Jamahiriya	4.09	0.823
12	Syria	4.03	0.804
13	Turkmenistan	4.01	0.798
14	Bahrain	4.00	0.795
15	Cyprus	4.00	0.795
16	Eritrea	3.94	0.777
17	Mauritania	3.91	0.768
18	Iran	3.90	0.765

[12] $SCARCITY_{WWF,min}$ at the time of writing this module was 1.40 for Ireland (WWF, 2020c).

[13] $SCARCITY_{WWF,max} - SCARCITY_{WWF,min}$ was calculated as 3.27: the WWF scarcity score for Israel (4.67) minus the WWF scarcity score for Ireland (1.40) (WWF, 2020c).

19	Tunisia	3.88	0.758
20	Uzbekistan	3.88	0.758
21	Algeria	3.86	0.752
22	Sudan	3.85	0.749
23	Morocco	3.82	0.740
24	Niger	3.82	0.740
25	Saudi Arabia	3.81	0.737
26	Yemen	3.75	0.719
27	Spain	3.70	0.703
28	Iraq	3.67	0.694
29	Armenia	3.65	0.688
30	Djibouti	3.65	0.688
31	Oman	3.60	0.673
32	Somalia	3.60	0.673
33	Pakistan	3.51	0.645
34	Afghanistan	3.49	0.639
35	Azerbaijan	3.49	0.639
36	Chad	3.46	0.630
37	Burkina Faso	3.46	0.630
38	Greece	3.46	0.630
39	Mali	3.40	0.612
40	India	3.37	0.602
41	South Africa	3.34	0.593
42	Turkey	3.32	0.587
43	Portugal	3.32	0.587
44	Senegal	3.31	0.584
45	Tajikistan	3.29	0.578
46	Namibia	3.27	0.572
47	Botswana	3.18	0.544
48	South Sudan	3.16	0.538
49	Mexico	3.15	0.535
50	Kyrgyzstan	3.15	0.535
51	Cayman Islands	3.03	0.498
52	Guam	3.00	0.489
53	Northern Mariana Islands	3.00	0.489
54	Wallis and Futuna	3.00	0.489
55	Ghana	2.96	0.477
56	Mongolia	2.96	0.477
57	Thailand	2.95	0.474
58	Ethiopia	2.93	0.468
59	Australia	2.92	0.465
60	Nepal	2.92	0.465
61	Cuba	2.90	0.459

62	San Marino	2.90	0.459
63	Italy	2.89	0.456
64	Albania	2.86	0.446
65	Uganda	2.85	0.443
66	Nigeria	2.81	0.431
67	Aruba	2.80	0.428
68	Bahamas	2.80	0.428
69	Dominica	2.80	0.428
70	Guadeloupe	2.80	0.428
71	Trinidad and Tobago	2.80	0.428
72	Curacao	2.80	0.428
73	Saint-Martin	2.80	0.428
74	Sint Maarten	2.80	0.428
75	Bulgaria	2.79	0.425
76	Benin	2.79	0.425
77	Macedonia	2.77	0.419
78	Kazakhstan	2.75	0.413
79	Zimbabwe	2.75	0.413
80	Chile	2.72	0.404
81	Sri Lanka	2.71	0.401
82	Greenland	2.71	0.401
83	Dominican Republic	2.69	0.394
84	Togo	2.68	0.391
85	Belgium	2.65	0.382
86	China	2.62	0.373
87	Georgia	2.62	0.373
88	Antigua and Barbuda	2.60	0.367
89	Barbados	2.60	0.367
90	Martinique	2.60	0.367
91	Guernsey	2.60	0.367
92	Haiti	2.57	0.358
93	Ukraine	2.55	0.352
94	Gambia	2.53	0.346
95	Swaziland	2.52	0.343
96	Jamaica	2.50	0.336
97	France	2.45	0.321
98	Kenya	2.43	0.315
99	Bangladesh	2.42	0.312
100	Comoros	2.40	0.306
101	Moldova	2.37	0.297
102	Lesotho	2.36	0.294
103	Guinea-Bissau	2.35	0.291
104	Cambodia	2.34	0.287

105	Angola	2.34	0.287
106	Côte d'Ivoire	2.33	0.284
107	South Korea	2.31	0.278
108	Monaco	2.30	0.275
109	Argentina	2.29	0.272
110	Peru	2.26	0.263
111	Germany	2.25	0.260
112	Mozambique	2.23	0.254
113	El Salvador	2.23	0.254
114	Viet Nam	2.22	0.251
115	Estonia	2.22	0.251
116	United States of America	2.21	0.248
117	Puerto Rico	2.20	0.245
118	Netherlands	2.19	0.242
119	Laos	2.18	0.239
120	Luxembourg	2.17	0.235
121	Ecuador	2.14	0.226
122	Romania	2.11	0.217
123	Hong Kong	2.10	0.214
124	Macao	2.10	0.214
125	Madagascar	2.09	0.211
126	Bolivia	2.09	0.211
127	Burundi	2.09	0.211
128	Zambia	2.07	0.205
129	Guinea	2.07	0.205
130	Costa Rica	2.06	0.202
131	Czech Republic	2.05	0.199
132	Myanmar	2.04	0.196
133	Nicaragua	2.02	0.190
134	New Caledonia	2.02	0.190
135	Sierra Leone	2.02	0.190
136	Brazil	2.00	0.183
137	Cameroon	2.00	0.183
138	Rwanda	2.00	0.183
139	Tanzania	2.00	0.183
140	Faroe Islands	2.00	0.183
141	Falkland Islands	2.00	0.183
142	Malawi	1.98	0.177
143	Switzerland	1.97	0.174
144	Central African Republic	1.96	0.171
145	Paraguay	1.95	0.168
146	Poland	1.92	0.159
147	Vanuatu	1.91	0.156

148	Slovakia	1.90	0.153
149	North Korea	1.88	0.147
150	Lithuania	1.87	0.144
151	Philippines	1.87	0.144
152	Panama	1.87	0.144
153	Hungary	1.86	0.141
154	Denmark	1.85	0.138
155	Honduras	1.85	0.138
156	Belarus	1.84	0.135
157	Liechtenstein	1.84	0.135
158	Congo, Democratic Republic of	1.81	0.125
159	Serbia	1.81	0.125
160	Singapore	1.80	0.122
161	Guatemala	1.79	0.119
162	Bhutan	1.77	0.113
163	Canada	1.76	0.110
164	Russia	1.75	0.107
165	Venezuela	1.72	0.098
166	Guyana	1.72	0.098
167	Latvia	1.70	0.092
168	New Zealand	1.68	0.086
169	Austria	1.65	0.076
170	Bosnia and Herzegovina	1.65	0.076
171	Colombia	1.63	0.070
172	Congo, Republic of	1.63	0.070
173	Solomon Islands	1.63	0.070
174	Liberia	1.62	0.067
175	United Kingdom	1.62	0.067
176	French Guiana	1.60	0.061
177	Croatia	1.59	0.058
178	Gabon	1.59	0.058
179	Brunei Darussalam	1.59	0.058
180	Japan	1.59	0.058
181	Iceland	1.58	0.055
182	Equatorial Guinea	1.57	0.052
183	Finland	1.56	0.049
184	Indonesia	1.54	0.043
185	Montenegro	1.54	0.043
186	Uruguay	1.53	0.040
187	Slovenia	1.51	0.034
188	Suriname	1.50	0.031
189	Papua New Guinea	1.49	0.028
190	Belize	1.48	0.024

191	Malaysia	1.47	0.021
192	Sweden	1.47	0.021
193	Norway	1.45	0.015
194	Timor-Leste	1.45	0.015
195	Ireland	1.40	0.000