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Virtual water trade

A quantification of virtual water flows between nations in relation to international crop trade

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VIRTUAL WATER TRADE

A QUANTIFICATION OF VIRTUAL WATER FLOWS BETWEEN NATIONS IN RELATION TO INTERNATIONAL CROP TRADE

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Contents

Appendices

I. Crop water requirements (m^3/ha)

II. Actual crop yields (ton/ha) in 1999

III. Specific water demands (m^3/ton) in 1999

IV. FAO guidelines on crop water requirements in mm [=10 m^3/ha]

Va. Gross virtual water import per country for the years 1995-1999 (10^6 m^3)

Vb. Gross virtual water export per country for the years 1995-1999 (10^6 m^3)

Vc. Net virtual water import per country for the years 1995-1999 (10^6 m^3)

VI. Classification of countries into thirteen world regions

VII. Gross virtual water trade between and within regions (Gm^3)

Summary

The water that is used in the production process of an agricultural or industrial product is called the 'virtual water' contained in the product. A water-scarce country might wish to import products that require a lot of water in their production (water-intensive products) and export products or services that require less water (water-extensive products). This implies net import of 'virtual water' (as opposed to import of real water, which is generally too expensive) and will relieve the pressure on the nation's own water resources. Until date little is known on the actual volumes of virtual water trade flows between countries.

The objective of this study is to quantify the volumes of all virtual water trade flows between nations in the period 1995-1999 and to put the virtual water trade balances of nations within the context of national water needs and water availability. The study has been limited to the quantification of virtual water trade flows related to international crop trade.

The basic approach has been to multiply international crop trade flows (ton/yr) by their associated virtual water content (m^3/ton). The required crop trade data have been taken from the United Nations Statistics Division in New York. The required data on virtual water content of crops originating from different countries have been estimated on the basis of various FAO databases (CropWat, ClimWat, FAOSTAT).

The calculations show that the global volume of crop-related virtual water trade between nations was 695 Gm^3/yr in average over the period 1995-1999. For comparison: the total water use by crops in the world has been estimated at 5400 Gm^3/yr (Rockström and Gordon, 2001). This means that 13% of the water used for crop production in the world is not used for domestic consumption but for export (in virtual form). This is the global percentage; the situation strongly varies between countries.

Considering the period 1995-1999, the countries with largest net virtual water export are: United States, Canada, Thailand, Argentina, and India. The countries with largest net virtual water import in the same period are: Sri Lanka, Japan, the Netherlands, the Republic of Korea, and China.

For each nation of the world a 'water footprint' has been calculated (a term chosen on the analogy of the 'ecological footprint'). The water footprint, equal to the sum of the domestic water use and net virtual water import, is proposed here as a measure of a nation's actual appropriation of the global water resources. It gives a more complete picture than if one looks at domestic water use only, as is being done until date. In addition to the water footprint, indicators are proposed for a nation's 'water self-sufficiency' and a nation's 'water dependency'.

In studying global virtual water trade flows, it is recommended to start working on other products than crops as well, for instance livestock products such as meat. Another next step is to start interpreting the data and to study how governments can deliberately interfere in the current national virtual water trade balances in order to achieve higher global water use efficiency.

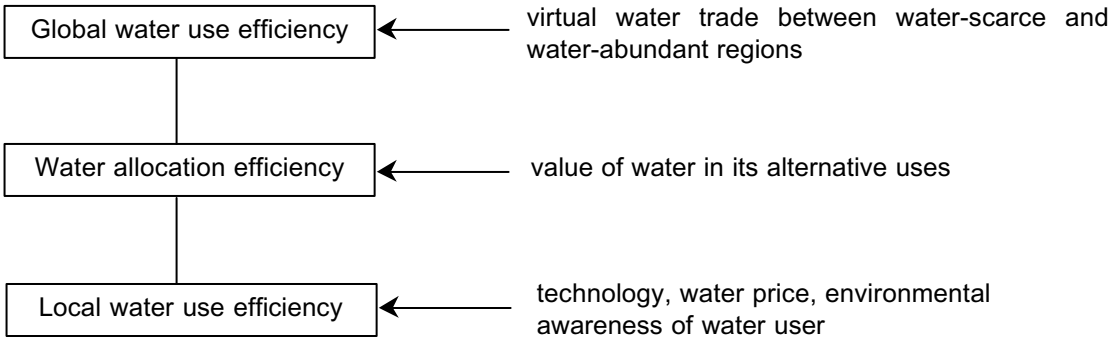
1. Introduction

1.1. The economics of water use

Water should be considered an economic good. Ten years after the Dublin conference this sounds like a mantra for water policy makers. The sentence is repeated again and again, conference after conference. It is suggested that problems of water scarcity, water excess and deterioration of water quality would be solved if the resource 'water' were properly treated as an economic good. The logic is clear: clean fresh water is a scarce good and thus should be treated economically. There is an urgent need to develop appropriate concepts and tools to do so.

In dealing with the available water resources in an economically efficient way, there are three different levels at which decisions can be made and improvements be achieved. The first level is the user level, where price and technology play a key role. This is the level where the 'local water use efficiency' can be increased by creating awareness, charging prices based on full marginal cost and by stimulating water-saving technology. Second, at a higher level, a choice has to be made on how to allocate the available water resources to the different sectors of economy (including public health and the environment). Water is used for the production of several 'goods' and 'services'. People allocate water to serve certain purposes, which generally implies that other, alternative purposes are not served. Choices on the allocation of water can be more or less 'efficient', depending on the value of water in its alternative uses. At this level we speak of 'water allocation efficiency'. Water is a public good, so water allocation at the country or catchment level is principally a governmental issue. The question is here how all demands for water can best be met and where – in case of water shortage – supply should be restricted.

Beyond 'local water use efficiency' and 'water allocation efficiency' there is a level at which one could talk about 'global water use efficiency'. It is a fact that some regions of the world are water-scarce and other regions are water-abundant. It is also a fact that in some regions there is a low demand for water and in other regions a high demand. Unfortunately there is no general positive relation between water demand and availability. Until recently people have focussed very much on considering how to meet demand based on the available water resources at national or river basin scale. The issue is then how to most efficiently allocate and use the available water. There is no reason to restrict the analysis to that. In a protected economy, a nation will have to achieve its development goals with its own resources. In an open economy, however, a nation can import products that are produced from resources that are scarcely available within the country and export products that are produced with resources that are abundantly available within the country. A water-scarce country can thus aim at importing products that require a lot of water in their production (water-intensive products) and exporting products or services that require less water (water-extensive products). This is called *import of virtual water* (as opposed to import of real water, which is generally too expensive) and will relieve the pressure on the nation's own water resources. For water-abundant countries an argumentation can be made for *export of virtual water*. Import of water-intensive products by some nations and export of these products by others includes what is called 'virtual water trade' between nations.



In summary, the overall efficiency in the appropriation of the global water resources can be defined as the 'sum' of local water use efficiencies, meso-scale water allocation efficiencies and global water use efficiency. So far most attention of scientists and politicians has gone to local water use efficiency. There is quite some knowledge available and improvements have actually been achieved already. More efficient allocation of water as a means to improved water management has got quite same attention as well, but if it comes to the implementation of improved allocation schemes there is still a long way to go. At the global level, it is even more severe, since basic data on virtual water trade and water dependency of nations are generally even lacking. This has been the incentive for this study.

1.2. Virtual water trade

For the production of nearly all goods water is required. The water that is used in the production process of an agricultural or industrial product is called the 'virtual water' contained in the product. For example, for producing a kilogram of grain, grown under rain-fed and favourable climatic conditions, we need about one to two cubic metres of water, that is 1000 to 2000 kg of water. For the same amount of grain, but growing in an arid country, where the climatic conditions are not favourable (high temperature, high evapotranspiration) we need up to 3000 to 5000 kg of water.

If one country exports a water-intensive product to another country, it exports water in virtual form. In this way some countries support other countries in their water needs. For water-scarce countries it could be attractive to achieve water security by importing water-intensive products instead of producing all water-demanding products domestically. Reversibly, water-rich countries could profit from their abundance of water resources by producing water-intensive products for export. Trade of real water between water-rich and water-poor regions is generally impossible due to the large distances and associated costs, but trade in water-intensive products (virtual water trade) is realistic. Virtual water trade between nations and even continents could thus be used as an instrument to improve global water use efficiency and to achieve water security in water-poor regions of the world.

World-wide both politicians and the general public increasingly show interest in the pros and cons of 'globalisation' of trade. This can be understood from the fact that increasing global trade implies increased

interdependence of nations. The tension in the debate relates to the fact that the game of global competition is played with rules that many see as unfair. Knowing that economically sound water pricing is poorly developed in many regions of the world, this means that many products are put on the world market at a price that does not properly include the cost of the water contained in the product. This leads to situations in which some regions in fact subsidise export of scarce water.

1.3. The objective of this study

The objectives of this study are:

1. To estimate the amount of water needed to produce crops in different countries of the world;
2. To quantify the volume of virtual water trade flows between nations in the period 1995-1999;
3. To put the virtual water trade balances of nations within the context of national water needs and water availability.

This report is primarily meant as a data report. We do not pretend to give an in-depth interpretation of the results. Besides, we limit ourselves to virtual water trade in relation to international crop trade, thus excluding virtual water trade related to international trade of livestock products and industrial products.

2. Method

2.1. Calculation of specific water demand per crop type

Per crop type, average specific water demand has been calculated separately for each relevant nation on the basis of FAO data on crop water requirements and crop yields:

$$SWD[n,c] = \frac{CWR[n,c]}{CY[n,c]} \tag{1}$$

Here, *SWD* denotes the specific water demand (m^3 ton^{-1}) of crop *c* in country *n*, *CWR* the crop water requirement (m^3 ha^{-1}) and *CY* the crop yield (ton ha^{-1}).

The crop water requirement *CWR* (in m^3 ha^{-1}) is calculated from the accumulated crop evapotranspiration ET_c (in mm/day) over the complete growing period. The crop evapotranspiration ET_c follows from multiplying the 'reference crop evapotranspiration' ET_0 with the crop coefficient K_c:

$$ET_c = K_c \times ET_0 \tag{2}$$

The concept of 'reference crop evapotranspiration' was introduced by FAO to study the evaporative demand of the atmosphere independently of crop type, crop development and management practices. The only factors affecting ET_0 are climatic parameters. The reference crop evapotranspiration ET_0 is defined as the rate of evapotranspiration from a hypothetical reference crop with an assumed crop height of 12 cm, a fixed crop surface resistance of 70 s m^{-1} and an albedo of 0.23. This reference crop evapotranspiration closely resembles the evapotranspiration from an extensive surface of green grass cover of uniform height, actively growing, completely shading the ground and with adequate water (Smith *et al*., 1992). Reference crop evapotranspiration is calculated on the basis of the FAO Penman-Monteith equation (Smith *et al*., 1992; Allen *et al*., 1994a, 1994b; Allen *et al*., 1998):

$$ET_0 = \frac{0.408\Delta(R_n - G) + \gamma \frac{900}{T+273} U_2 (e_a - e_d)}{\Delta + \gamma(1 + 0.34U_2)} \tag{3}$$

in which:

ET_0 = reference crop evapotranspiration [mm day^{-1}];
R_n = net radiation at the crop surface [MJ m^{-2} day^{-1}];
G = soil heat flux [MJ m^{-2} day^{-1}];
T = average air temperature [°C];
U_2 = wind speed measured at 2 m height [m s^{-1}];
e_a = saturation vapour pressure [kPa];

e_d = actual vapour pressure [kPa];

e_a-e_d = vapour pressure deficit [kPa];

Δ = slope of the vapour pressure curve [kPa °C^{-1}];

γ = psychrometric constant [kPa °C^{-1}].

The crop coefficient accounts for the actual crop canopy and aerodynamic resistance relative to the hypothetical reference crop. The crop coefficient serves as an aggregation of the physical and physiological differences between a certain crop and the reference crop.

The overall scheme for the calculation of specific water demand is drawn in Figure 1.1. This figure also shows the next step: the calculation of the virtual water trade flows between nations.

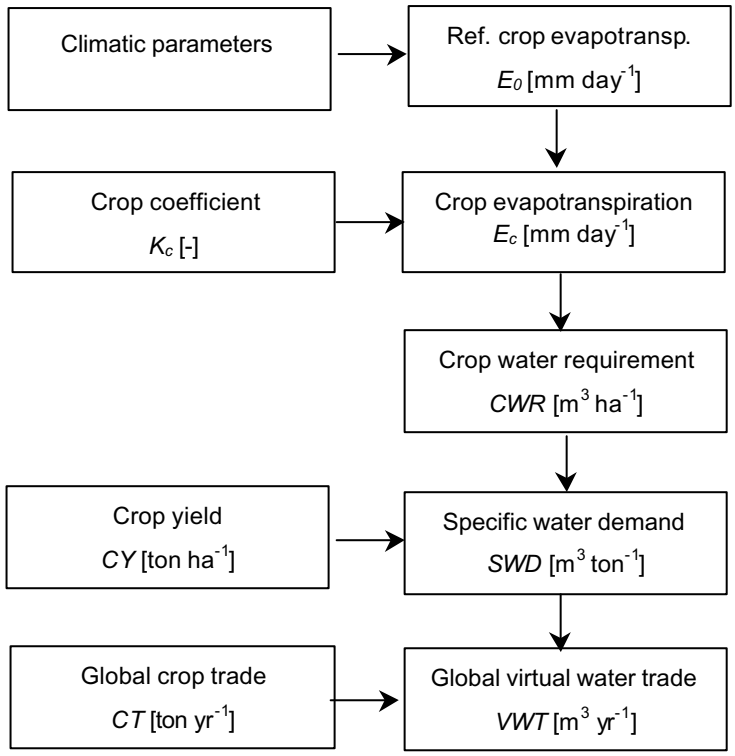


Figure 1.1. Steps in the calculation of global virtual water trade.

2.2. Calculation of virtual water trade flows and the national virtual water trade balance

Virtual water trade flows between nations have been calculated by multiplying international crop trade flows by their associated virtual water content. The latter depends on the specific water demand of the crop in the exporting country where the crop is produced. Virtual water trade is thus calculated as:

$$VWT[n_e, n_i, c, t] = CT[n_e, n_i, c, t] \times SWD[n_e, c] \quad (4)$$

in which *VWT* denotes the virtual water trade ($m^3 yr^{-1}$) from exporting country n_e to importing country n_i in year t as a result of trade in crop c. *CT* represents the crop trade (ton yr^{-1}) from exporting country n_e to importing country n_i in year t for crop c. *SWD* represents the specific water demand (m^3 ton^{-1}) of crop c in the exporting country. Above equation assumes that if a certain crop is exported from a certain country, this crop is actually grown in this country (and not in another country from which the crop was just imported for further export). Although a certain error will be made in this way, it is estimated that this error will not substantially influence the overall virtual water trade balance of a country. Besides, it is practically impossible to track the sources of all exported products.

The gross virtual water import to a country n_i is the sum of all imports:

$$GVWI[n_i, t] = \sum_{n_e, c} VWT[n_e, n_i, c, t] \tag{5}$$

The gross virtual water export from a country n_e is the sum of all exports:

$$GVWE[n_e, t] = \sum_{n_i, c} VWT[n_e, n_i, c, t] \tag{6}$$

The net virtual water import of a country is equal to the gross virtual water import minus the gross virtual water export. The virtual water trade balance of country x for year t can thus be written as:

$$NVWI[x,t] = GVWI[x,t] - GVWE[x,t] \tag{7}$$

where *NVWI* stands for the net virtual water import (m^3 yr^{-1}) to the country. Net virtual water import to a country has either a positive or a negative sign. The latter indicates that there is net virtual water *export* from the country.

2.3. Calculation of a nation's 'water footprint'

The total water use within a country itself is not the right measure of a nation's actual appropriation of the global water resources. In the case of net import of virtual water import into a country, this virtual water volume should be added to the total domestic water use in order to get a picture of a nation's real call on the global water resources. Similarly, in the case of net export of virtual water from a country, this virtual water volume should be subtracted from the volume of domestic water use. The sum of domestic water use and net virtual water import can be seen as a kind of 'water footprint' of a country, on the analogy of the 'ecological footprint' of a nation. In simplified terms, the latter refers to the amount of land needed for the production of the goods and services consumed by the inhabitants of a country. Studies have shown that for some countries the ecological footprint is smaller than the area of the nation's territory, but in other cases much bigger (Wackernagel and Rees, 1996; Wackernagel *et al*., 1997). The latter means that apparently some nations need land outside their own territory to provide in their goods and services.

The ‘water footprint’ of a country (expressed as a volume of water per year) is defined as:

$$Water\ footprint = WU + NVWI \tag{8}$$

in which *WU* denotes the total domestic water use (m^3yr^{-1}) and *NVWI* the net virtual water import of a country (m^3yr^{-1}). As noted earlier, the latter can have a negative sign as well.

Total domestic water use *WU* should ideally refer to the sum of ‘blue’ water use (referring to the use of ground- and surface water) and ‘green’ water use (referring to the use of precipitation). However, since data on green water use on country basis are not easily obtainable, we have provisionally chosen in this report to limit the definition of water use to blue water use. It should be noted that ‘net virtual water import’ as defined in the previous section includes both ‘blue’ and ‘green’ water.

2.4. Calculation of national water scarcity, water dependency and water self-sufficiency

At the start of this study we expected to find a relation between national water scarcity and net virtual water import. One would logically assume that a country with high water scarcity would seek to profit from net virtual water import. On the other hand, countries with abundant water resources could make profit by exporting water in virtual form. In order to check this hypothesis we need indices of both water scarcity and virtual water import dependency. Plotting countries in a graph with water scarcity on the x-axis and virtual water import dependency on the y-axis, would expectedly result in some positive relation.

As an index of national water scarcity we use the ratio of total water use to water availability:

$$WS = \frac{WU}{WA} \times 100 \tag{9}$$

In this equation, *WS* denotes national water scarcity (%), *WU* the total water use in the country (m^3yr^{-1}) and *WA* the national water availability (m^3yr^{-1}). Defined in this way, water scarcity will generally range between zero and hundred per cent, but can in exceptional cases (e.g. groundwater mining) be above hundred per cent. As a measure of the national water availability *WA* we take the annual internal renewable water resources, that are the average fresh water resources renewably available over a year from precipitation falling within a country’s borders (see for instance Gleick, 1993). As noted in the previous section, total water use *WU* should ideally refer to the sum of blue and green water use, but for practical reasons we have provisionally chosen in this report to define water scarcity as the ratio of blue water use to water availability, which is generally done by others as well.

Next, we have looked for a proper indicator of ‘virtual water import dependency’ or ‘water dependency’ in brief. The indicator should reflect the level to which a nation relies on foreign water resources (through import

of water in virtual form). The water dependency *WD* of a nation is in this report calculated as the ratio of the net virtual water import into a country to the total national water appropriation:

$$WD = \begin{cases} \dfrac{NVWI}{WU + NVWI} \times 100 & \text{if } NVWI \geq 0 \\ 0 & \text{if } NVWI < 0 \end{cases} \tag{10}$$

The value of the water dependency index will per definition vary between zero and hundred per cent. A value of zero means that gross virtual water import and export are in balance or that there is net virtual water export. If on the other extreme the water dependency of a nation approaches hundred percent, the nation nearly completely relies on virtual water import.

As the counterpart of the water dependency index, the water self-sufficiency index is defined as follows:

$$WSS = \begin{cases} \dfrac{WU}{WU + NVWI} \times 100 & \text{if } NVWI \geq 0 \\ 100 & \text{if } NVWI < 0 \end{cases} \tag{11}$$

The water self-sufficiency of a nation relates to the water dependency of a nation in the following simple way:

$$WSS = 1 - WD \tag{12}$$

The level of water self-sufficiency *WSS* denotes the national capability of supplying the water needed for the production of the domestic demand for goods and services. Self-sufficiency is hundred per cent if all the water needed is available and indeed taken from within the own territory. Water self-sufficiently approaches zero if a country heavily relies on virtual water imports.

3. Data sources

Data on crop water requirements are calculated with FAO's CropWat model for Windows, which is available through the web site of FAO (www.fao.org). The CropWat model uses the FAO Penman-Monteith equation for calculating reference crop evapotranspiration as described in the previous chapter (Clarke *et al*., 1998). The CropWat model calculates crop water requirement of different crop types on the basis of the following assumptions:

(1) Crops are planted under optimum soil water conditions without any effective rainfall during their life; the crop is developed under irrigation conditions.
(2) Crop evapotranspiration under standard conditions (ET_c), this is the evapotranspiration from disease-free, well-fertilised crops, grown in large fields with 100% coverage.
(3) Crop coefficients are selected depending on the single crop coefficient approach, that means single cropping pattern, not dual or triple cropping pattern.

Climatic data

The climatic data needed as input to CropWat have been taken from FAO's climatic database ClimWat, which is also available through FAO's web site. The ClimWat database contains climatic data for more than hundred countries. For many countries climatic data are available for different climatic stations. As a crude approach, the capital climatic station data have been taken as the country representative. For the countries, where the required climatic input data are not available in ClimWat, the crop water requirement is taken from the guideline of FAO as reported by Gleick (1993) (Appendix IV). Depending on the country, the authors made an estimate somewhere between the minimum and maximum estimate given in the FAO guideline. If still data were lacking, data were taken from a neighbouring country.

Crop parameters

In the crop directory of the CropWat package sets of crop parameters are available for 24 different crops (Table 3.1). The crop parameters used as input data to CropWat are: the crop coefficients in different crop development stages (initial, middle and late stage), the length of each crop in each development stage, the root depth, and the planting date. For the 14 crops where crop parameters are not available in the CropWat package, crop parameters have been based on Allen *et al*. (1998).

Crop yields

Data on crop yields have been taken from the FAOSTAT database, again available through FAO's web site.

Table 3.1. Availability of crop parameters.

Crops for which crop parameters have been taken from FAO's CropWat package			Crops for which crop parameters have been taken from Allen *et al*. (1998)	
Banana	Maize	Sugar beet	Artichoke	Onion dry
Barley	Mango	Sugar cane	Carrots	Peas
Bean dry	Millet	Sunflower	Cauliflower	Rice
Bean green	Oil palm fruit	Tobacco	Citrus	Safflower
Cabbage	Pepper	Tomato	Cucumber	Spinach
Cotton seeds	Potato	Vegetable	Lettuce	Sweet potato
Grape	Sorghum	Watermelon	Oats	
Groundnut	Soybean	Wheat	Onion green	

Global trade in crops

As a source for the global trade in crops, we have used the 1995-1999 data contained in the Personal Computer Trade Analysis System (PC-TAS), a cd-rom produced by the United Nations Statistics Division (UNSD) in New York in collaboration with the International Trade Centre (ITC) in Geneva. These data are based on the Commodity Trade Statistics Data Base (COMTRADE) of the UNSD. Every year individual countries supply the UNSD with their annual international trade statistics, detailed by commodity and partner country. These data are processed into a standard format with consistent coding and valuation. Commodities are classified according the Harmonised System (HS) classification of the World Customs Organization.

Link between two crop classifications

Specific water demand is calculated for 38 crop types as distinguished by the FAO in CropWat. The Harmonised System (HS) classification used in the COMTRADE database is a much more detailed classification. For our purpose we therefore have to link the two classifications, which has been done as shown in Table 3.2.

Table 3.2. The link between FAO's crop types and the Harmonised System classification.

FAO crop types	**Commodities in the Harmonised System classification**
Artichoke	Global artichoke, fresh or chilled
Banana	Banana, including plantains
Barley	Barley
Bean dry	Bean dried
	Bean, small red, dried
Bean green	Bean, frozen
	Bean, shelled or unshelled, fresh or chilled
Cabbage	Cabbage lettuce, fresh or chilled
	Cabbages, konrabi
Carrots	Carrot, fresh or chilled
Cauliflower	Cauliflower and headed broccoli, fresh or chilled
Citrus	Citrus fruit, fresh or dried
	Grapefruit, fresh or chilled

FAO crop types	Commodities in the Harmonised System classification
Cotton seeds	Cotton seed, whether or not broken
Cucumber	Cucumber and gherkins provisionally preserved but not immediately consumption
	Cucumber and gherkins, fresh or chilled
Sorghum	Grain sorghum
Grape	Grape dried
	Grape fresh
Groundnut	Groundnut in shell whether or not broken
	Groundnuts in shell or roasted
Lettuce	Lettuce, fresh or chilled
Maize	Maize (corn)
Millet	Millet
Oats	Oats
Onion dry	Onion dried, but not further prepared
Onion green	Onion and shallots, fresh or chilled
	Onion, provisionally preserved
Oil palm fruit	Palm nut
Peas	Peas, dried, shelled
	Peas, frozen
	Peas, shelled or unshelled, fresh or chilled
Pepper	Pepper of the genius capsuis
Potato	Potato, fresh or chilled
	Potatoes, frozen
Sugar beet	Raw sugar beet
Sugar cane	Raw sugar can
Rice	Rice, broken
	Rice, husked, (brown)
	Rice, in the husk (paddy or rough)
Safflower	Safflower seed, whether or not broken
Soybean	Soybean
Spinach	Spinach, N-Z spinach orache spinach
Sunflower	Sunflower seed
Sweet potato	Sweet potatoes, fresh or dried
Tobacco	Tobacco, unmanufactured, not stemmed
	Tobacco, unmanufactured, partly or wholly stemmed
Tomato	Tomatoes, fresh or chilled
Vegetable	Vegetable, fresh or chilled
	vegetable, frozen
Wheat	Wheat
	Durum wheat
	Buck wheat

4. Specific water demand per crop type per country

The calculated crop water requirements for different crops in different countries are shown in Appendix I. The crop water requirements as calculated here refer to the evapotranspiration under optimal growth conditions (see Chapter 3). This means that the calculated values are overestimates, because in reality there are often water shortage conditions. On the other hand, the calculated values can also be seen as conservative, because they exclude inevitable losses (e.g. during transport and application of water) and required losses such as drainage. The calculated crop water requirements differ considerably over countries, which is mainly due to the differences in climatic conditions.

Data on actual crop yields in the year 1999 have been retrieved from the FAOSTAT database. The data, which are country averages, are shown in Appendix II. Where country specific crop yield data are lacking in FAOSTAT, regional averages have been taken. The values that have been assessed in this way are presented in grey-shadow cells in Appendix II. The differences between countries are here even larger than in the case of the crop water requirements. This is due to the impact of the human factor on the actual crop yields.

Specific water demand (m^3/ton) per crop type has been calculated for different countries by dividing the crop water requirement (m^3/ha) by the crop yield (ton/ha). The results are shown in Appendix III. Because both crop water requirements and crop yields strongly vary between countries, specific water demands vary as well.

It is noted here that the specific water demand data for 1999 will be used to calculate the virtual water trade flows in the whole period 1995-1999 (see Chapter 5). This is acceptable because country crop yield data appear not to vary considerably over years.

5. Global trade in virtual water

5.1. International trade in virtual water

5.1.1. Overview of international virtual water trade

The calculation results show that the global volume of crop-related virtual water trade between nations was 695 Gm^3/yr in average over the period 1995-1999. For comparison: the global water withdrawal for agriculture (water use for irrigation) was about 2500 Gm^3/yr in 1995 and 2600 Gm^3/yr in 2000 (Shiklomanov, 1997, p.61). Taking into account the use of rainwater by crops as well, the total water use by crops in the world has been estimated at 5400 Gm^3/yr (Rockström and Gordon, 2001, p.847). This means that 13% of the water used for crop production in the world is not used for domestic consumption but for export (in virtual form). This is the global percentage; the situation strongly varies between countries.

Considering the period 1995-1999, the top-5 list of countries with net virtual water export is: 1st. United States, 2nd. Canada, 3rd. Thailand, 4th. Argentina, and 5th. India. The top-5 list of countries in terms of net virtual water import for the same period is: 1st. Sri Lanka, 2nd. Japan, 3rd. Netherlands, 4th. Republic of Korea, and 5th. China. Top-30 lists are given in Table 5.1. The ranking lists do not considerably change if we look into particular years within the five-year period 1995-1999.

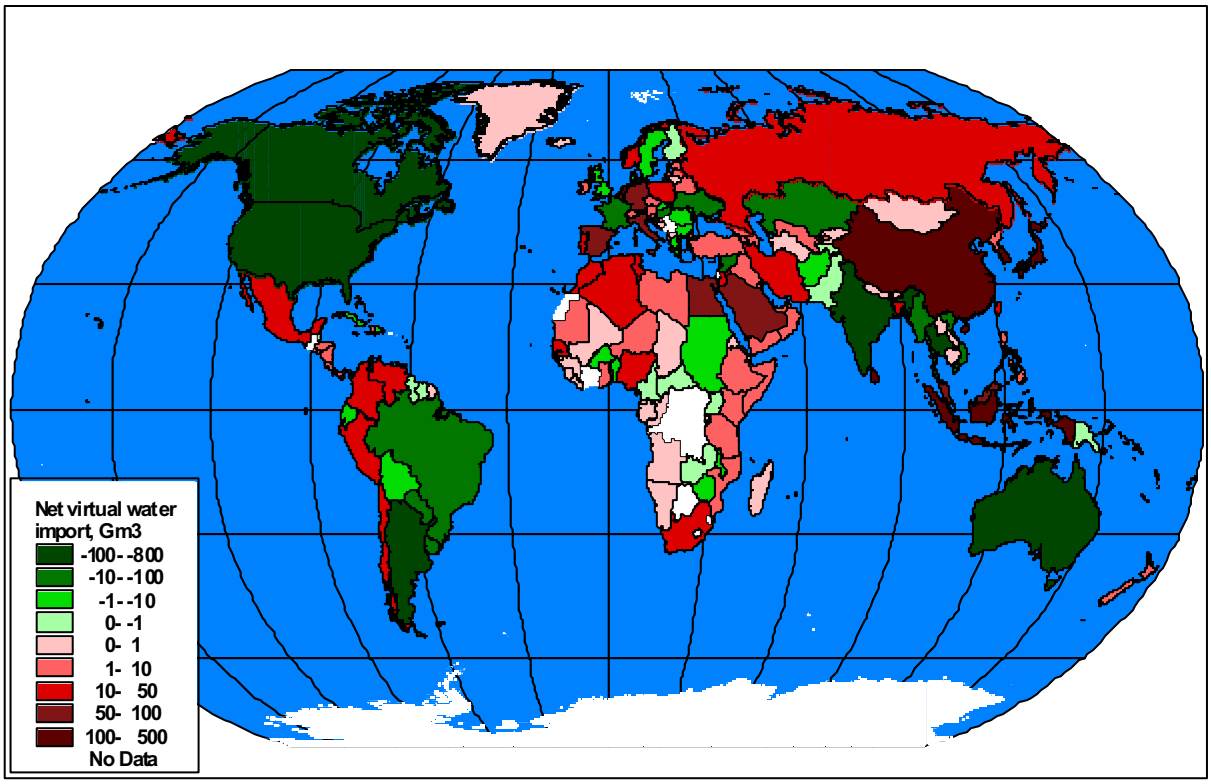


Figure 5.1. National virtual water trade balances over the period 1995-1999.
Green coloured countries have net virtual water export. Red coloured countries have net virtual water import.

National virtual water trade balances over the period 1995-1999 are shown in the coloured world map of Figure 5.1. Countries with net virtual water export are green and countries with net virtual water import are red. Appendix V presents the complete set of calculated data with respect to gross import, gross export and net import of virtual water for all countries of the world for the years 1995 up to 1999.

Some countries have net export of virtual water over the period 1995-1999, but net import of virtual water in one or more particular years in this period (Table 5.2). There are also countries that show the reverse (Table 5.3).

Table 5.1. Top-30 of virtual water export countries and top-30 of virtual water import countries (over 1995-1999).

Country	Net export volume (10^9 m^3)		Country	Net import volume (10^9 m^3)
United States	758.3	1	Sri Lanka	428.5
Canada	272.5	2	Japan	297.4
Thailand	233.3	3	Netherlands	147.7
Argentina	226.3	4	Korea Rep.	112.6
India	161.1	5	China	101.9
Australia	145.6	6	Indonesia	101.7
Vietnam	90.2	7	Spain	82.5
France	88.4	8	Egypt	80.2
Guatemala	71.7	9	Germany	67.9
Brazil	45.0	10	Italy	64.3
Paraguay	42.1	11	Belgium	59.6
Kazakhstan	39.2	12	Saudi Arabia	54.4
Ukraine	31.8	13	Malaysia	51.3
Syria	21.5	14	Algeria	49.0
Hungary	19.8	15	Mexico	44.9
Myanmar	17.4	16	Taiwan	35.2
Uruguay	12.1	17	Colombia	33.4
Greece	9.8	18	Portugal	31.1
Dominican Republic	9.7	19	Iran	29.1
Romania	9.1	20	Bangladesh	28.7
Sudan	5.8	21	Morocco	27.7
Bolivia	5.3	22	Peru	27.1
Saint Lucia	5.2	23	Venezuela	24.6
United Kingdom	4.8	24	Nigeria	24.0
Burkina Faso	4.5	25	Israel	23.0
Sweden	4.2	26	Jordan	22.4
Malawi	3.8	27	South Africa	21.8
Dominica	3.1	28	Tunisia	19.3
Benin	3.0	29	Poland	18.8
Slovakia	3.0	30	Singapore	16.9

Table 5.2. Countries with net export of virtual water in the period 1995-1999 that have however net import in particular years. A 'minus' indicates a negative virtual water trade balance (i.e. net export of virtual water). A 'plus' indicates a positive virtual water trade balance (i.e. net import of virtual water).

Country	1995	1996	1997	1998	1999
Brazil	-	+	-	-	-
Syria	-	-	-	-	+
Greece	-	-	-	+	-
Sudan	-	+	+	+	-
United Kingdom	+	+	-	+	+
Burkina Faso	-	+	+	-	-
Benin	+	-	-	-	-
Slovakia	-	-	+	-	-
Ecuador	-	-	-	+	-
Bulgaria	-	+	+	-	-
Cuba	+	-	-	+	-
Finland	-	-	-	-	+
Yugoslavia	-	-	+	-	-
Uganda	-	-	+	+	+
Papua N. Guinea	-	-	+	-	+
Bahamas	+	-	-	-	-
Montserrat	-	-	-	-	+
Tajikistan	+	-	-	-	-
Cameroon	-	-	+	+	-
Martinique	-	+	+	+	+
Pakistan	-	-	+	-	+
Solomon Islands	-	+	-	+	+
Central Africa	-	+	-	+	-
Samoa	-	-	-	+	-
Wallis Island	-	+	+	+	+

Table 5.3. Countries with net import of virtual water in the period 1995-1999 that have however net export in particular years. A 'minus' indicates a negative virtual water trade balance (i.e. net export of virtual water). A 'plus' indicates a positive virtual water trade balance (i.e. net import of virtual water).

Country	1995	1996	1997	1998	1999
St. Kitts & Nevis	-	+	-	+	+
Guinea Bissau	+	+	-	-	+
Burundi	+	+	-	+	+
Tonga	+	+	-	+	+
Mongolia	-	+	+	+	+
Nepal	+	+	+	-	+
Kyrgyzstan	+	+	-	-	-

Country	1995	1996	1997	1998	1999
Macedonia	-	+	+	+	+
Lithuania	+	+	+	-	-
Bermuda	+	+	+	-	-
Bahrain	+	+	+	+	+
Gambia	+	+	+	-	+
Bosnia	+	-	+	+	+
Madagascar	+	-	-	+	+
George	+	+	+	+	-
Croatia	-	-	+	+	+
Nicaragua	+	+	-	+	+
Uzbekistan	+	+	+	+	-
Czech Republic	-	+	+	+	-
Philippines	-	-	+	+	+
Russian Fed.	-	-	+	-	+
Mexico	+	+	-	+	+

5.1.2. Virtual water trade balance per country

In this section we present the virtual water trade balances of a few selected countries. For each country, we give the annual balances for the individual years 1995-1999 and the overall five-year balance. Figures 5.2-5.11 show the virtual water trade balances for the ten biggest net export countries: United States, Canada, Thailand, Argentina, India, Australia, Vietnam, France, Guatemala and Brazil. Figures 5.12-5.21 show the balances for the ten biggest net import countries: Sri Lanka, Japan, Netherlands, Korea Rep., China, Indonesia, Spain, Egypt, Germany and Italy. The Figures 5.22-5.29 show the balances for a few other countries which have been chosen a bit arbitrarily. For the balances of those countries that are not shown here, the reader is referred to the data in Appendix V.

It is not the intention of this report to make an in-depth analysis and interpretation of the calculated national virtual water trade balances. Instead, we limit ourselves here to make just a few observations. First, the data show that developed countries generally have a more stable virtual water trade balance than the developing countries. Peak years in virtual water export were for instance found for Thailand, India, Vietnam, Guatemala and Syria. The opposite, the occurrence of peak years with relatively high virtual water import, was found for Sri Lanka and Jordan.

Second, we see that countries that are relatively close to each other in terms of geography and development level can have a rather different virtual water trade balance. While European countries such as the Netherlands, Belgium, Germany, Spain and Italy import virtual water in the form of crops, France exports a large amount of virtual water. In the Middle East we see that Syria has net export of virtual water related to crop trade, but Jordan and Israel have net import. In Southern Africa, Zimbabwe and Zambia had net export in the period 1995-

1999, but South Africa had net import. [It should be noted that the trade balance of Zimbabwe has recently turned due to the recent political and economic developments.] In the regions of the Former Soviet Union, countries such as Kazakhstan and the Ukraine have net export of virtual water, but the Russian Federation has net import.

It is hard to put the data presented here in the context of earlier studies, for the simple reason that few quantitative studies into virtual water trade between nations have been carried out. A few interesting studies have been done for the Middle East and Africa (Allan, 1997, 2001; Wichelns, 2001; Nyagwambo, 1998; Earle, 2001). One study was done by Buchvald for Israel and is available in Hebrew only. The main results of this study are cited in Yegnes-Botzer (2001). According to Buchvald's estimation Israel exported 377 million m^3 of virtual water in 1999 and imported more than 6900 million m^3. The current study calculates for Israel an export of 700 million m^3 of virtual water in 1999 and an import of 7400 million m^3.

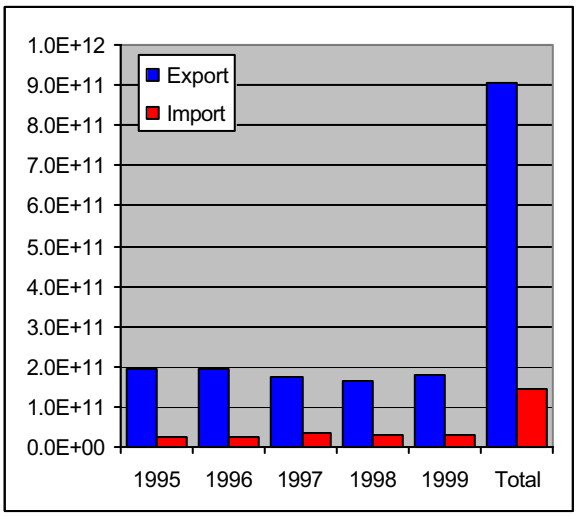


Figure 5.2. Gross virtual water import into and export from the United States in the period 1995-1999 (m^3yr^{-1}).

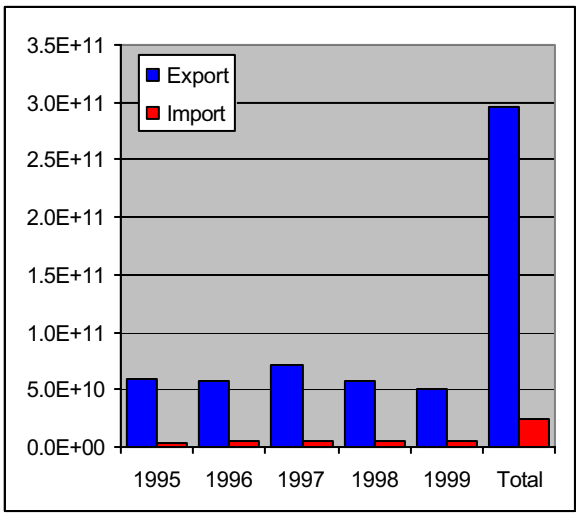


Figure 5.3. Gross virtual water import into and export from Canada in the period 1995-1999 (m^3yr^{-1}).

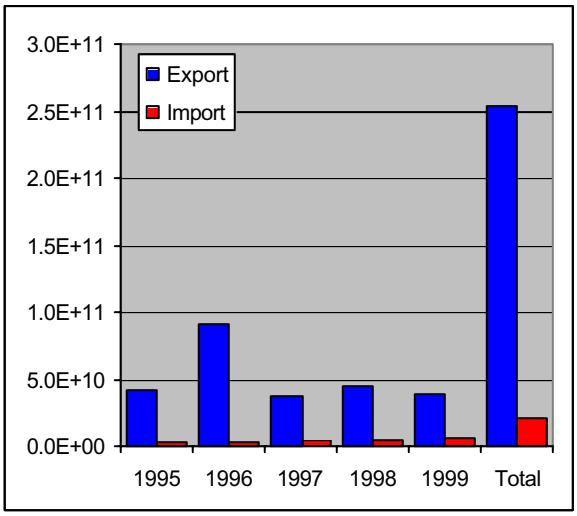


Figure 5.4. Gross virtual water import into and export from Thailand in the period 1995-1999 (m^3yr^{-1}).

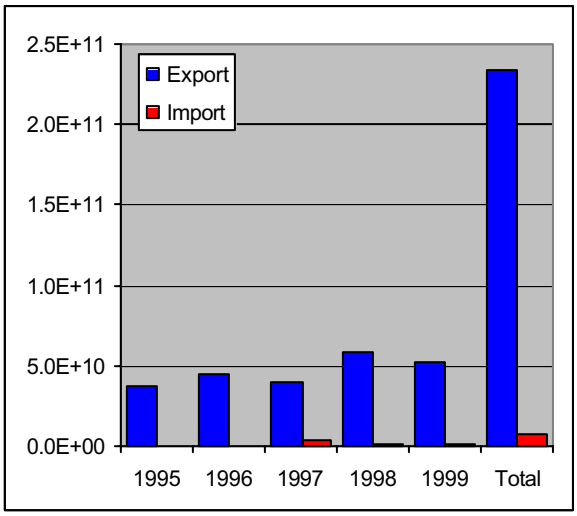


Figure 5.5. Gross virtual water import into and export from Argentina in the period 1995-1999 (m^3yr^{-1}).

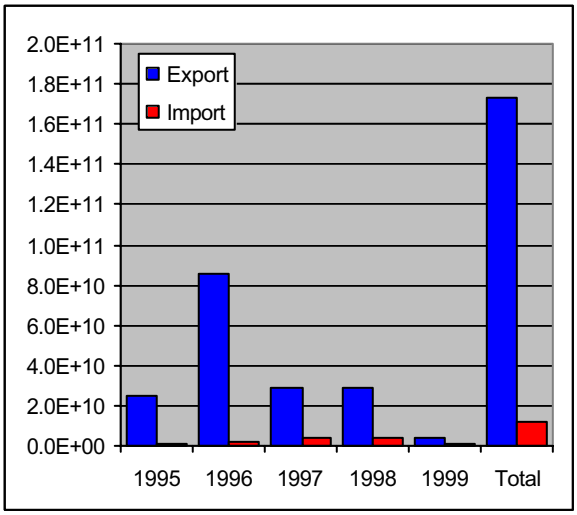


Figure 5.6. Gross virtual water import into and export from India in the period 1995-1999 (m^3yr^{-1}).

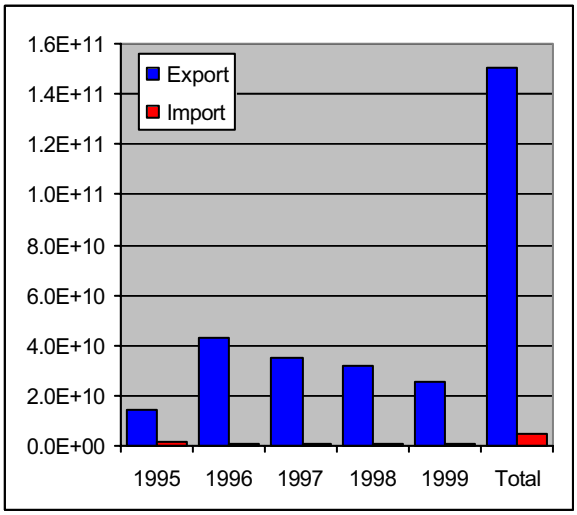


Figure 5.7. Gross virtual water import into and export from Australia in the period 1995-1999 (m^3yr^{-1}).

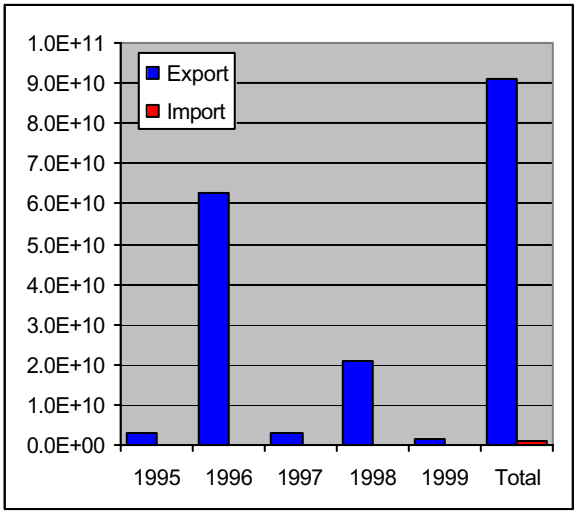


Figure 5.8. Gross virtual water import into and export from Vietnam in the period 1995-1999 (m^3yr^{-1}).

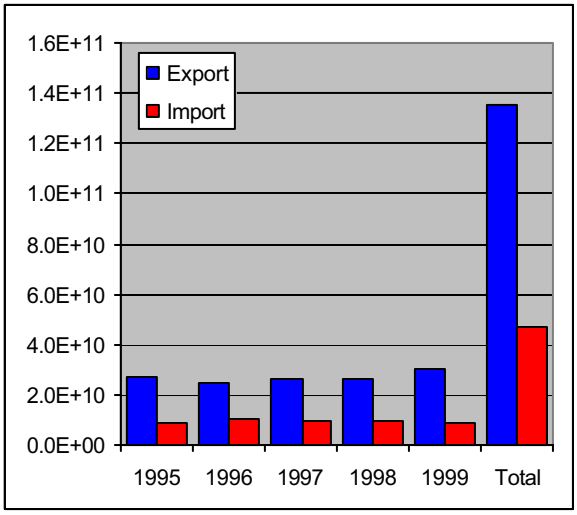


Figure 5.9. Gross virtual water import into and export from France in the period 1995-1999 (m^3yr^{-1}).

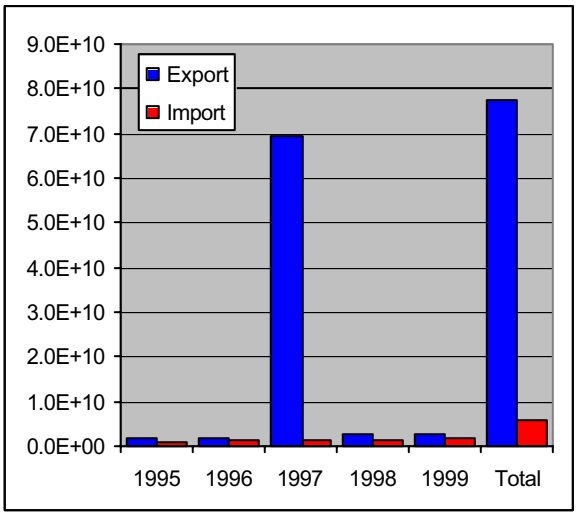


Figure 5.10. Gross virtual water import into and export from Guatemala in the period 1995-1999 (m^3yr^{-1}).

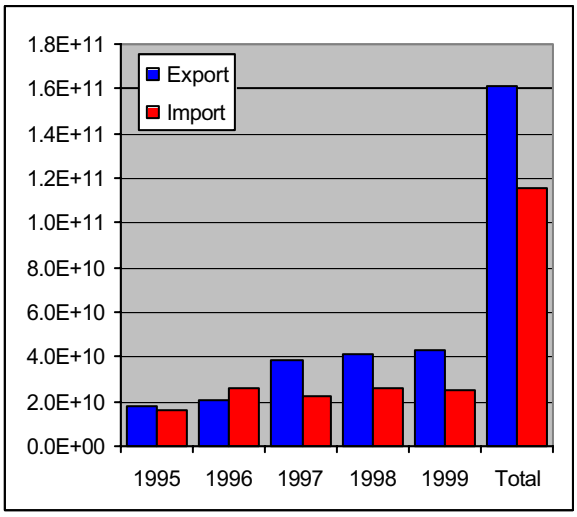


Figure 5.11. Gross virtual water import into and export from Brazil in the period 1995-1999 (m^3yr^{-1}).

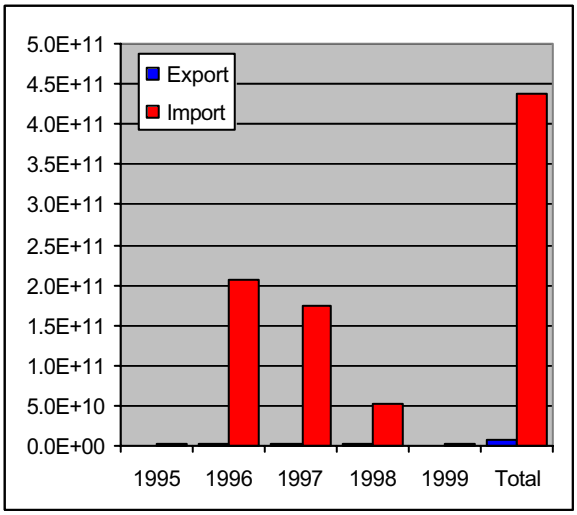


Figure 5.12. Gross virtual water import into and export from Sri Lanka in the period 1995-1999 (m^3yr^{-1}).

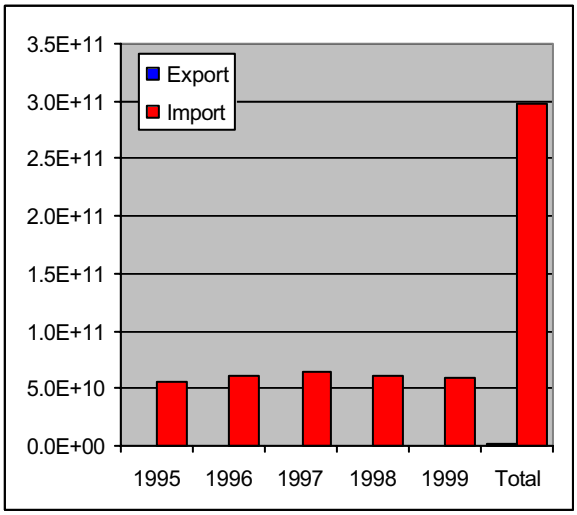


Figure 5.13. Gross virtual water import into and export from Japan in the period 1995-1999 (m^3yr^{-1}).

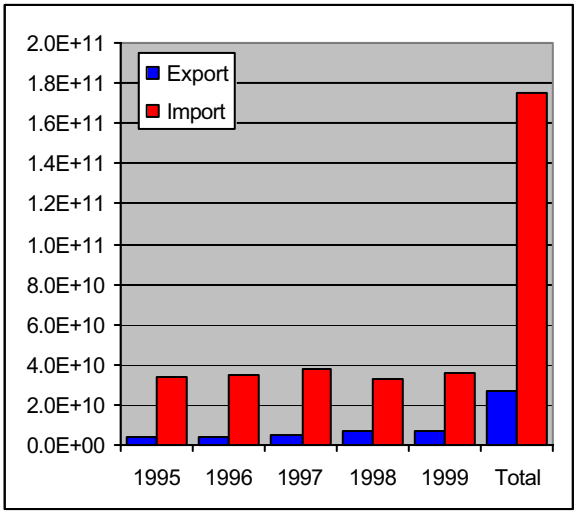


Figure 5.14. Gross virtual water import into and export from the Netherlands in the period 1995-1999 (m^3yr^{-1}).

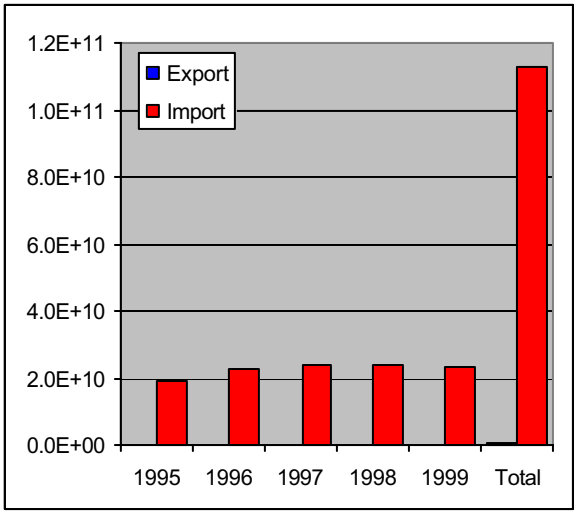


Figure 5.15. Gross virtual water import into and export from the Korea Republic in the period 1995-1999 (m^3yr^{-1}).

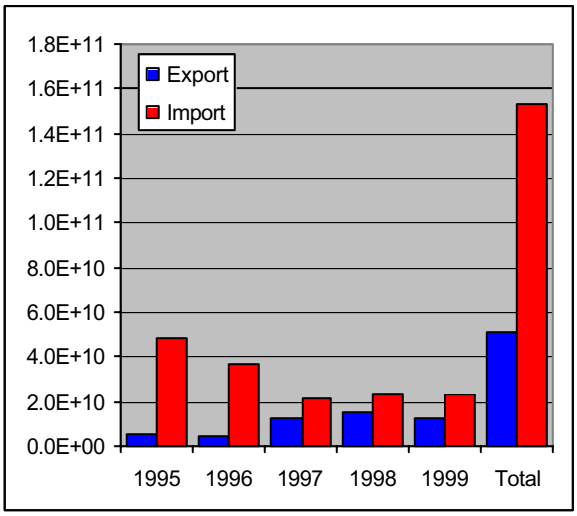


Figure 5.16. Gross virtual water import into and export from China in the period 1995-1999 (m^3yr^{-1}).

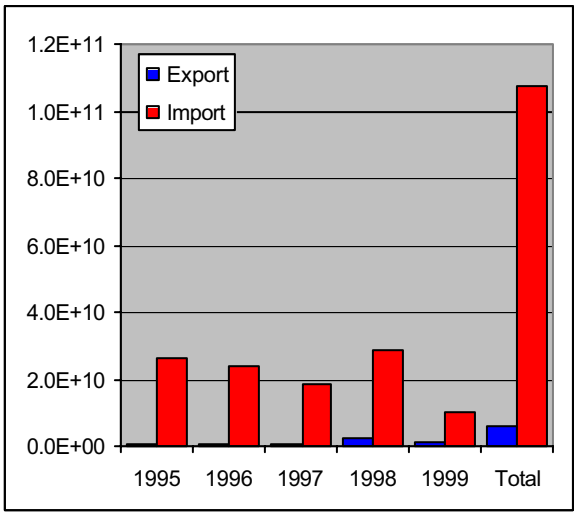


Figure 5.17. Gross virtual water import into and export from Indonesia in the period 1995-1999 (m^3yr^{-1}).

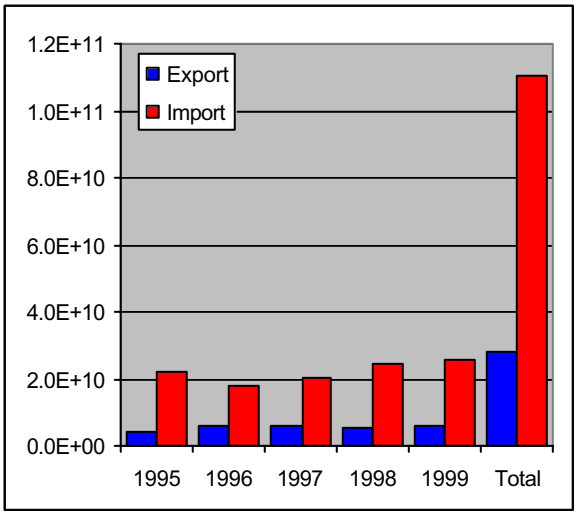


Figure 5.18. Gross virtual water import into and export from Spain in the period 1995-1999 (m^3yr^{-1}).

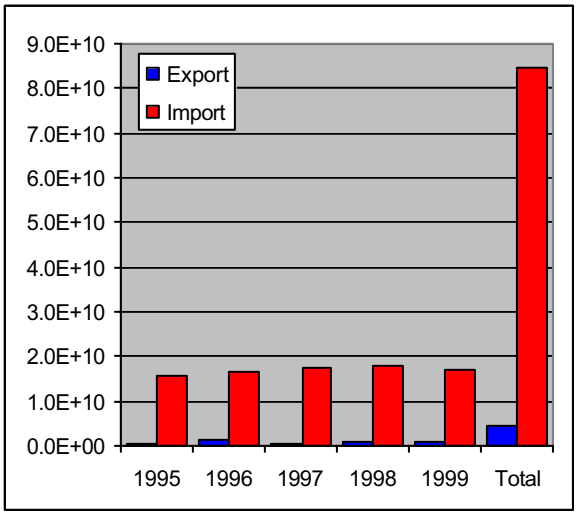


Figure 5.19. Gross virtual water import into and export from Egypt in the period 1995-1999 (m^3yr^{-1}).

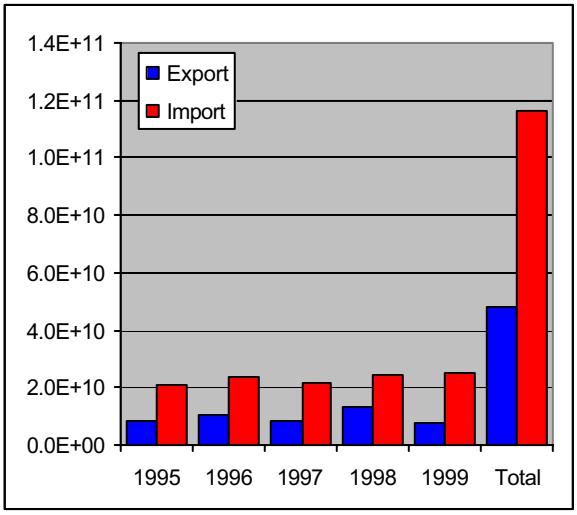


Figure 5.20. Gross virtual water import into and export from Germany in the period 1995-1999 (m^3yr^{-1}).

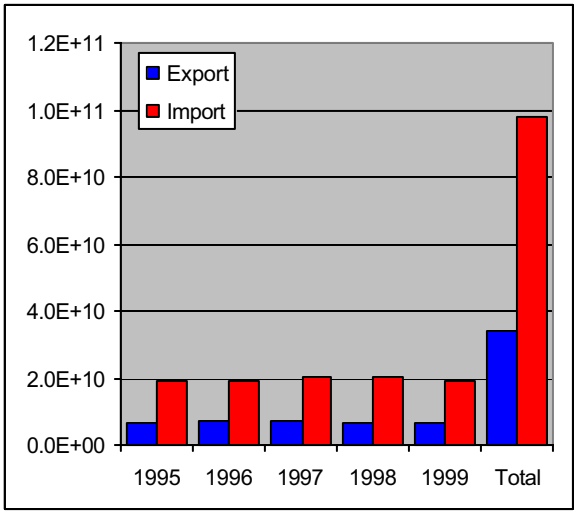


Figure 5.21. Gross virtual water import into and export from Italy in the period 1995-1999 (m^3yr^{-1}).

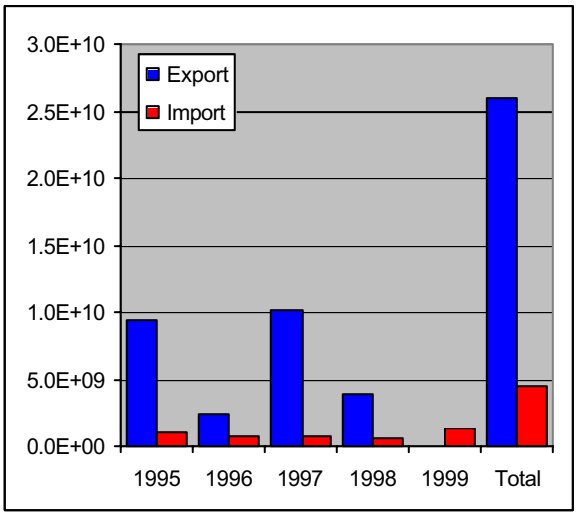


Figure 5.22. Gross virtual water import into and export from Syria in the period 1995-1999 (m^3yr^{-1}).

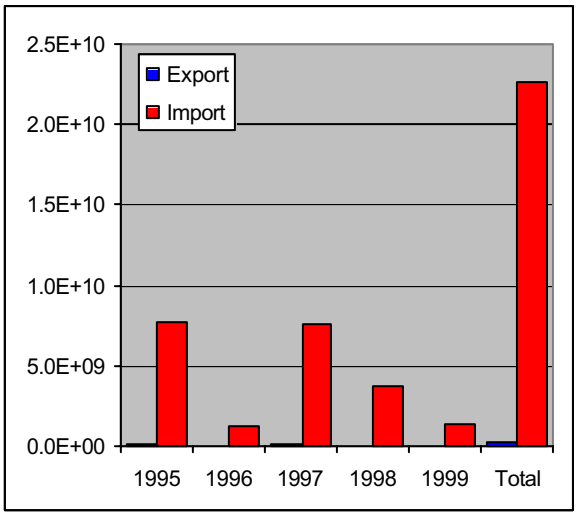


Figure 5.23. Gross virtual water import into and export from Jordan in the period 1995-1999 (m^3yr^{-1}).

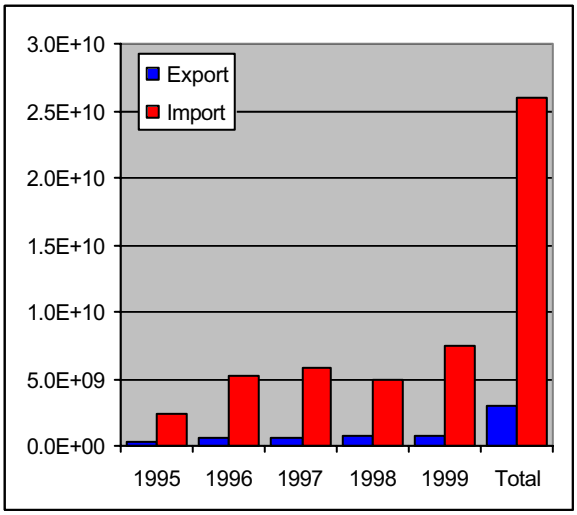


Figure 5.24. Gross virtual water import into and export from Israel in the period 1995-1999 (m^3yr^{-1}).

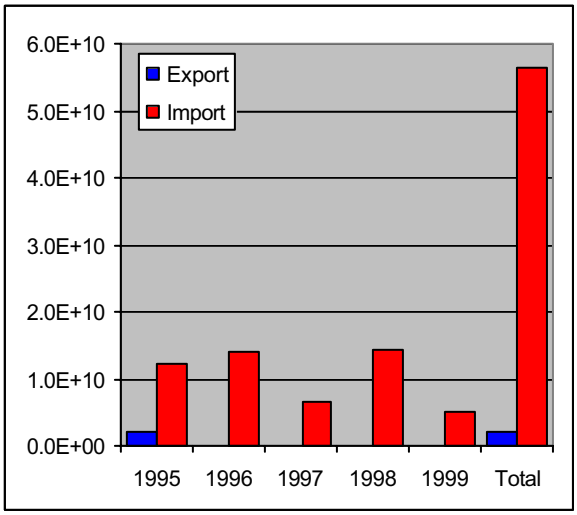


Figure 5.25. Gross virtual water import into and export from Saudi Arabia in the period 1995-1999 (m^3yr^{-1}).

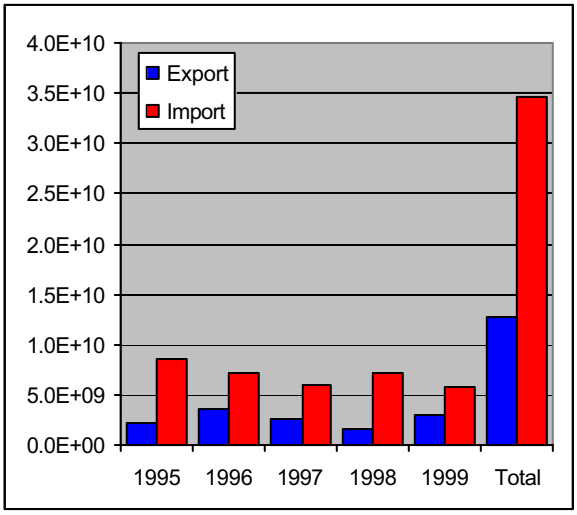


Figure 5.26. Gross virtual water import into and export from South Africa in the period 1995-1999 (m^3yr^{-1}).

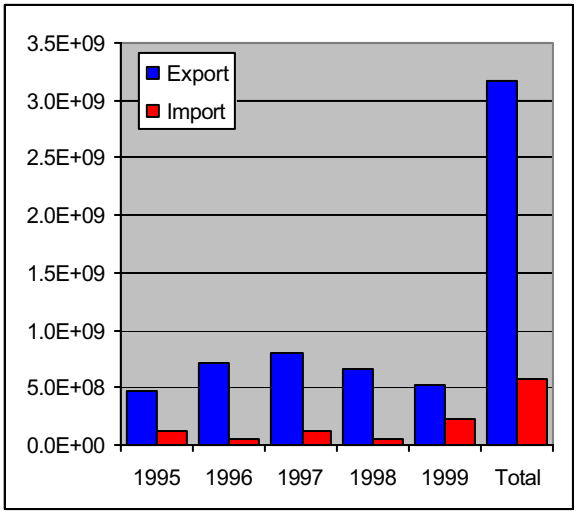


Figure 5.27. Gross virtual water import into and export from Zimbabwe in the period 1995-1999 (m^3yr^{-1}).

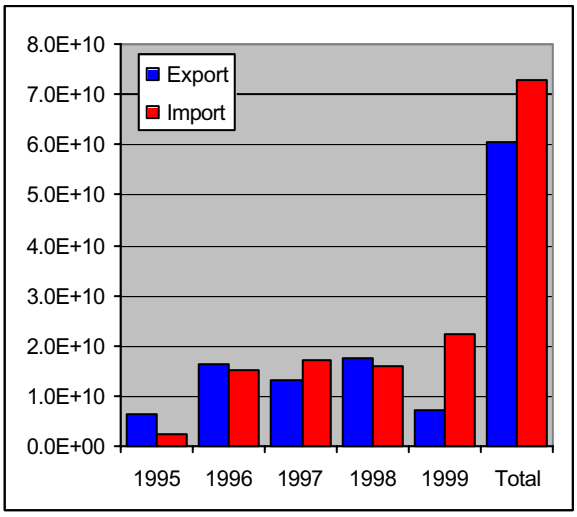


Figure 5.28. Gross virtual water import into and export from the Russian Federation in the period 1995-1999 (m^3yr^{-1}).

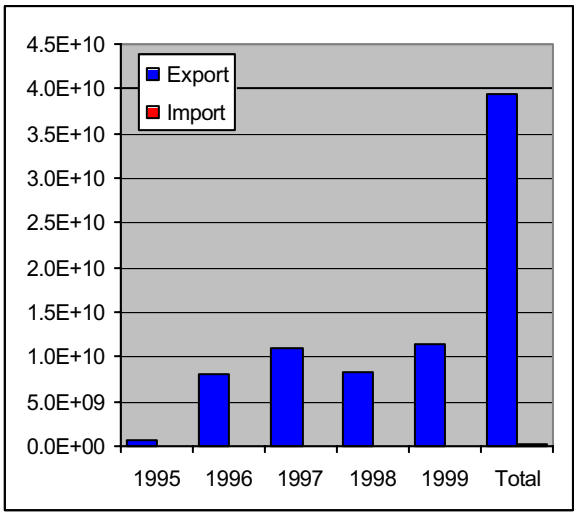


Figure 5.29. Gross virtual water import into and export from Kazakhstan in the period 1995-1999 (m^3yr^{-1}).

5.1.3. International virtual water trade by product

The total volume of crop-related virtual water trade between nations in the period 1995-1999 can for 30% be explained by trade in wheat (Table 5.4). Next come soybeans and rice, which account respectively for 17% and 15% of global crop-related virtual water trade.

Table 5.4. Global virtual water trade between nations by product (Gm^3).

Product	1995	%	1996	%	1997	%	1998	%	1999	%	Total	%
Wheat	181	32.35	215	26.49	254	32.01	203	29.00	197	32.73	1049	30.20
Soybean	103	18.37	108	13.28	125	15.79	122	17.47	135	22.45	593	17.07
Rice	81	14.57	198	24.35	71	8.95	119	16.95	65	10.78	534	15.36
Maize	58	10.40	56	6.93	67	8.51	65	9.22	61	10.14	307	8.85
Raw sugar	9	1.60	68	8.35	119	14.99	42	5.99	13	2.09	250	7.20
Barley	36	6.41	30	3.67	35	4.41	29	4.15	30	5.05	170	4.88
Sunflower	12	2.17	24	2.97	20	2.50	20	2.92	18	2.94	94	2.71
Sorghum	12	2.14	26	3.21	12	1.49	10	1.39	10	1.73	70	2.01
Bananas	11	1.88	16	2.00	15	1.95	15	2.15	11	1.83	68	1.97
Grapes	12	2.07	13	1.64	13	1.65	13	1.87	13	2.24	65	1.86
Oats	9	1.67	10	1.25	11	1.41	9	1.34	10	1.61	50	1.43
Tobacco	5	0.98	10	1.19	11	1.33	13	1.90	7	1.10	46	1.31
Ground-nuts	6	1.10	7	0.84	8	1.02	6	0.90	4	0.70	32	0.91
Peppers	4	0.80	5	0.62	9	1.12	6	0.84	6	1.02	30	0.87
Cotton seeds	5	0.83	5	0.56	5	0.64	6	0.92	7	1.24	28	0.81
Peas	3	0.46	4	0.48	4	0.57	5	0.67	2	0.31	18	0.50
Beans	3	0.47	6	0.68	3	0.35	2	0.36	2	0.38	16	0.45
Potatoes	2	0.40	2	0.26	2	0.31	2	0.33	2	0.37	11	0.33
Onions	2	0.28	3	0.33	2	0.19	2	0.35	1	0.25	10	0.28
Vegetables	1	0.14	1	0.10	1	0.12	4	0.50	1	0.17	7	0.20
Millet	1	0.23	1	0.14	1	0.16	1	0.17	1	0.22	6	0.18
Tomatoes	1	0.14	1	0.12	1	0.13	1	0.17	1	0.19	5	0.15
Palm nuts	1	0.12	1	0.12	1	0.07	1	0.08	0	0.08	3	0.09
Safflower	1	0.12	1	0.09	1	0.08	1	0.09	1	0.09	3	0.09
Cucumbers	0	0.06	1	0.12	1	0.07	0	0.06	0	0.07	3	0.08
Cauliflower	0	0.06	0	0.05	0	0.05	0	0.06	0	0.07	2	0.06
Cabbages	0	0.05	0	0.04	0	0.04	0	0.05	0	0.06	2	0.05
Carrots	0	0.04	0	0.03	0	0.03	0	0.04	0	0.05	1	0.04
Citrus	0	0.04	0	0.03	0	0.02	0	0.01	0	0.01	1	0.02
Artichokes	0	0.02	0	0.01	0	0.01	0	0.01	0	0.02	1	0.01
Lettuce	0	0.01	0	0.01	0	0.01	0	0.01	0	0.02	0	0.01
Sweet potato	0	0.02	0	0.01	0	0.01	0	0.01	0	0.01	0	0.01
Spinach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0	0.00
Grand total	559	100.00	813	100.00	793	100.00	700	100.00	601	100.00	3475	100.00

5.2. Inter-regional trade in virtual water

5.2.1. Inter-regional virtual water trade relations

In order to show virtual water trade between major world regions, the world has been classified into thirteen regions: North America, Central America, South America, Eastern Europe, Western Europe, Central and South Asia, the Middle East, South-east Asia, North Africa, Central Africa, Southern Africa, the Former Soviet Union, and Oceania. A list of countries per world region is given in Appendix VI.

The gross virtual water trade between and within regions in the period 1995-1999 is presented in Table 5.5. The details of the regional trade data are presented in Appendix VII. Net virtual water trade between regions in the period 1995-1999 is presented in Table 5.6 and Figure 5.30. In the figure the largest trade flows are indicated with arrows. The regions that have net import are marked in red colour and the regions that have net export are marked in green colour.

For each world region, a ranking has been made of the most important regions for gross import and gross export of virtual water (Table 5.7). Also a ranking has been made of the most important regions for *net* import and *net* export (Table 5.8).

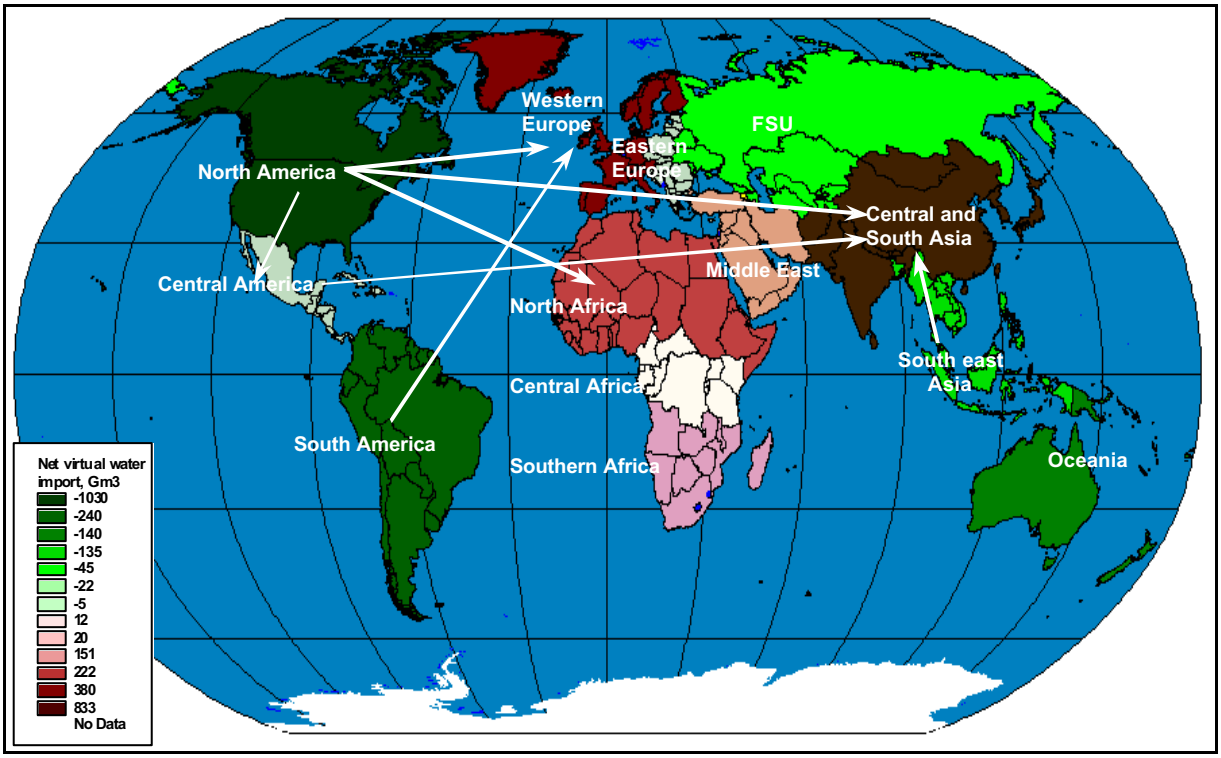


Figure 5.30. Virtual water trade balances of thirteen world regions over the period 1995-1999. Green coloured regions have net virtual water export; red coloured regions have net virtual water import. The arrows show the largest net virtual water flows between regions (>100 Gm3).

Table 5.5. Gross virtual water trade between world regions in the period 1995-1999 (Gm^3). The grey-shaded cells refer to gross trade between countries within *the regions.*

Importer / Exporter	Central Africa	Central America	Central & South Asia	Eastern Europe	Middle East	North Africa	North America	Oceania	FSU	Southern Africa	South America	South-east Asia	Western Europe	Total gross export
Central Africa	1.65	0.00	0.11	0.12	0.07	0.05	0.05	0.02	0.01	0.64	0.00	0.05	1.99	3.11
Central America	0.25	4.62	124.52	0.78	0.43	1.53	40.37	0.01	4.29	0.17	2.45	0.41	14.33	189.52
Central and South Asia	3.53	0.67	100.40	3.07	21.64	13.76	3.32	0.40	9.88	9.44	0.87	64.89	17.77	149.25
Eastern Europe	0.02	0.15	2.82	20.40	10.37	7.56	0.56	0.21	5.23	0.12	0.08	0.55	37.42	65.09
Middle East	0.79	0.13	11.56	2.54	25.65	13.21	2.35	0.82	1.21	0.03	0.48	2.72	18.37	54.21
North Africa	0.13	0.15	2.46	1.14	3.74	2.74	4.18	0.00	0.22	0.43	4.61	0.16	13.79	30.99
North America	2.87	153.24	395.21	9.51	63.77	128.51	82.78	4.02	9.65	9.84	88.67	82.80	170.27	1118.38
Oceania	0.81	0.40	83.26	0.07	9.47	9.31	2.69	2.80	0.06	2.84	3.66	31.56	4.41	148.54
FSU	0.01	0.33	8.00	13.06	29.26	3.07	0.96	0.01	48.68	0.00	0.06	0.40	35.00	90.17
Southern Africa	0.73	0.68	5.38	0.50	0.37	0.42	1.74	0.10	0.26	2.78	1.31	1.21	7.66	20.33
South America	1.63	7.16	62.29	7.83	20.26	18.63	13.37	0.34	4.85	2.75	146.73	16.50	191.21	346.83
South-east Asia	1.81	2.14	226.63	2.56	25.76	31.56	12.97	2.63	5.98	11.81	3.45	87.20	11.08	338.38
Western Europe	2.00	2.26	59.53	18.97	20.20	25.45	5.08	0.15	3.89	2.03	1.59	1.78	250.46	142.95
Total gross import	14.60	167.30	981.76	60.16	205.35	253.06	87.62	8.71	45.53	40.11	107.24	203.03	523.28	2698

Table 5.6. Net virtual water trade between regions in the period 1995-1999 (Gm^3).

Importer / Exporter	Central Africa	Central America	Central & South Asia	Eastern Europe	Middle East	North Africa	North America	Oceania	FSU	Southern Africa	South America	South-east Asia	Western Europe	Total net export
Central Africa		-0.25	-3.43	0.1	-0.73	-0.08	-2.82	-0.79	0	-0.09	-1.63	-1.77	-0.02	-11.51
Central America	0.25		123.84	0.62	0.3	1.38	-112.87	-0.4	3.96	-0.51	-4.71	-1.73	12.07	22.2
Central and South Asia	3.43	-123.84		0.25	10.08	11.31	-391.89	-82.86	1.89	4.06	-61.42	-161.74	-41.76	-832.49
Eastern Europe	-0.1	-0.62	-0.25		7.83	6.42	-8.96	0.14	-7.83	-0.38	-7.75	-2	18.44	4.94
Middle East	0.73	-0.3	-10.08	-7.83		9.47	-61.43	-8.65	-28.05	-0.34	-19.79	-23.04	-1.84	-151.15
North Africa	0.08	-1.38	-11.31	-6.42	-9.47		-124.34	-9.31	-2.86	0.02	-14.02	-31.41	-11.66	-222.08
North America	2.82	112.87	391.89	8.96	61.43	124.34		1.33	8.69	8.1	75.31	69.84	165.19	1030.77
Oceania	0.79	0.4	82.86	-0.14	8.65	9.31	-1.33		0.04	2.74	3.32	28.94	4.26	139.84
FSU	0	-3.96	-1.89	7.83	28.05	2.86	-8.69	-0.04		-0.26	-4.79	-5.57	31.11	44.65
Southern Africa	0.09	0.51	-4.06	0.38	0.34	-0.02	-8.1	-2.74	0.26		-1.44	-10.6	5.62	-19.76
South America	1.63	4.71	61.42	7.75	19.79	14.02	-75.31	-3.32	4.79	1.44		13.05	189.62	239.59
South-east Asia	1.77	1.73	161.74	2	23.04	31.41	-69.84	-28.94	5.57	10.6	-13.05		9.3	135.33
Western Europe	0.02	-12.07	41.76	-18.44	1.84	11.66	-165.19	-4.26	-31.11	-5.62	-189.62	-9.3		-380.33
Total net import	11.51	-22.2	832.49	-4.94	151.15	222.08	-1030.77	-139.84	-44.65	19.76	-239.59	-135.33	380.33	

Table 5.7. Ranking of gross import and gross export regions for each of the thirteen world regions.

Region	Gross import from				Gross export to			
	First	Second	Third	Fourth	First	Second	Third	Fourth
Central Africa	Central and South Asia	North America	Western Europe	South-east Asia	Western Europe	Southern Africa	Eastern Europe	Central and South Asia
North Africa	North America	South-east Asia	Western Europe	South America	Western Europe	South America	North America	Middle East
Southern Africa	South-east Asia	North America	Central and South Asia	Oceania	Western Europe	South and Central Asia	North America	South America
South America	North America	North Africa	South-east Asia	Oceania	Western Europe	Central and South Asia	Middle East	North Africa
Central America	North America	South America	Western Europe	South-east Asia	Central and South Asia	North America	Western Europe	Russian Fed
North America	Central America	Southern Africa	South-east Asia	Western Europe	Central and South Asia	Western Europe	Central America	North Africa
Central Asia	North America	South-east Asia	Central America	Oceania	South-east Asia	Middle East	Western Europe	North Africa
Middle East	North America	Russian Fed	South-east Asia	Central and South Asia	Western Europe	North Africa	Central and South Asia	South-east Asia
South-east Asia	North America	Central and South Asia	Oceania	Southern Africa	Central and South Asia	North Africa	Middle East	North America
Eastern Europe	Western Europe	Russian Fed	North America	South America	Western Europe	Middle East	North Africa	Russian Fed
Western Europe	South America	North America	Eastern Europe	Middle East	Central and South Asia	North Africa	Middle East	Eastern Europe
Oceania	North America	South-east Asia	Middle East	Central and South Asia	Central and South Asia	South-east Asia	Middle East	North Africa
Russian Fed	Central and South Asia	North America	South-east Asia	Eastern Europe	Western Europe	Middle East	Eastern Europe	Central and South Asia

Table 5.8. Ranking of net import and net export regions for each of the thirteen world regions.

Region	Net import from				Net export to			
	First	Second	Third	Fourth	First	Second	Third	Fourth
Central Africa	Central and South Asia	North America	South-east Asia	South America	Eastern Europe			
North Africa	North America	South-east Asia	South America	Western Europe	Central Africa			
Southern Africa	South-east Asia	North America	Central and South Asia	Oceania	Western Europe	Central America	Eastern Europe	Middle East
South America	North America	Oceania			Western Europe	Central and South Asia	Middle East	North Africa
Central America	North America	South America	South-east Asia	Southern Africa	Central and South Asia	Western Europe	Russian Fed	
North America					Central and South Asia	Western Europe	North Africa	Central Africa
Central and South Asia	North America	South-east Asia	Central America	Oceania	North Africa	Middle East	Southern Africa	Central Africa
Middle East	North America	Russian Fed	South-east Asia	South America	North Africa	Central Africa		
South-east Asia	North America	Oceania	South America	Ocean	Central and South Asia	North Africa	Middle East	Southern Africa
Eastern Europe	North America	Russian Fed	South America	South-east Asia	Western Europe	Middle East	North Africa	Oceania
Western Europe	South America	North America	Russian Fed	Eastern Europe	Central and South Asia	North Africa	Middle East	Central Africa
Ocean	North America				Central and South Asia	South-east Asia	North Africa	Middle East
Russian Fed	North America	South-east Asia	South America	Central America	Western Europe	Middle East	Eastern Europe	North Africa

5.2.2. Virtual water trade balance per world region

The virtual water trade balances of the thirteen world regions are shown in Figures 5.31a and 5.31b. The former shows the *gross* import and export of virtual water for each region. The latter shows the difference between the two, the *net* import, which is positive in some cases and negative in others.

Regions with a significant net virtual water import are: Central and South Asia, Western Europe, North Africa, and the Middle East. Two other regions with net virtual water import, but less substantial, are Southern Africa and Central Africa. Regions with substantial net virtual water export are: North America, South America, Oceania, and South-east Asia. Three other regions with net virtual water export, but less substantial, are the FSU, Central America and Eastern Europe.

North America is by far the biggest virtual water exporter in the world, while Central and South Asia is by far the biggest virtual water importer. A further ranking of the world regions is given in Table 5.9.

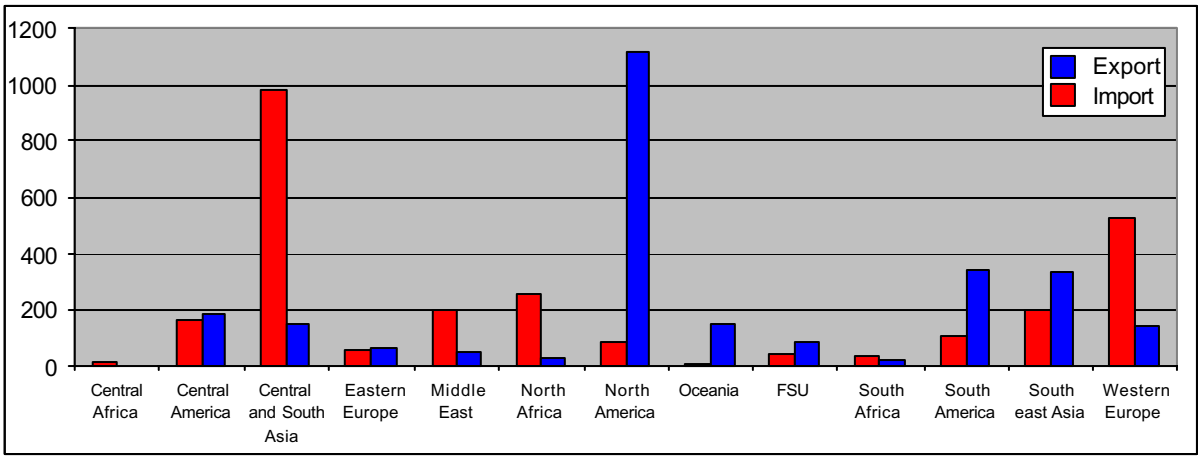


Figure 5.31a. Gross virtual water import and export per region in the period 1995-1999 (Gm^3).

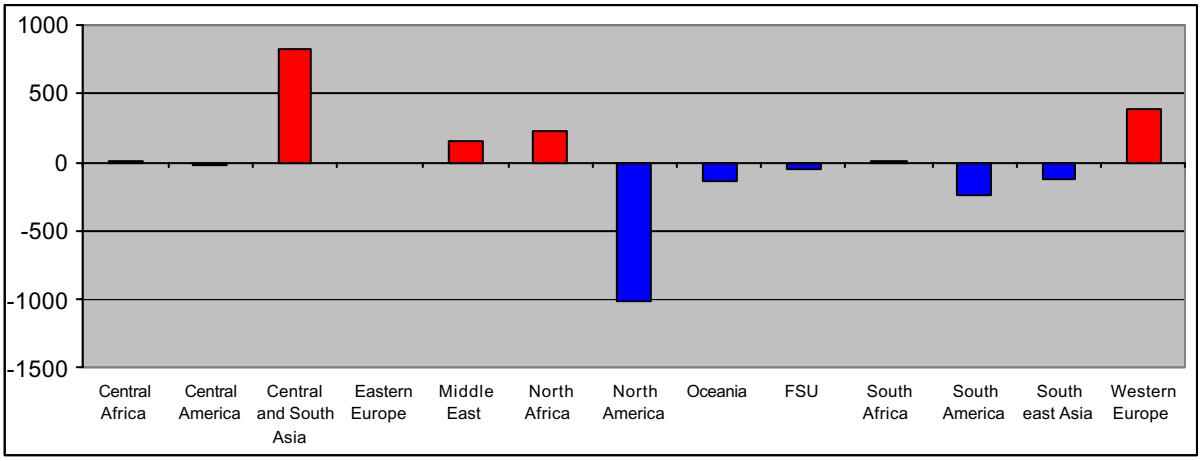


Figure 5.31b. Net virtual water import per region in the period 1995-1999 (Gm^3).

Table 5.9. Ranking of regions in terms of gross virtual water import and gross virtual water export.

Gross virtual water import (1995-1999)		Ranking	Gross virtual water export (1995-1999)	
Region	Gm^3		Region	Gm^3
Central and South Asia	982	1	North America	1118
Western Europe	523	2	South America	347
North Africa	253	3	South-east Asia	338
Middle East	205	4	Central America	190
South-east Asia	203	5	Central and South Asia	149
Central America	167	6	Oceania	149
South America	107	7	Western Europe	143
North America	88	8	FSU	90
Eastern Europe	60	9	Eastern Europe	65
FSU	46	10	Middle East	54
Southern Africa	40	11	North Africa	31
Central Africa	15	12	Southern Africa	20
Oceania	9	13	Central Africa	3

In the remaining part of this section, an overview will be given of the import and export of virtual water for each of the thirteen world regions. Figures 5.32a to 5.44a give the gross virtual water import and export of the thirteen world regions for the period 1995-1999. Figures 5.32b to 5.44b give the *net* virtual water import of the world regions for this period.

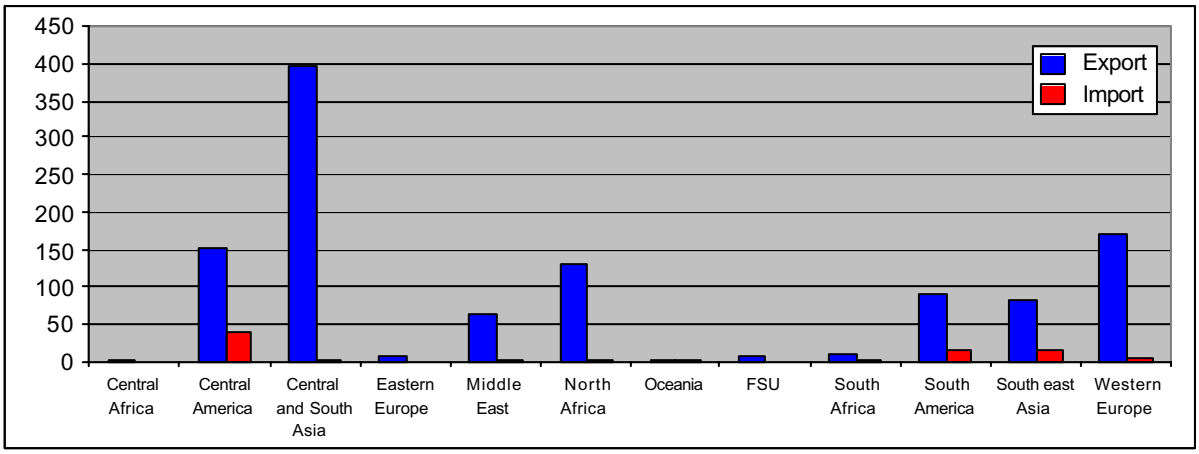


Figure 5.32a. Gross virtual water import and export of North America in the period 1995-1999 (Gm^3).

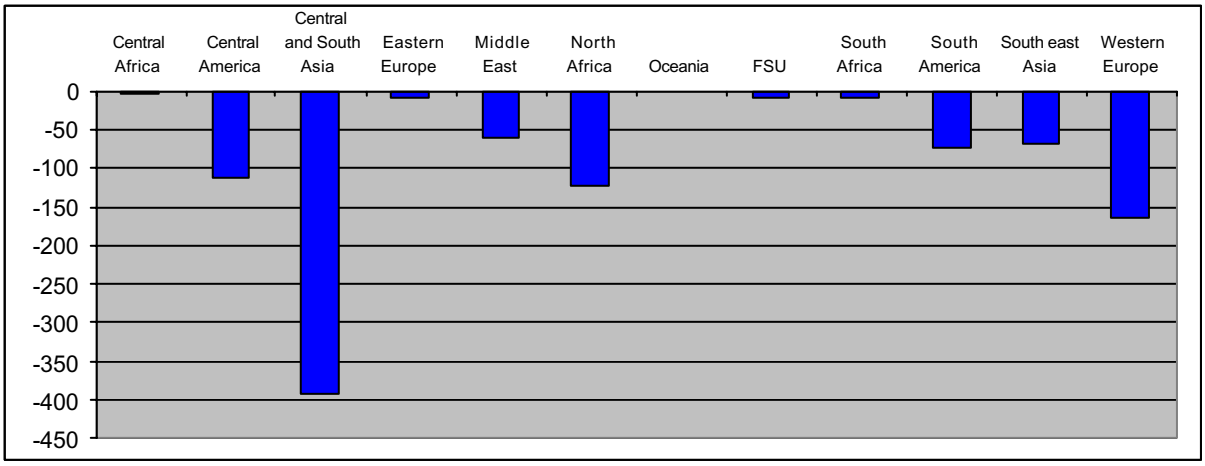


Figure 5. 32b. Net virtual water import of North America in the period 1995-1999 (Gm^3).

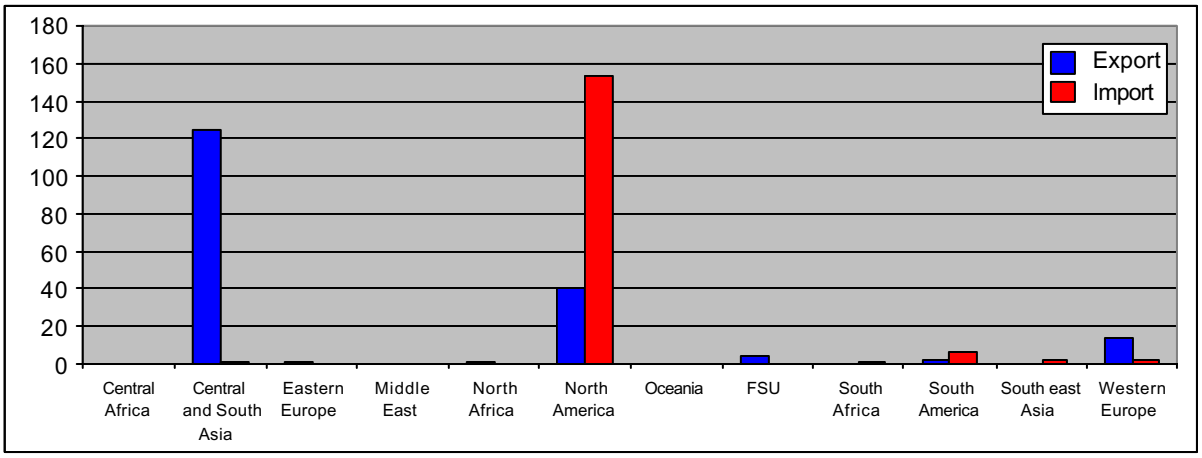


Figure 5.33a. Gross virtual water import and export of Central America in the period 1995-1999 (Gm^3).

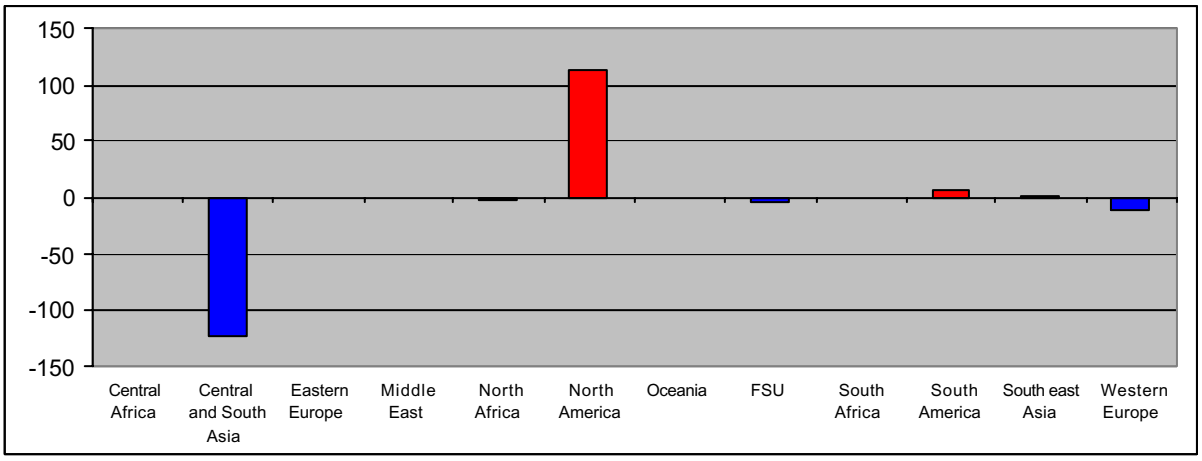


Figure 5.33b. Net virtual water import of Central America in the period 1995-1999 (Gm^3).

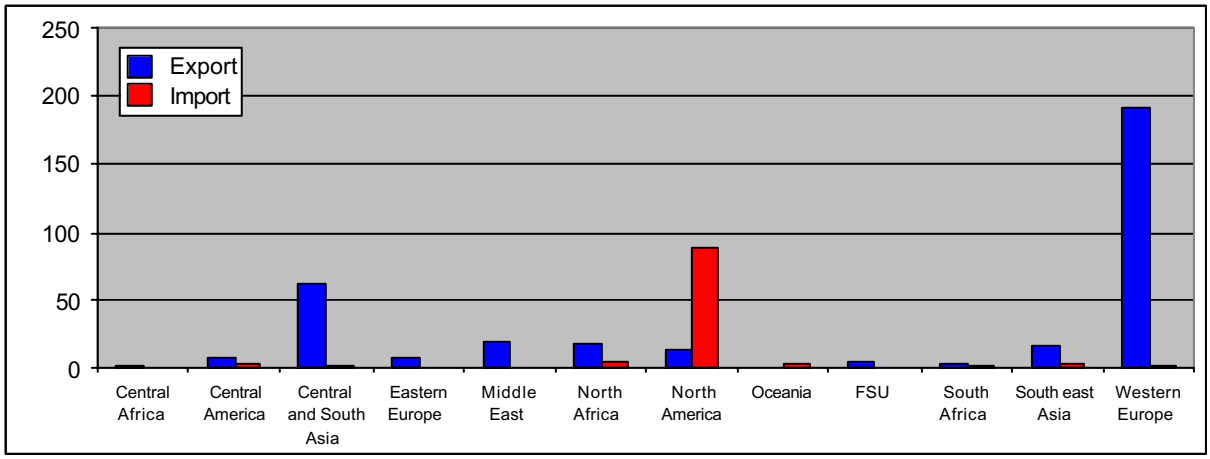


Figure 5.34a. Gross virtual water import and export of South America in the period 1995-1999 (Gm^3).

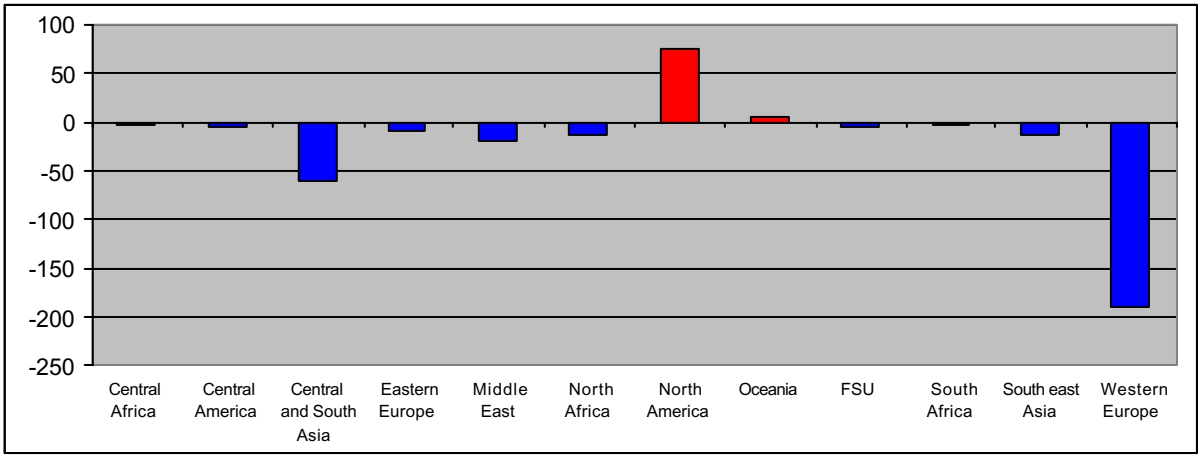


Figure 5.34b. Net virtual water import of South America in the period 1995-1999 (Gm^3).

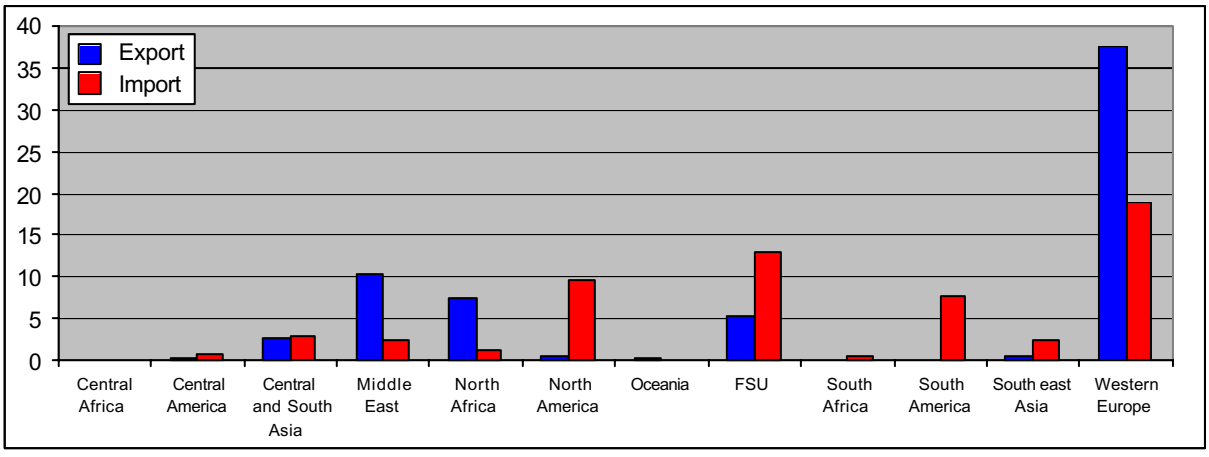


Figure 5.35a. Gross virtual water import and export of Eastern Europe in the period 1995-1999 (Gm^3).

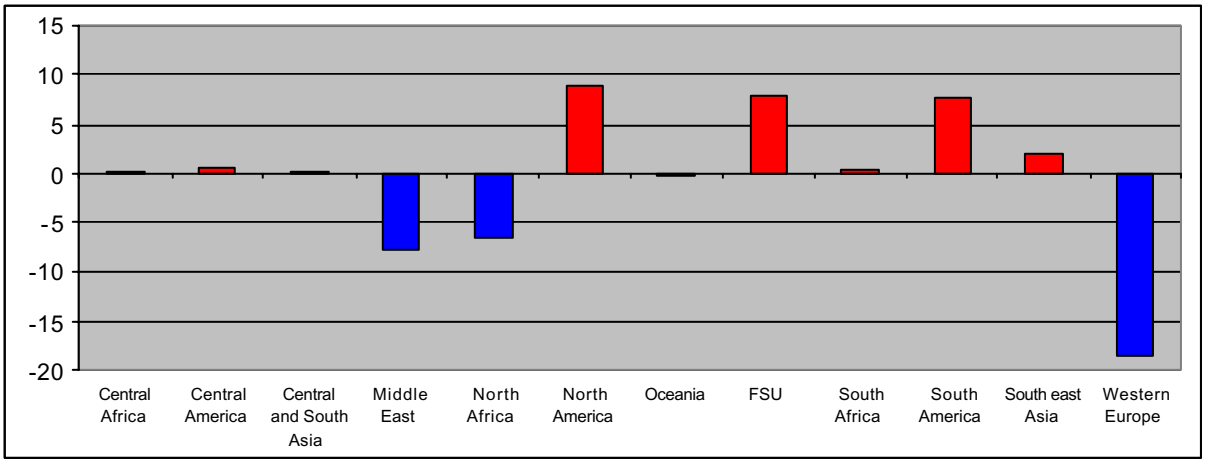


Figure 5.35b. Net virtual water import of Eastern Europe in the period 1995-1999 (Gm^3).

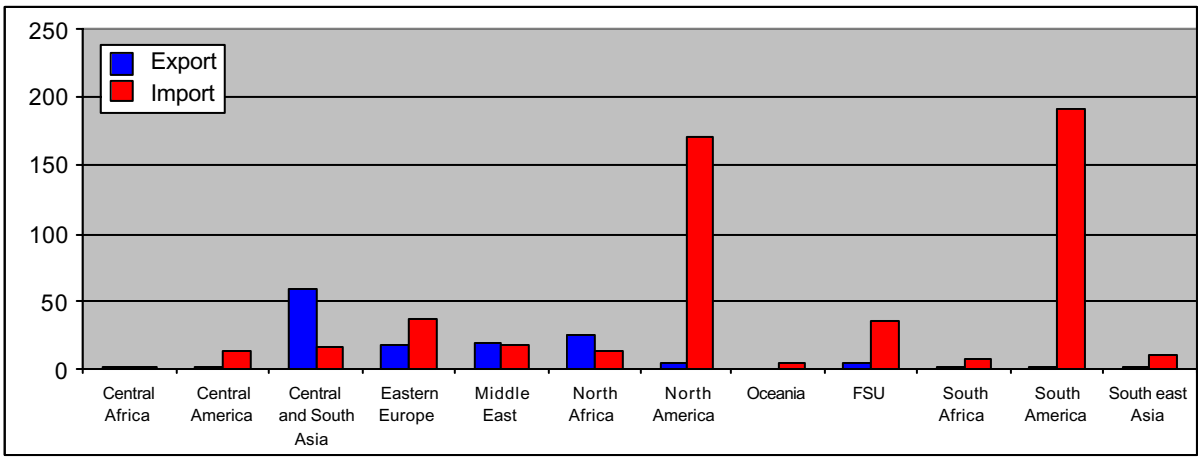


Figure 5.36a. Gross virtual water import and export of Western Europe in the period 1995-1999 (Gm^3).

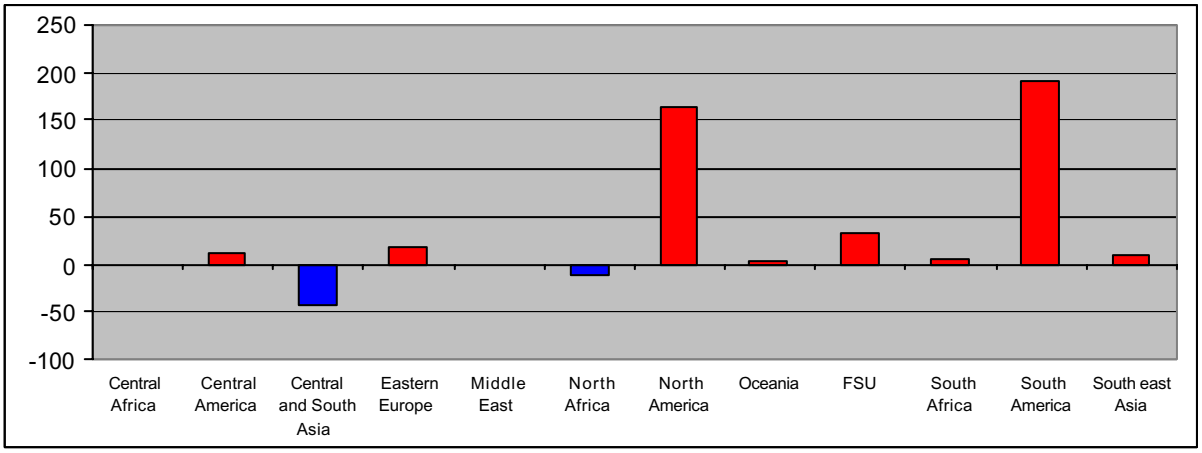


Figure 5.36b. Net virtual water import of Western Europe in the period 1995-1999 (Gm^3).

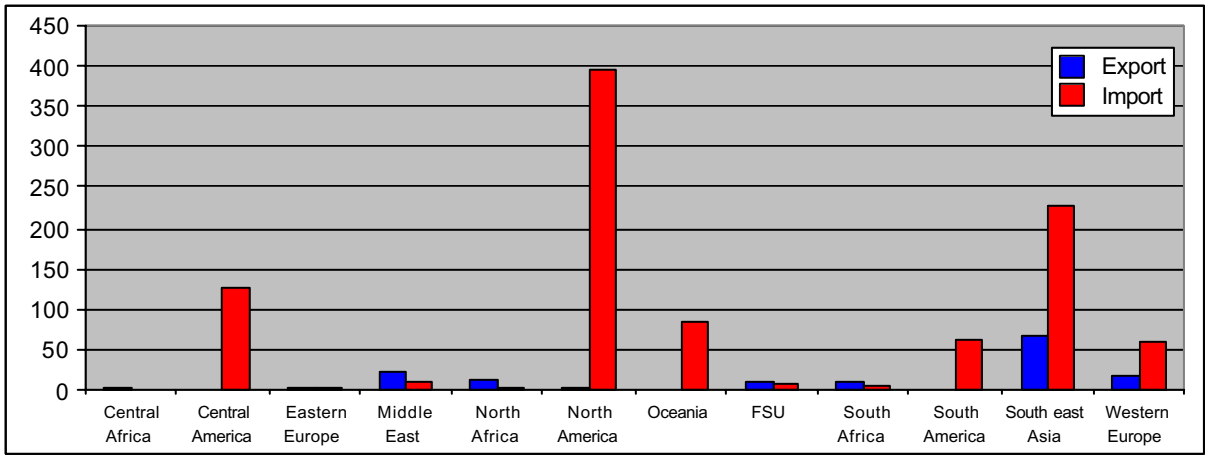


Figure 5.37a. Gross virtual water import and export of Central and South Asia in the period 1995-1999 (Gm^3).

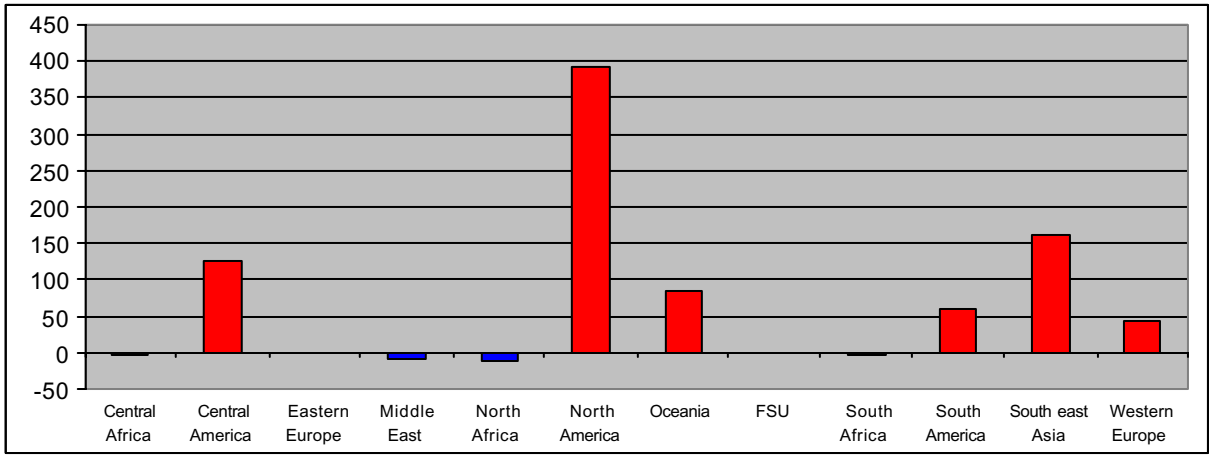


Figure 5.37b. Net virtual water import of Central and South Asia in the period 1995-1999 (Gm^3).

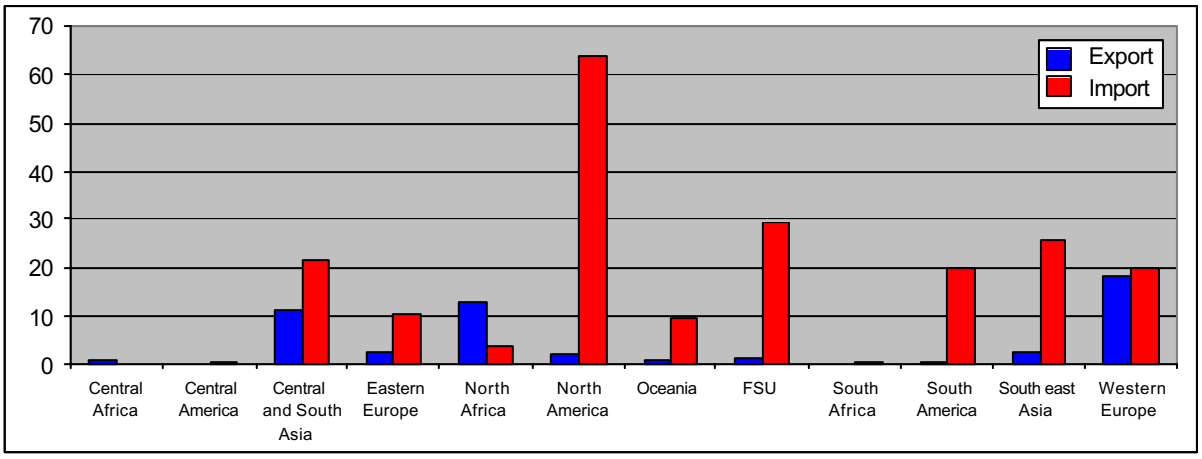


Figure 5.38a. Gross virtual water import and export of the Middle East in the period 1995-1999 (Gm^3).

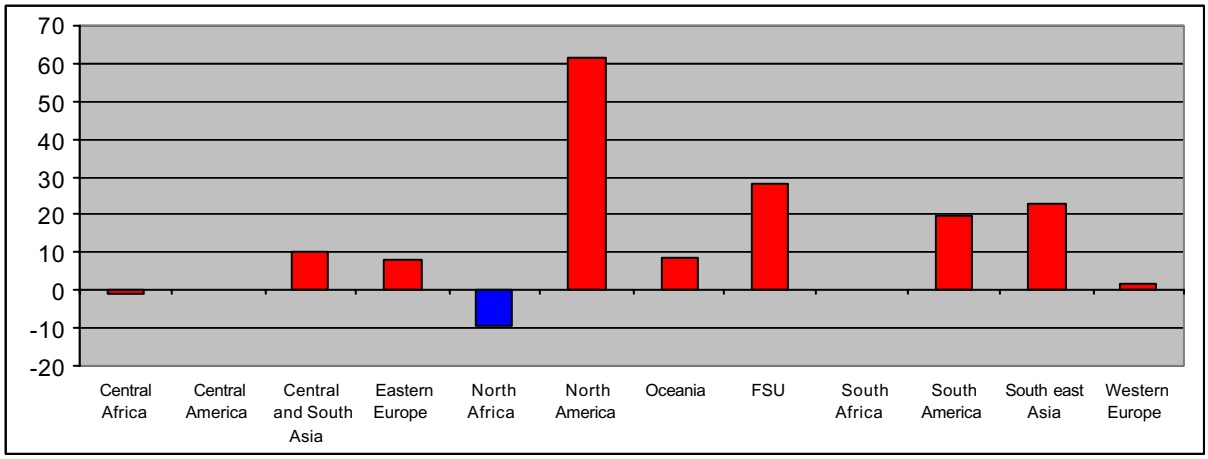


Figure 5.38b. Net virtual water import of the Middle East in the period 1995-1999 (Gm^3).

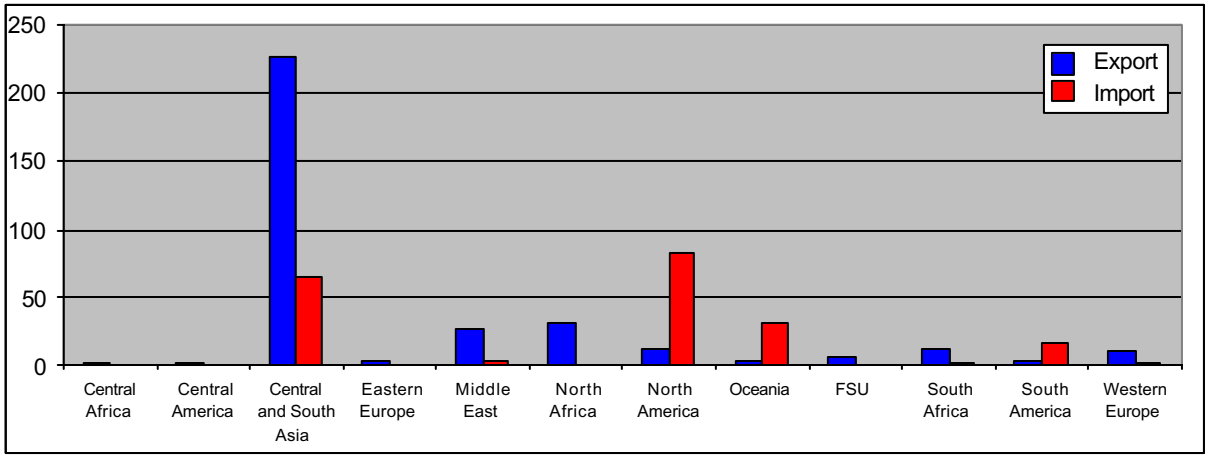


Figure 5.39a. Gross virtual water import and export of South-east Asia in the period 1995-1999 (Gm^3).

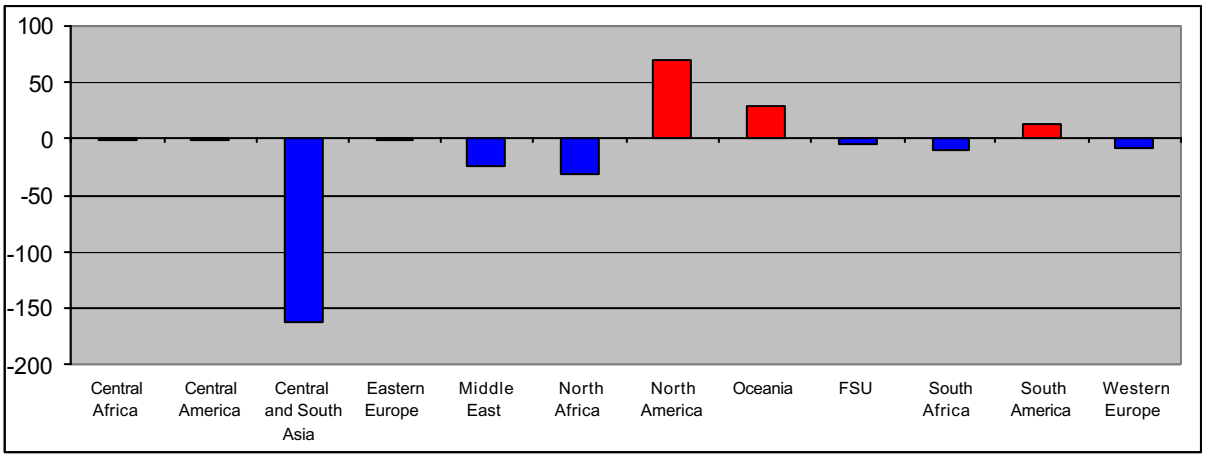


Figure 5.39b. Net virtual water import of South-east Asia in the period 1995-1999 (Gm^3).

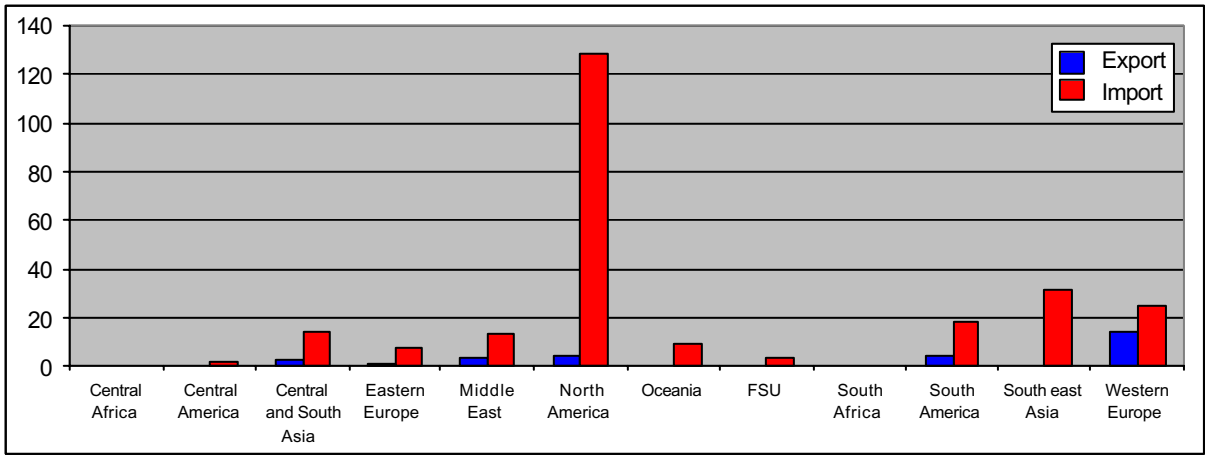


Figure 5.40a. Gross virtual water import and export of North Africa in the period 1995-1999 (Gm^3).

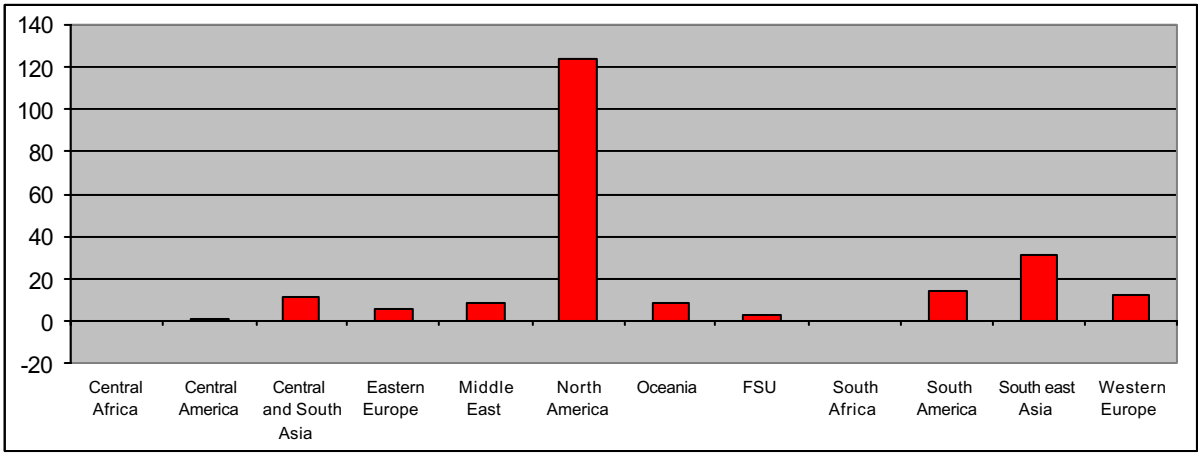


Figure 5.40b. Net virtual water import of North Africa in the period 1995-1999 (Gm^3).

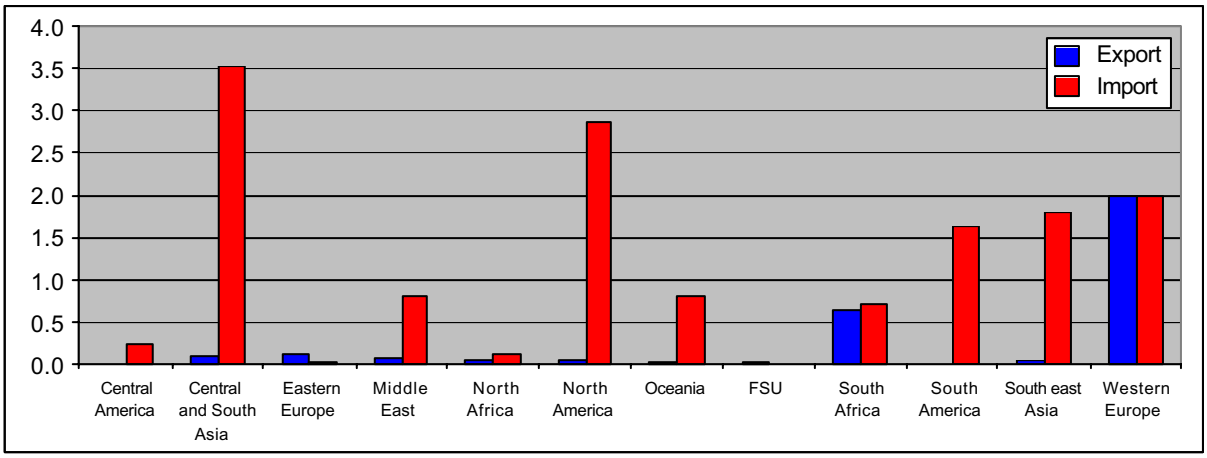


Figure 5.41a. Gross virtual water import and export of Central Africa in the period 1995-1999 (Gm^3).

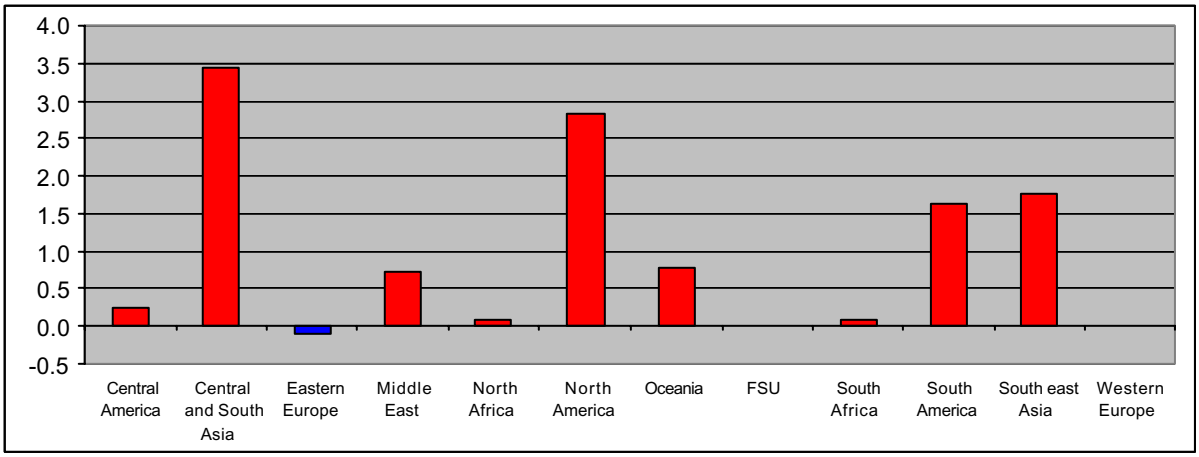


Figure 5.41b. Net virtual water import of Central Africa in the period 1995-1999 (Gm^3).

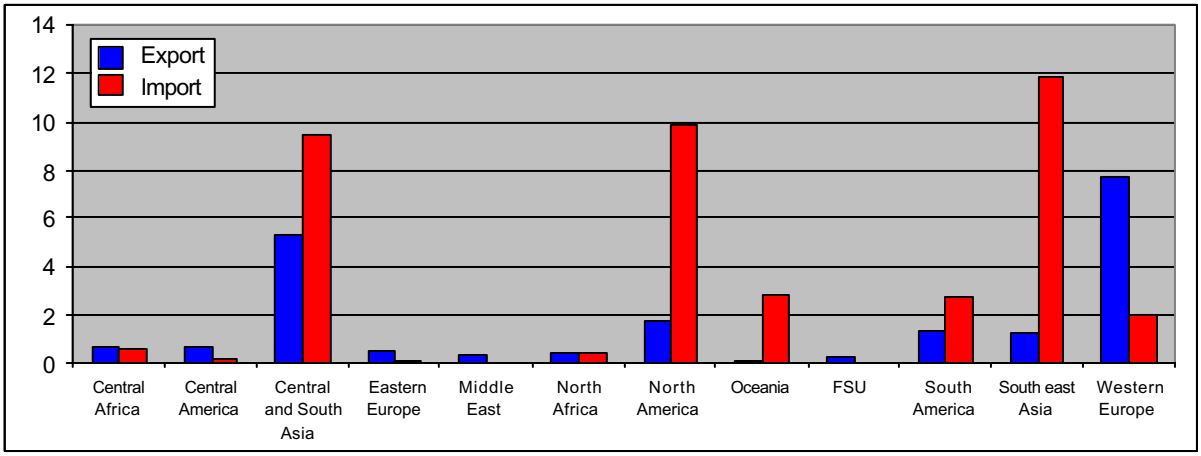


Figure 5.42a. Gross virtual water import and export of Southern Africa in the period 1995-1999 (Gm^3).

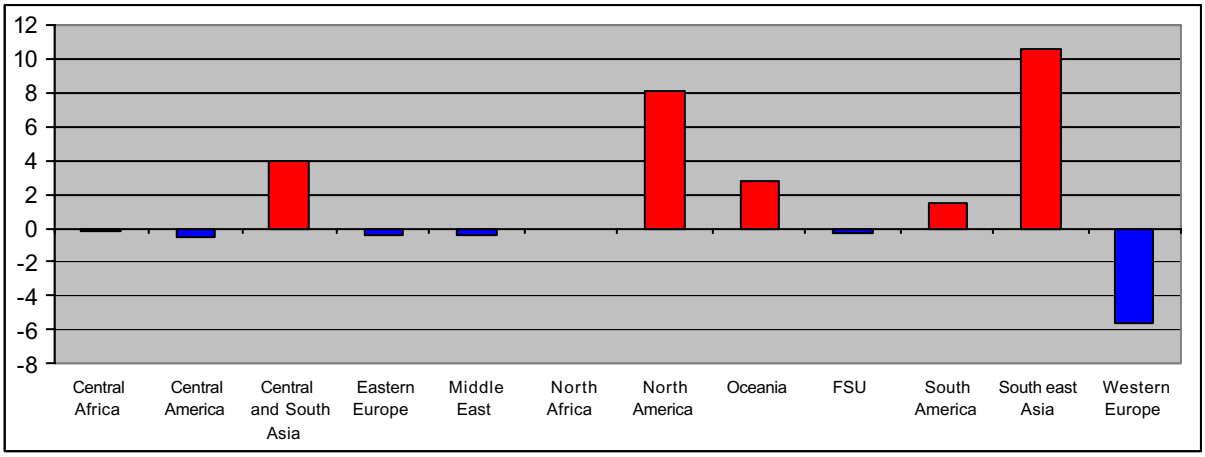


Figure 5.42b. Net virtual water import of Southern Africa in the period 1995-1999 (Gm^3).

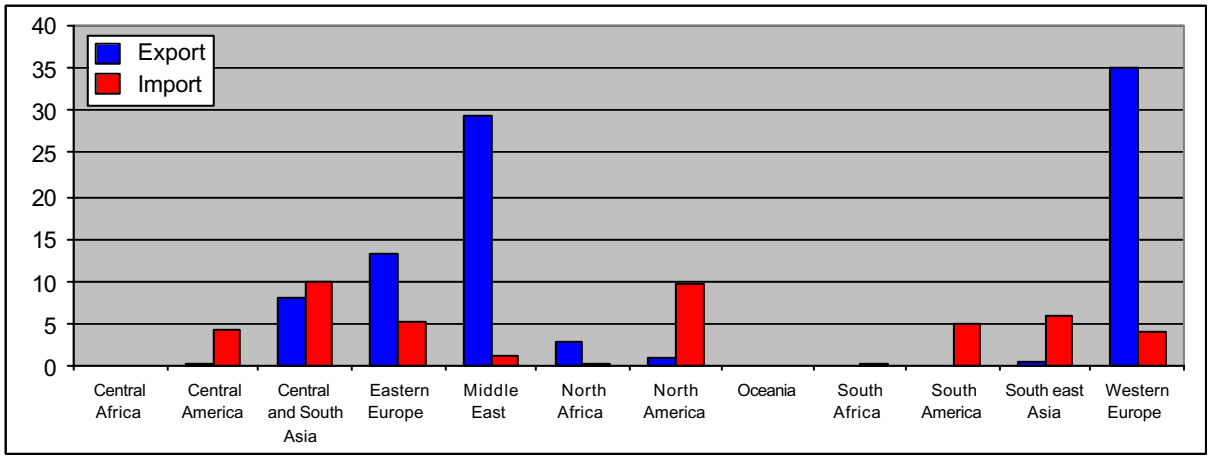


Figure 5.43a. Gross virtual water import and export of the Former Soviet Union in the period 1995-1999 (Gm^3).

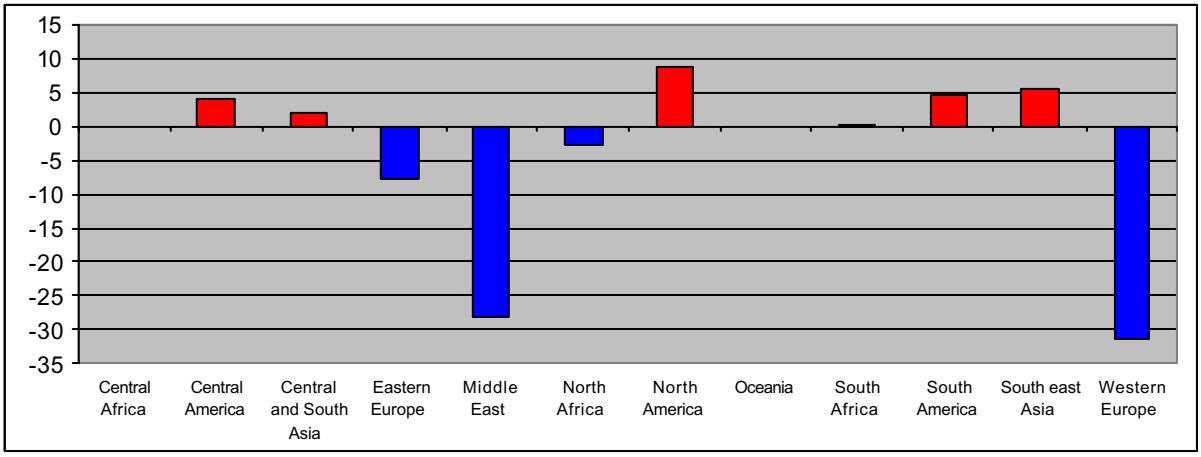


Figure 5.43b. Net virtual water import of the Former Soviet Union in the period 1995-1999 (Gm^3).

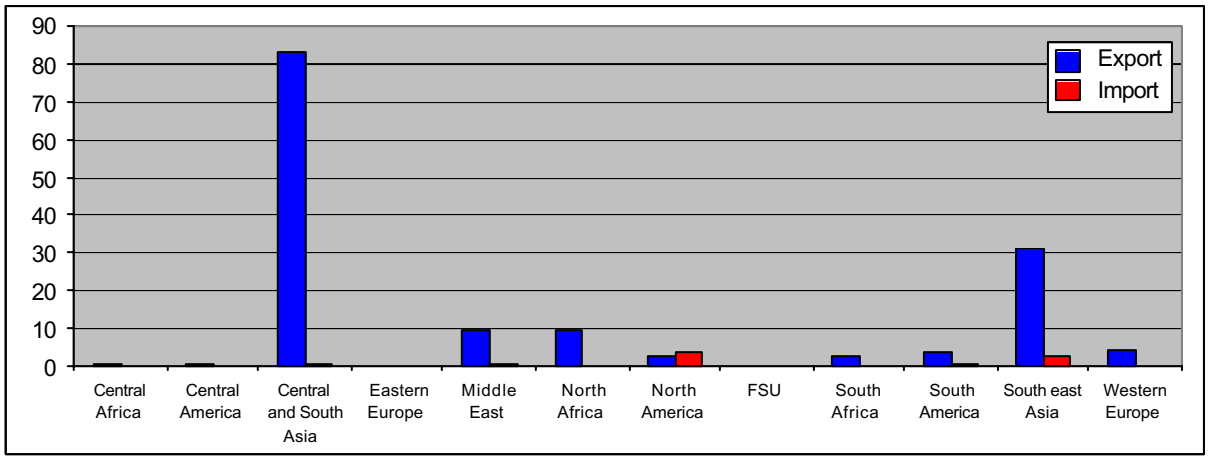


Figure 5.44a. Gross virtual water import and export of Oceania in the period 1995-1999 (Gm^3).

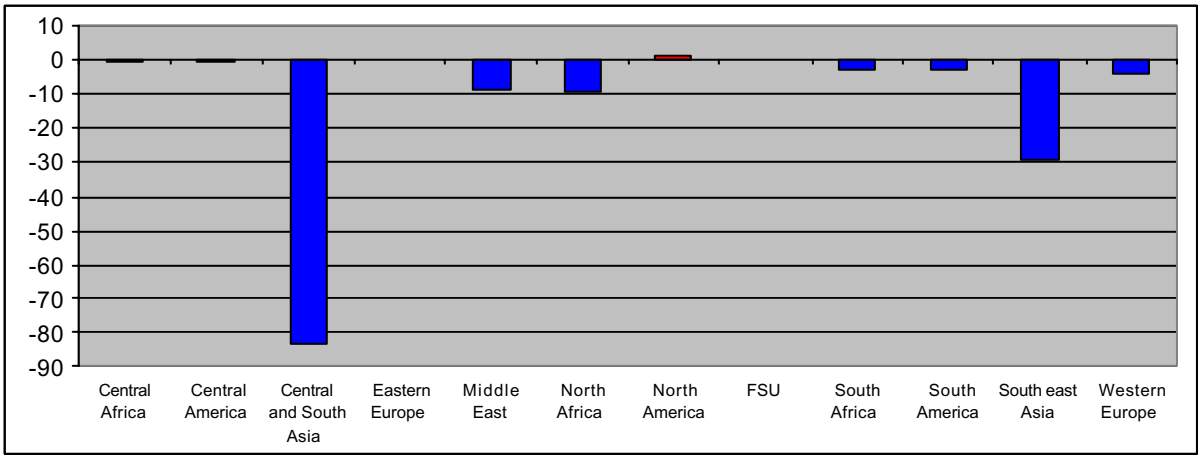


Figure 5.44b. Net virtual water import of Oceania in the period 1995-1999 (Gm^3).

5.2.3. Gross virtual water trade between countries within regions

The virtual water trade flows between countries in each of the thirteen world regions are shown in Figures 5.45 and 5.46. The gross trade in virtual water within a region has been calculated by summing up all virtual water imports of the countries of the region that originate from other countries in the same region. Note that it yields the same result as if we would have added all virtual water exports of the countries in a region that go to other countries in the same region.

Western Europe is the region with the biggest internal trade in virtual water. Besides, the trade volume is rather stable here. South America is second in the ranking of internal trade volume. Central and South Asia is a rather unstable region if we look at the annual volume of virtual water traded between the countries of the region. Central and South Asia is the largest region in terms of population, so food demand is higher than in the other regions. This explains why the region is the biggest virtual water importer (see Figure 5.31b). The virtual water trade between countries within the region is also high, thus the countries within the region highly depend on both countries outside and countries within the region.

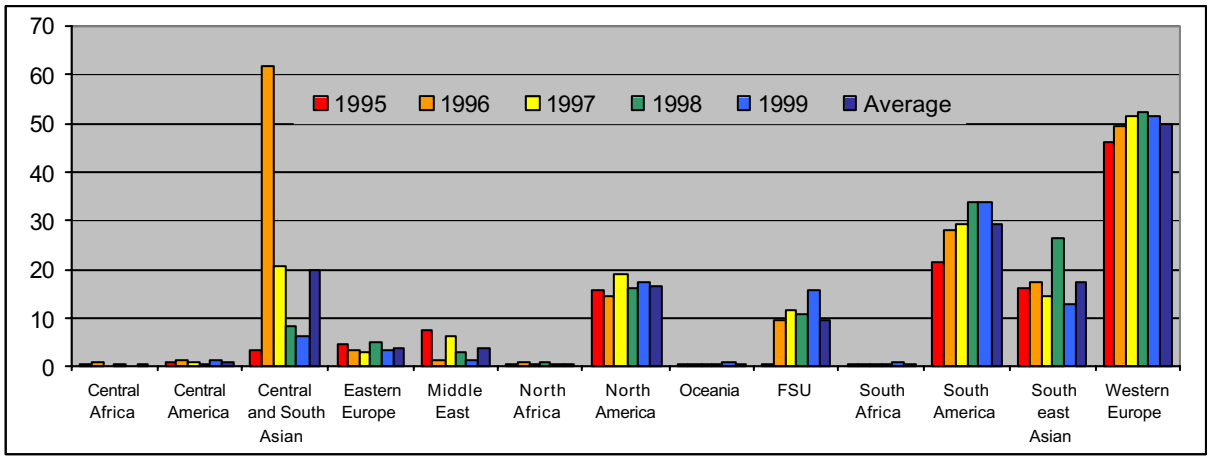


Figure 5.45. Gross virtual water trade between countries within each region in the years 1995-1999 (Gm^3).

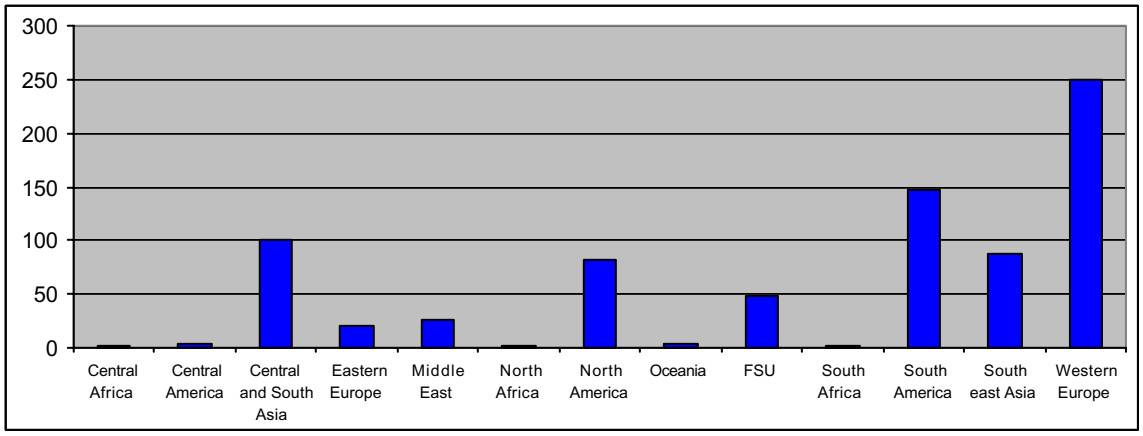


Figure 5.46. Gross virtual water trade between countries within each region in the total period 1995-1999 (Gm^3).

5.3. Intercontinental trade in virtual water

5.3.1. Intercontinental virtual water trade relations

In the previous section the world was divided into thirteen 'world regions'. In the current section, virtual water trade will be presented at the level of 'continents'. The six continents – Africa, America, Asia, Europe, Oceania and the Former Soviet Union (FSU) – correspond to the world regions as indicated in Table 5.10.

The volumes of gross virtual water trade between continents in the period 1995-1999 are presented in Table 5.11. The gross virtual water trade between countries within the continents is given in the same table (the grey-shaded cells). The net virtual water trade between continents is presented in Table 5.12.

Table 5.10. Correspondence between the six 'continents' and the thirteen 'world regions'.

Continent	**Region**		
America	North America	Central America	South America
Europe	Eastern Europe	Western Europe	
Asia	Middle East	Central and South Asia	South-east Asia
Africa	North Africa	Central Africa	Southern Africa
FSU	FSU		
Ocean	Oceania		

Table 5.11. Gross virtual water trade between continents in the years 1995-1999 (Gm^3). The grey-shaded cells refer to gross trade between countries within *the continents.*

Importer / Exporter		Africa	America	Asia	Europe	Oceania	FSU
Africa	1995	1.874	0.442	4.204	5.980	0.029	0.005
	1996	2.201	1.651	3.247	4.708	0.018	0.115
	1997	1.560	1.106	2.071	3.967	0.022	0.094
	1998	2.060	3.121	2.463	5.380	0.020	0.130
	1999	1.873	6.393	1.542	5.154	0.024	0.145
	Total	9.568	12.713	13.527	25.188	0.113	0.488
America	1995	32.655	83.598	136.725	78.196	1.239	1.523
	1996	31.882	107.887	146.857	73.898	0.755	3.028
	1997	33.980	115.344	227.862	77.621	1.023	2.640
	1998	35.488	114.888	138.451	79.397	0.646	3.206
	1999	32.187	117.654	116.306	84.815	0.705	8.392
	Total	166.193	539.371	766.201	393.934	4.370	18.790
Asia	1995	16.082	4.593	73.852	8.580	0.599	0.855
	1996	12.549	6.212	243.549	12.740	0.715	3.524
	1997	16.918	5.375	90.138	12.797	0.881	3.394
	1998	20.624	6.023	108.184	11.345	0.810	7.120
	1999	17.804	4.175	43.626	9.353	0.844	2.179
	Total	85.951	26.379	566.451	55.379	3.851	17.072
Europe	1995	9.390	1.607	8.782	61.467	0.129	1.818
	1996	5.008	1.117	8.737	65.128	0.032	1.748
	1997	7.549	1.973	52.808	65.571	0.066	1.476
	1998	7.611	2.727	13.979	67.163	0.048	1.225
	1999	7.624	2.297	10.948	67.857	0.089	2.855
	Total	37.181	9.722	95.253	327.254	0.366	9.121
Oceania	1995	0.178	0.363	13.247	0.474	0.547	0.000
	1996	3.028	1.847	36.723	1.021	0.646	0.023
	1997	4.889	1.950	27.316	0.921	0.476	0.013
	1998	2.799	0.949	26.480	1.139	0.393	0.018
	1999	2.064	1.641	20.527	0.935	0.738	0.002
	Total	12.958	6.751	124.293	4.482	2.796	0.057
FSU	1995	0.694	0.003	3.813	4.757	0.000	0.545
	1996	0.575	0.547	7.066	14.002	0.000	9.740
	1997	0.776	0.416	5.533	12.495	0.013	11.843
	1998	0.673	0.308	13.261	11.171	0.000	10.695
	1999	0.365	0.076	7.985	5.644	0.000	15.862
	Total	3.082	1.350	37.659	48.066	0.013	48.682

Table 5.12. Net virtual water trade between continents in the period 1995-1999 (Gm^3).

Importer / Exporter	Africa	America	Asia	Europe	Oceania	FSU	Total net export
Africa		-153.48	-72.42	-11.99	-12.84	-2.59	-253.32
America	153.48		739.82	384.21	-2.38	17.44	1292.57
Asia	72.42	-739.82		-39.87	-120.44	-20.59	-848.3
Europe	11.99	-384.21	39.87		-4.12	-38.94	-375.41
Oceania	12.84	2.38	120.44	4.12		0.04	139.82
FSU	2.59	-17.44	20.59	38.94	-0.04		44.64
Total net import	253.32	-1292.57	848.3	375.41	-139.82	-44.64	0

5.3.2. Virtual water trade balance per continent

Figure 5.47a shows the gross virtual water import and gross virtual water export for each continent for the whole period 1995-1999. Figure 5.47b shows the *net* import per continent. Net import is negative - this means there is net export – for America, Oceania and the Former Soviet Union. Net import is positive for Asia, Europe and Africa.

Table 5.13 ranks the continents according their gross import and gross export of virtual water. America is by far the largest export continent, with an average gross export of 270 Gm^3 per year (over the period 1995-1999). The USA takes the largest share in this total export. Gross import to the American continent as a whole is only 11 Gm^3 per year in average, which results in a net export of virtual water of 259 Gm^3 per year. Asia is the largest importer of virtual water. Average gross import amounts to 207 Gm^3 per year (over the years 1995-1999). Average gross export amounts to 38 Gm^3 per year, resulting in an average annual import of 169 Gm^3.

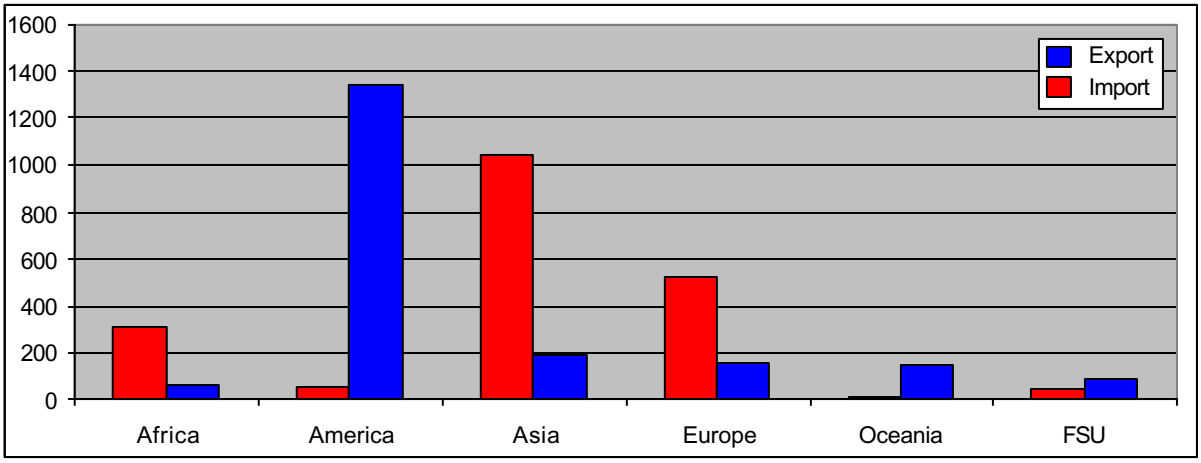


Figure 5.47a. Gross virtual water import and export per continent in the period 1995-1999 (Gm^3).

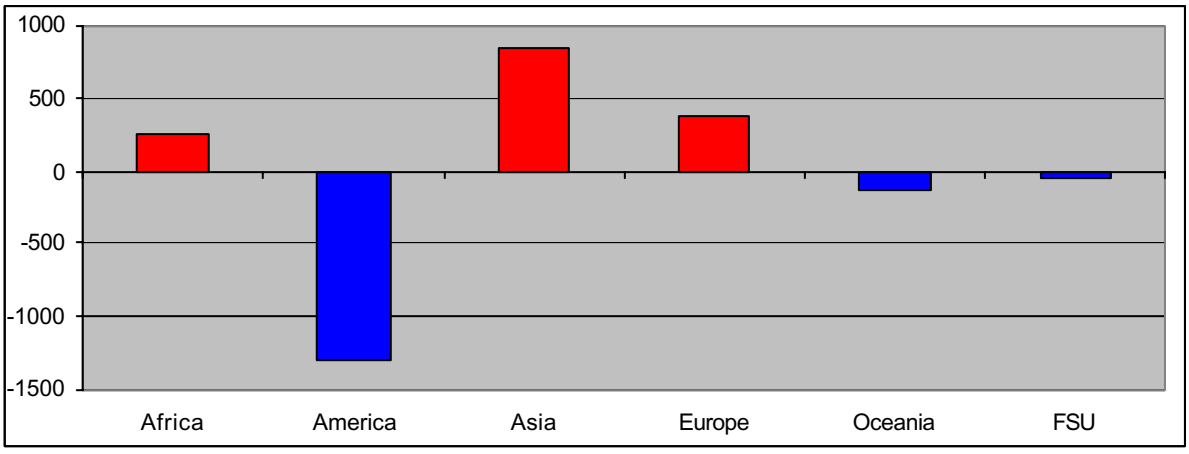


Figure 5.47b. Net virtual water import per continent in the period 1995-1999 (Gm^3).

Table 5.13. Ranking of continents in terms of gross virtual water import and gross virtual water export.

Gross virtual water import (1995-1999)		Rank	Gross virtual water export (1995-1999)	
Continent	Gm^3		Continent	Gm^3
Asia	1037	1	America	1350
Europe	527	2	Asia	189
Africa	305	3	Europe	152
America	57	4	Oceania	149
FSU	46	5	FSU	90
Oceania	9	6	Africa	65

5.3.3. Gross virtual water trade between countries within continents

Data on gross virtual water trade between countries within continents are shown in Table 5.11 (the grey-shaded cells). Asia and America have the biggest internal gross virtual water trade (Figures 5.48-5.49). The virtual water trade between the American countries seems to be rather stable, which is not the case for the trade between the countries of the Asian continent. If compared to Asia and America, virtual water trade between countries within the area of the Former Soviet Union, within Africa and within Oceania is very small.

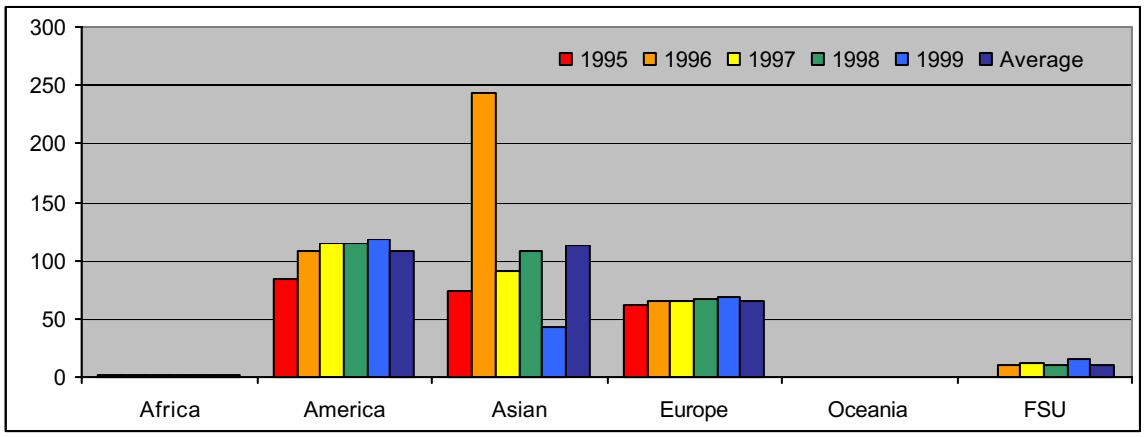


Figure 5.48. Gross virtual water trade between countries within each continent in the years 1995-1999 (Gm^3).

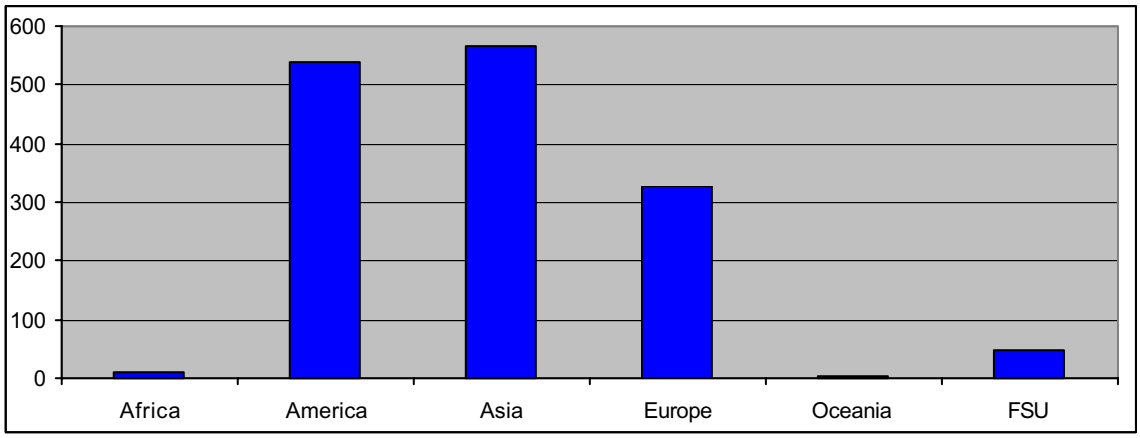


Figure 5.49. Gross virtual water trade between countries within each continent in the period 1995-1999 (Gm^3).

6. Virtual water trade of nations in relation to national water needs and availability

6.1. Water footprints, water scarcity, water self-sufficiency and water dependency of nations

Using the definition given in Section 2.3, a 'water footprint' has been calculated for each nation. Next, given the definitions in Section 2.4, indicators of national water scarcity, water self-sufficiency and water dependency have been calculated. The basic data on national water withdrawal and water availability have been taken from Raskin *et al*. (1997). The data on net virtual water import per country are taken from Appendix Vc. The results are shown in Table 6.1.

The level of water self-sufficiency has been classified into six categories: 0-20%; 20-50%; 50-70%; 70-90%; 90-99%; and 100%. Table 6.2 lists the countries in each of the categories.

Table 6.1. Water footprints, water scarcity, water self-sufficiency and water dependency of nations in 1995.

Country	Water withdrawal (10^6 m^3)	Water availability[1] (10^6 m^3)	Net virtual water import (10^6 m^3)	Water footprint (10^6 m^3)	Water scarcity (%)	Water self-sufficiency (%)	Water dependency (%)
Afghanistan	35704	50000	29	35733	71.4	99.9	0.1
Albania	356	21300	100	456	1.7	78.1	21.9
Algeria	5042	14300	9523	14565	35.3	34.6	65.4
Angola	628	184000	224	852	0.3	73.7	26.3
Argentina	35812	994000	-36742	-930	3.6	100.0	0.0
Armenia	4109	13300	308	4417	30.9	93.0	7.0
Australia	27312	343000	-13269	14043	8.0	100.0	0.0
Austria	2424	90300	-42	2382	2.7	100.0	0.0
Azerbaijan	17061	33000	158	17219	51.7	99.1	0.9
Bahrain	334	290	144	478	115.2	69.8	30.2
Bangladesh	26467	2,357,000	12391	38858	1.1	68.1	31.9
Belarus	2979	73800	142	3121	4.0	95.4	4.6
Belgium	9237	12500	11730	20967	73.9	44.1	55.9
Benin	154	25800	97	251	0.6	61.4	38.6
Bhutan	23	95000	10	33	0.0	70.2	29.8
Bolivia	1557	300000	-1409	148	0.5	100.0	0.0
Bosnia/Herzeg.	1354	265000	83	1437	0.5	94.3	5.7
Brazil	46856	6,950,000	-1933	44923	0.7	100.0	0.0
Bulgaria	13576	205000	-1128	12448	6.6	100.0	0.0
Burkina Faso	412	17500	-10	402	2.4	100.0	0.0
Burundi	127	3600	2	129	3.5	98.8	1.2
Cambodia	660	498100	201	861	0.1	76.7	23.3

[1] Data refer to the sum of internal and external water resources.

Country	Water withdrawal (10^6 m^3)	Water availability[1] (10^6 m^3)	Net virtual water import (10^6 m^3)	Water footprint (10^6 m^3)	Water scarcity (%)	Water self-sufficiency (%)	Water dependency (%)
Cameroon	500	268000	-15	485	0.2	100.0	0.0
Canada	47246	2,901,000	-55330	-8084	1.6	100.0	0.0
Cape Verde	30	300000	40	70	0.0	43.0	57.0
Cent. African Rep.	85	141000	-1	84	0.1	100.0	0.0
Chad	218	43000	3	221	0.5	98.6	1.4
Chile	23203	468000	1509	24712	5.0	93.9	6.1
China	504315	2,800,000	42189	546504	18.0	92.3	7.7
Colombia	6031	1,070,000	5604	11635	0.6	51.8	48.2
Comoros	13	1020	13	26	1.3	50.2	49.8
Congo	51	832000	636	687	0.0	7.4	92.6
Costa Rica	1464	95000	932	2396	1.5	61.1	38.9
Cote d'Ivoire	941	77700	578	1519	1.2	62.0	38.0
Croatia	1760	265000	-166	1594	0.7	100.0	0.0
Cuba	9585	34500	203	9788	27.8	97.9	2.1
Czech Rep.	2727	58200	-610	2117	4.7	100.0	0.0
Denmark	1210	13000	-1029	181	9.3	100.0	0.0
Djibouti	11	2300	102	113	0.5	9.7	90.3
Dominican R.	3483	20000	-1190	2293	17.4	100.0	0.0
Ecuador	6677	314000	-516	6161	2.1	100.0	0.0
Egypt	55432	68500	15302	70734	80.9	78.4	21.6
El Salvador	1084	19000	918	2002	5.7	54.1	45.9
Eritrea	240	8800	27	267	2.7	90.0	10.0
Estonia	3220	17600	194	3414	18.3	94.3	5.7
Ethiopia	2156	110000	487	2643	2.0	81.6	18.4
Fiji	33	28600	68	101	0.1	32.6	67.4
Finland	2243	113000	-431	1812	2.0	100.0	0.0
France	38570	198000	-18454	20116	19.5	100.0	0.0
Gabon	78	164000	64	142	0.0	55.0	45.0
Gambia	36	8000	150	186	0.5	19.3	80.7
Georgia	4054	65200	207	4261	6.2	95.1	4.9
Germany	47303	171000	12228	59531	27.7	79.5	20.5
Ghana	325	53200	229	554	0.6	58.7	41.3
Greece	7109	58700	-2989	4120	12.1	100.0	0.0
Guatemala	1501	116000	-883	618	1.3	100.0	0.0
Guinea-Bissau	22	27000	8	30	0.1	72.8	27.2
Guyana	1501	241000	-14	1487	0.6	100.0	0.0
Haiti	47	11000	364	411	0.4	11.4	88.6
Honduras	1656	63400	315	1971	2.6	84.0	16.0
Hungary	6678	120000	-5536	1142	5.6	100.0	0.0

Country	Water withdrawal (10^6 m^3)	Water availability[1] (10^6 m^3)	Net virtual water import (10^6 m^3)	Water footprint (10^6 m^3)	Water scarcity (%)	Water self-sufficiency (%)	Water dependency (%)
Iceland	167	168000	56	223	0.1	74.9	25.1
India	607227	2,085,000	-24610	582617	29.1	100.0	0.0
Indonesia	83061	2,530,000	25256	108317	3.3	76.7	23.3
Iran	85608	117500	5494	91102	72.9	94.0	6.0
Iraq	52259	109200	51	52310	47.9	99.9	0.1
Ireland	808	50000	675	1483	1.6	54.5	45.5
Israel	2277	2200	2021	4298	103.5	53.0	47.0
Italy	56362	167000	12706	69068	33.7	81.6	18.4
Jamaica	414	8300	271	685	5.0	60.4	39.6
Japan	91945	547000	55416	147361	16.8	62.4	37.6
Jordan	907	1700	7629	8536	53.4	10.6	89.4
Kazakhstan	44138	169400	-658	43480	26.1	100.0	0.0
Kenya	2454	30200	1667	4121	8.1	59.5	40.5
Korea (DPR)	16407	67000	561	16968	24.5	96.7	3.3
Korea (Rep.)	29558	66100	18964	48522	44.7	60.9	39.1
Kuwait	472	758000	472	944	0.1	50.0	50.0
Kyrgyzstan	12953	61700	143	13096	21.0	98.9	1.1
Laos	1260	270000	86	1346	0.5	93.6	6.4
Latvia	673	34000	224	897	2.0	75.0	25.0
Lebanon	1178	5600	727	1905	21.0	61.8	38.2
Liberia	168	232000	67	235	0.1	71.5	28.5
Libya	4751	600000	610	5361	0.8	88.6	11.4
Lithuania	4416	24200	443	4859	18.2	90.9	9.1
Macedonia	847	265000	-32	815	0.3	100.0	0.0
Madagascar	23135	337000	447	23582	6.9	98.1	1.9
Malawi	971	18700	-387	584	5.2	100.0	0.0
Malaysia	13058	456000	9983	23041	2.9	56.7	43.3
Mali	1746	100000	67	1813	1.7	96.3	3.7
Mauritania	1851	11400	161	2012	16.2	92.0	8.0
Mauritius	390	2200	250	640	17.7	60.9	39.1
Mexico	84209	357400	12432	96641	23.6	87.1	12.9
Moldova	3787	13700	-210	3577	27.6	100.0	0.0
Mongolia	657	24600	-27	630	2.7	100.0	0.0
Morocco	11540	30000	6710	18250	38.5	63.2	36.8
Mozambique	655	216000	376	1031	0.3	63.5	36.5
Myanmar	4694	1,082,000	-1477	3217	0.4	100.0	0.0
Nepal	3284	170000	129	3413	1.9	96.2	3.8
Netherlands	8039	90000	29315	37354	8.9	21.5	78.5
New Zealand	1992	327000	845	2837	0.6	70.2	29.8

Country	Water withdrawal (10^6 m^3)	Water availability[1] (10^6 m^3)	Net virtual water import (10^6 m^3)	Water footprint (10^6 m^3)	Water scarcity (%)	Water self-sufficiency (%)	Water dependency (%)
Nicaragua	1688	175000	168	1856	1.0	90.9	9.1
Niger	628	32500	106	734	1.9	85.5	14.5
Nigeria	4648	280000	628	5276	1.7	88.1	11.9
Norway	2077	392000	2548	4625	0.5	44.9	55.1
Oman	524	2103	1158	1682	24.9	31.1	68.9
Pakistan	278844	468000	-429	278415	59.6	100.0	0.0
Panama	1975	144000	68	2043	1.4	96.7	3.3
Papua New Guinea	120	801000	-81	39	0.0	100.0	0.0
Paraguay	541	314000	-6914	-6373	0.2	100.0	0.0
Peru	18726	40000	4789	23515	46.8	79.6	20.4
Philippines	49035	323000	-654	48381	15.2	100.0	0.0
Poland	12349	56200	4298	16647	22.0	74.2	25.8
Portugal	7257	69600	6154	13411	10.4	54.1	45.9
Qatar	226	195	49	275	115.9	82.2	17.8
Romania	25173	208000	-740	24433	12.1	100.0	0.0
Russia	116422	4,498,000	-4000	112422	2.6	100.0	0.0
Rwanda	809	6300	112	921	12.8	87.9	12.1
Saudi Arabia	5092	8760	10241	15333	58.1	33.2	66.8
Senegal	1702	39400	1282	2984	4.3	57.0	43.0
Sierra Leone	445	160000	324	769	0.3	57.9	42.1
Singapore	211	600	3599	3810	35.2	5.5	94.5
Slovakia	1818	30800	-1149	669	5.9	100.0	0.0
Slovenia	762	265000	1255	2017	0.3	37.8	62.2
Somalia	914	13500	138	1052	6.8	86.9	13.1
South Africa	14890	50000	6334	21224	29.8	70.2	29.8
Spain	30968	111300	17348	48316	27.8	64.1	35.9
Sri Lanka	10410	43200	1333	11743	24.1	88.6	11.4
Sudan	17800	154000	-5159	12641	11.6	100.0	0.0
Suriname	518	200000	-31	487	0.3	100.0	0.0
Sweden	2990	180000	-220	2770	1.7	100.0	0.0
Switzerland	1146	50000	2045	3191	2.3	35.9	64.1
Syria	10907	53700	-8414	2493	20.3	100.0	0.0
Tajikistan	14950	101300	49	14999	14.8	99.7	0.3
Tanzania	1193	89000	606	1799	1.3	66.3	33.7
Thailand	35042	179000	-39010	-3968	19.6	100.0	0.0
Togo	115	12000	598	713	1.0	16.1	83.9
Trinidad & Tobago	163	5100	707	870	3.2	18.7	81.3
Tunisia	3391	9000	6048	9439	37.7	35.9	64.1
Turkey	36237	193100	1206	37443	18.8	96.8	3.2

Country	Water withdrawal (10^6 m^3)	Water availability[1] (10^6 m^3)	Net virtual water import (10^6 m^3)	Water footprint (10^6 m^3)	Water scarcity (%)	Water self-sufficiency (%)	Water dependency (%)
Turkmenistan	26186	72000	139	26325	36.4	99.5	0.5
UAE	657	797	2282	2939	82.4	22.4	77.6
Uganda	217	66000	-338	-121	0.3	100.0	0.0
UK	11929	71000	6390	18319	16.8	65.1	34.9
Ukraine	34623	231000	-1779	32844	15.0	100.0	0.0
Uruguay	4325	124000	-998	3327	3.5	100.0	0.0
USA	492259	2,478,000	-168000	324259	19.9	100.0	0.0
Uzbekistan	91842	129600	434	92276	70.9	99.5	0.5
Venezuela	4446	1,317,000	4031	8477	0.3	52.5	47.5
Viet Nam	30851	376000	-2596	28255	8.2	100.0	0.0
Yemen	3397	4902	1416	4813	69.3	70.6	29.4
Yugoslavia	4248	265000	-1	4247	1.6	100.0	0.0
Zambia	1759	116000	-38	1721	1.5	100.0	0.0
Zimbabwe	1527	20000	-340	1187	7.6	100.0	0.0
Grand total	3696312	50547567					

Table 6.2. Countries categorised into different levels of water self-sufficiency (data for 1995).

Level of water self-sufficiency						
0-20%	20-50 %	50-70%	70-90%	90-99 %	100%	
Congo	Algeria	Bahrain	Albania	Afghanistan	Argentina	Malawi
Djibouti	Belgium	Bangladesh	Angola	Armenia	Australia	Moldova
Gambia	Cape Verde	Benin	Bhutan	Azerbaijan	Austria	Mongolia
Haiti	Fiji	Colombia	Cambodia	Belarus	Bolivia	Myanmar
Jordan	Kuwait	Comoros	Egypt	Bosnia	Brazil	Pakistan
Singapore	Netherlands	Costa Rica	Eritrea	Burundi	Bulgaria	Paraguay
Togo	Norway	Côte d'Ivoire	Ethiopia	Chad	Burkina Faso	Philippines
Trinidad	Oman	El Salvador	Germany	Chile	Cameroon	Papua/NG
Tobago	Saudi Arabia	Gabon	Guinea-Bissau	China	Canada	Russia
	Slovenia	Ghana	Honduras	Cuba	Central Africa	Syria
	Switzerland	Ireland	Iceland	Estonia	Croatia	Slovakia
	Tunisia	Israel	Indonesia	Georgia	Czech Rep	Suriname
	UAE	Jamaica	Italy	Iran	Denmark	Sweden
		Japan	Latvia	Iraq	Dominican R.	Thailand
		Kenya	Liberia	Korea	Ecuador	Uganda
		Korea (Rep.)	Libya	Kyrgyzstan	Finland	Ukraine
		Lebanon	Mexico	Laos	France	USA
		Malaysia	New Zealand	Lithuania	Greece	Vietnam
		Mauritius	Niger	Madagascar	Guatemala	Yugoslavia
		Morocco	Nigeria	Mali	Guyana	Romania
		Mozambique	Peru	Mauritania	Hungary	Sudan
		Portugal	Poland	Nepal	India	Uruguay
		Senegal	Qatar	Nicaragua	Kazakhstan	Zambia
		Sierra Leone	Rwanda	Panama	Macedonia	Zimbabwe
		Spain	Somalia	Tajikistan		
		Tanzania	Southern	Turkey		
		UK	Africa	Turkmenistan		
		Venezuela	Sri Lanka	Uzbekistan		
			Yemen			

6.2. The relation between water scarcity and water dependency

One would expect that in general terms there is a positive relationship between water scarcity and water dependency, because high water scarcity will make it attractive to import virtual water and thus become water dependent. One would logically suppose: the higher the scarcity within a country, the more dependency on water in other countries. To test this hypothesis, all countries of the world have been plotted in a scarcity-dependency graph. The result is shown in Figure 6.1. Surprisingly, there seems to be no relation as hypothesised. Let us for simplicity schematise the scarcity-dependency graph into four areas or 'classes'. See Figure 6.2. In Table 6.3 we can see that most of the countries fall in class I.

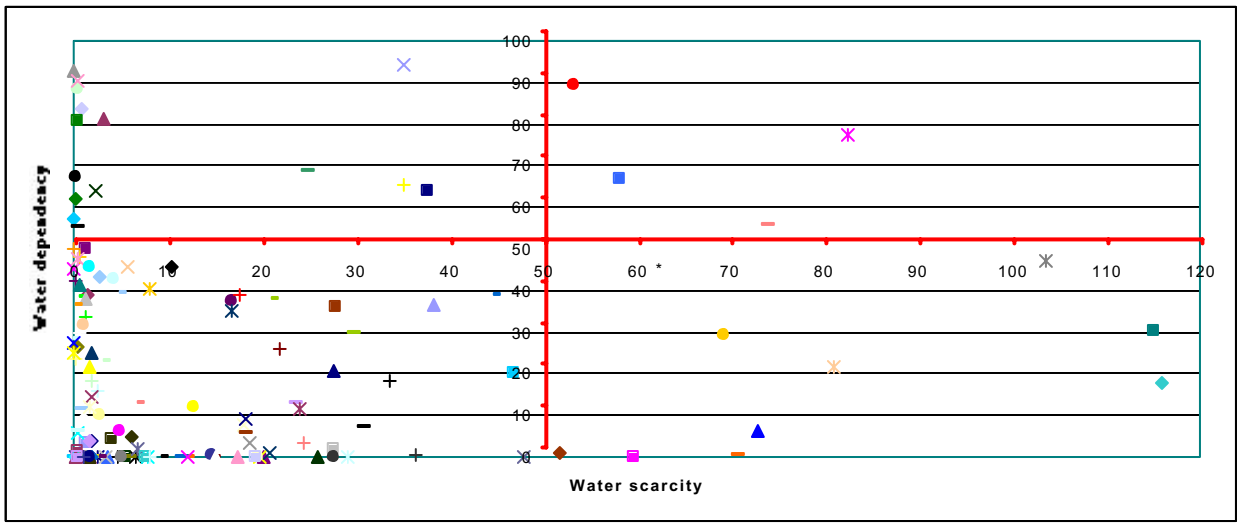


Figure 6.1. Water dependency versus water scarcity for all countries of the world (1995).

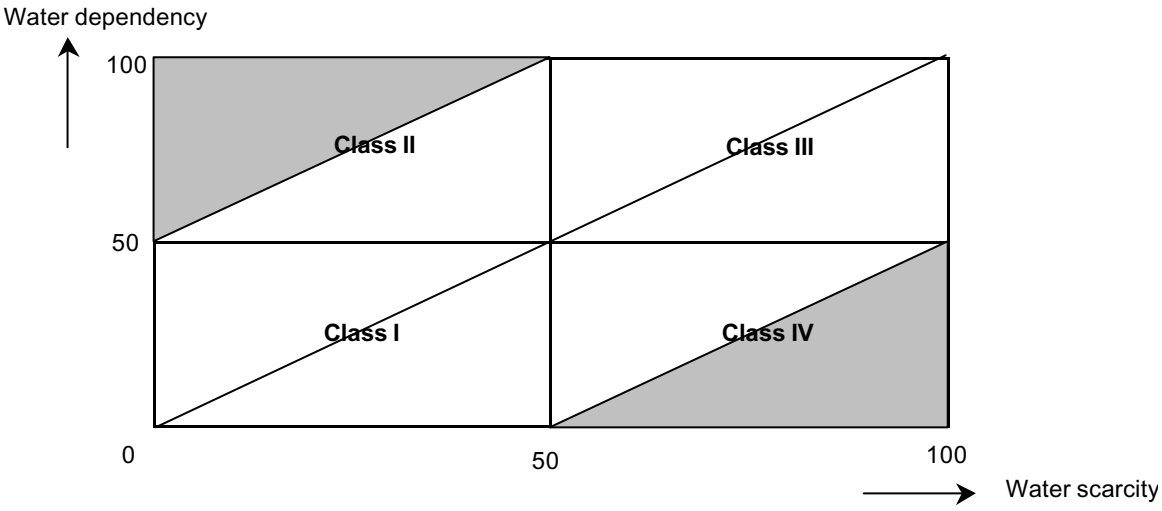


Figure 6.2. Four classes in the scarcity-dependency graph. The grey-shaded areas refer to combinations of water scarcity and water dependency that can difficult be understood at first sight: high water scarcity but low water dependency, and low water scarcity but high water dependency.

Table 6.3. Position of countries in the scarcity-dependency graph. The grey-shaded countries fall in one of the grey-shaded areas of Figure 6.2.

Class I					Class II	Class III	Class IV
Angola	Costa Rica	India	Mexico	South Africa	Algeria	Belgium	Afghanistan
Albania	Cote d'Ivoire	Indonesia	Moldova	Spain	Cape Verde	Jordan	Azerbaijan
Argentina	Croatia	Italy	Mongolia	Sri Lanka	Congo	Saudi Arabia	Bahrain
Armenia	Cuba	Iraq	Morocco	Sudan	Djibouti	UAE	Egypt
Australia	Czech Rep.	Ireland	Mozambique	Suriname	Fiji		Iran
Austria	Denmark	Jamaica	Myanmar	Syria	Gambia		Israel
Bangladesh	Dominican R.	Japan	Nepal	Sweden	Haiti		Pakistan
Belarus	Ecuador	Kazakhstan	New Zealand	Tajikistan	Kuwait		Qatar
Benin	El Salvador	Kenya	Nicaragua	Tanzania	Netherlands		Uzbekistan
Bhutan	Eritrea	Korea (DPR)	Niger	Thailand	Norway		Yemen
Bosnia	Estonia	Korea (Rep.)	Nigeria	Turkey	Oman		
Bolivia	Ethiopia	Kyrgyztan	Panama	Turkmenistan	Singapore		
Brazil	Finland	Laos	Papua/NG	Uganda	Slovenia		
Bulgaria	France	Latvia	Paraguay	UK	Switzerland		
Burkina Faso	Gabon	Lebanon	Peru	Ukraine	Togo		
Burundi	Georgia	Liberia	Philippines	Uruguay	Trinidad		
Canada	Germany	Libya	Poland	USA	Tunisia		
Cambodia	Ghana	Lithuania	Portugal	Venezuela			
Cameroon	Greece	Macedonia	Romania	Vietnam			
Central Africa	Guatemala	Madagascar	Russia	Yugoslavia			
Chad	Guinea-Bissau	Malawi	Rwanda	Zambia			
Chile	Guyana	Malaysia	Senegal	Zimbabwe			
China	Honduras	Mali	Sierra Leone				
Colombia	Hungary	Mauritania	Slovakia				
Comoros	Iceland	Mauritius	Somalia				

7. Concluding remarks

This study was limited to virtual water trade related to crop trade between nations. Also other goods contain virtual water, for instance meat, diary products, cotton, paper, etc. In order to get a complete picture of the global virtual water trade flows, also other products than crops have to be taken into account. For instance, the virtual water trade balance of the Netherlands drawn in the current study suggests that this country has an incredibly high net import of virtual water, due to the large import of feed for the Dutch bio-industry. The balance will look quite differently if we would take into account the export of virtual water that relates to the export of meat from the Netherlands.

As stated in the introductory chapter, the current study is primarily a data report, aimed at disclosing the numbers. A next step is of course to interpret the results and ask the question why the global virtual water trade flows are as they are. What are the explanatory factors behind changes in national virtual water trade balances? What is for instance the relative importance of year-to-year fluctuations in agricultural yields, subsidies in agriculture, national water scarcity, the development of domestic demand for agriculture products? Another next step is to go beyond 'explanation' and to study how governments can deliberately interfere in the current national virtual water trade balances in order to achieve a higher global water use efficiency.

Knowing the national virtual water trade balance is essential for developing a rational national policy with respect to virtual water trade. But for some large countries it might be as relevant to know the internal trade of virtual water within the country. For China for instance, relatively dry in the north and relatively wet in the south, domestic virtual water trade is a relevant issue.

The method used for the calculation of the virtual water content of different types of crops has a few weak points. As explained, the crop water requirement estimates used in this study are conservative on the one hand (due to the water losses that are not taken into account), but they are overestimates on the other hand (because they are based on the assumption of optimal growth conditions, an assumption which is generally not met in reality). Improvements to the calculated figures can be made if we could make better estimates of actual specific water use per crop.

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Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Afghanistan	6800	3770	3850	3540	6470	3890	3340	12680	4580	11910
Albania	6610	5420	3970	4250	12640	3790	2160		2160	
Algeria	13690	3420	8040	4260	14360	7370	6860	21660	5530	19630
American Samoa	9400									
Angola	5840	3400	2390	2500	6780	3550	3290	11400	3360	10560
Antille	11380	5520	5920	4200	12510	7290	6780	21190	4800	19600
Antigua	9760	4510	5010	3390	10200	6060	5640	17430	3820	16130
Argentina	6570	3640	4140	2120	6530	3540	3250	11450	2500	10550
Armenia	7120	3560	2700	2200	3970	3180	3170		3690	
Australia	8970	4030	5290	2670	9030	5930	4380	17370	4210	15920
Austria	7120	3560	2700	2200	3970	3180	3170		3690	5140
Azerbaijan	7120	3560	2700	2200	3542	3180	3170		3690	
Bahamas	8130	3790	4420	2760	7790	5240	4890	13820	2580	12740
Bahrain										
Bangladesh	7050	3520	3450	3260	7640	4600	3350	13060	3370	12190
Barbados	9250	4180	4620	3190	10110	5570	5180	17000	3910	15770
Belarus	7120	3560	2700	2200	3970	3180	3170		3690	
Belgium-Luxembourg	3520	2780	2700	2120	2690	3400	3120		2720	5140
Belize	7010	3270	3450	2500	7410	4280	3980	12540	2810	11600
Benin	16700	3420	3500	2740	9400	4450	4110	11530	3680	14100
Bermuda	7260	3490	4200	2460	6290	4940	4620	11650	1850	10670
Bhutan										
Bolivia	5940	2960	2350	2470	7260	3430	3170	11350	2380	10520
Bosnia and Herzegovina	3520	2780	2700	2120	3110	3400	3120		2720	
Botswana	18840	4310	2950	3570	11120	4200	3850	16950	3050	15700
Bahrain	12510	2870	7180	3510	13010	6140	5700	19570	4580	17700
Brazil	7730	4220	3970	2250	7640	4830	3480	13810	2940	12780
Brunei Darussalam										
Bulgaria	7120	3560	2700	2200	3970	3180	3170		3690	
Burkina Faso	13690	3420	8040	4260	14360	7370	6860	21660	5530	19630
Burundi	16810	4440	4110	3480	9130	5440	5060	15300	4190	14080
Burma	7070	3620	3050	3470	8570	5690	4470	14130	3010	13190
Cambodia	7410	3580	3660	2740	7690	4650	4330	13030	2990	12020
Cameroon	13330	2870	2860	2290	7470	3660	3390	12080	2980	11230
Canary Islands	18060	5140	5600	3760	9170	7150	6690	16590	5680	15220
Canada	7120	3560	2700	2200	3970	3180	3170		3690	5140
Cape Verde	19640	4600	4830	3540	10680	6150	5720	17880	4990	16560
Cayman Islands	9860	4520	5050	3400	10360	6080	5660	17680	3860	16360
Central African Republic	7930	4110	4000	3200	8340	5110	4760	13970	4090	13000
Chad	22850	5210	5740	4120	15070	7150	6610	21320	6070	22720
Chile	5580	2540	2620	2270	8270	3740	2510	12250	2140	11480
China	5180	4100	4330	4120	5200	4960	3500	10760	2930	9980
Colombia	6560	3120	3040	2460	7390	3940	3660	12110	3130	11210
Comoros	18380	4290	3450	3580	10550	4690	4330	16600	3560	15370
Congo, Dem Republic	14340	3220	2910	2630	8110	3830	3540	12980	3030	12050
Congo, Republic of										
Cook Islands										
Costa Rica	6300	3880	4000	3000	7000	4080	2970	10940	2000	12250
Côte d'Ivoire	16280	3480	3310	2830	9220	4280	3960	14730	3460	13700
Croatia	5530	4350	3330	3530	5770	5370	2460		3050	
Cuba	9430	4270	4900	3190	9790	5820	5410	16830	3530	15580
Cyprus	8670	5050	5200	4180	7650	6530	6060		5100	
Czech Republic	7120	3560	2700	2200	3970	3180	3170		3690	
Denmark	7120	3560	2700	2200	3970	3180	3170		3690	
Djibouti	22760	6250	6230	4660	12020	8060	7520	20810	6340	19130
Dominica	9480	4330	4840	3260	10020	5820	5410	17080	3720	15830
Dominican Republic	9481	4270		3260						
Ecuador	6290	3050	2680	2480	7440	3680	3410	11880	3390	11000
Egypt	9680	5620	4520	4200	10250	6930	4490	20110	4210	18570
El Salvador	8720	3930	4080	3090	11080	5060	4690	16630	4250	14570
Equatorial Guinea	14100	3040	3100	2400	7890	3960	3670	12780	3230	11890
Estonia	7120	3560	2700	2200	3970	3180	3170		3690	
Ethiopia	19170	4080	4470	3170	10550	5600	5190	17430	4670	16210
Falkland	2050	1030	1230	1040	3600	1880	1410	6630	2210	4590
Fiji Islands										
Finland	7120	3560	2700	2200	3970	3180	3170		3690	
France	7120	3560	2700	2200	3970	3180	3170		3690	7080
French Guiana	8380	4300	3730	3430	8870	5220	4860	14620	3810	13450
Gabon	11930	2630	2570	2100	6680	3320	3070	10810	2680	10040
Gambia	21520	4130	5220	3110	11750	6230	5860	19580	5510	18310
Georgia	7120	3560	2700	2200	3970	3180	3170		3690	
Germany	7120	3560	2700	2200	3970	3180	3170		3690	7080
Ghana	16280	3480	3310	2830	9220	4280	3960	14730	3460	13700
Greece	6610	5420	3970	4250	12640	3790	2160		2160	
Grenada										
Guadeloupe	8520	3940	4320	2980	8910	5260	4890	15200	3330	14060
Guatemala	6300	3880	4000	3000	7000	4080	2970	10940	2000	12250
Guinea	15280	3000	3200	2390	8600	4020	3710	13840	3380	12920
Guinea-Bissau	17740	3450	3950	2690	9880	4880	4520	16100	4170	15040

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Guyana	7960	4120	3590	3270	8180	5020	4680	13620	3420	12510
Haiti	8230	3900	4270	2930	8470	5220	4860	14590	3110	13460
Honduras	6300	3880	4000	3000	7000	4080	2970	10940	2000	12250
Hungary	7120	3560	2700	2200	3970	3180	3170		3690	5140
Iceland	7120	3560	2700	2200	3970	3180	3170		3690	
India	8510	3780	5510	5190	11320	6930	4720	19720	5180	18460
Indonesia	8640	4180	3920	3020	9680	5010	4850	15710	4160	14500
Iran	13070	8800	4160		13240	5980	6350	24940	3960	22610
Iraq	14920	1880	8530	3280	14990	6180	5710	21620	4400	19300
Ireland	7120	3560	2700	2200	3970	3180	3170		3690	7080
Israel	13070	8800	4160		13240	5980	6350	24940	3960	22610
Italy	5530	4350	3330	3530	5770	5370	2460		3050	9740
Jamaica	9500	4400	4880	3310	9800	5910	5500	16820	3610	15550
Japan	5400	3650	3070	2980	5100	4620	3160	10540	2910	9500
Jordan	8740	1910	5120	2470	9060	4340	4030	13550	3220	12240
Kampuchia	7720	3700	3510	3380	8890	5340	4470	14730	3530	13710
Kazakhstan	8600	3200		2672	3970		6420		3180	
Kenya	16780	3370	3090	2800	9680	4020	3710	15140	3260	14120
Kiribati										
Korea	6500	2460	3870	2980	5290	3370	2190	9880	3560	9230
Korea, Republic of										
Kuwait										
Kyrgyzstan	17850	3000	8170	4510	18220	8210	7620	24720	5980	23960
Laos	6840	3040	3170	2960	7650	4520	3670	12770	3170	11880
Latvia	7120	3560	2700	2200	3970	3180	3170		3690	
Lebanon	7560	1710	4300	2040	7840	3590	3330	11780	2670	10650
Lesotho	13510	2960	2400	2690	8250	2500	2280	12080	2300	11200
Liberia	14220	3120	3100	2470	7940	3980	3690	12900	3230	11980
Libyan	10520	2550	6140	3200	11000	5540	5150	16580	4150	15020
Lithuania	7120	3560	2700	2200	3970	3180	3170		3690	
Macedonia	7120	3560	2700	2200	3970	3180	3170		3690	
Macao	7010	3020	3820	2560	6420	3660	2270	11140	3770	10290
Madagascar	20580	5130	4340	4170	11550	5850	4530	18650	4450	17200
Maderia	12380	3430	3880	2490	6270	4900	4590	11380	3950	10460
Malawi	14430	3520	2600	2980	8230	3670	3350	13030	2670	12030
Malaysia	7810	3560	3640	3180	8720	4950	4250	14460	3690	13430
Maldives	8440	4250	3770	3560	9880	5850	5100	16200	3860	15050
Mali	23300	4270	4900	3380	13140	6010	5560	21100	5190	19750
Malta										
Martinique	8530	3820	4210	3000	9270	5160	4790	15560	3600	14420
Mauritania	12530	6630	6310	5830	14400	9240	8620	23750	7350	22090
Mauritius	15160	3120	2370	2710	8970	3250	2980	13620	2490	12670
Mexico	5820	3170	3880	2920	6330	4580	3430	12060	3190	11130
Micronesia										
Moldova	7120	3560	2700	2200	3970	3180	3170		3690	
Mongolia							4200			
Montserrat	11160	5120	5710	3860	11720	6880	6400	20000	4380	18510
Morocco	7560	2400	4150	2570	8080	4300	4010	12510	3300	11420
Mozambique	15170	3460	2520	2970	8880	3510	3230	13660	2610	12660
Myanmar	7410	3580	3660	2740	7690	4650	4330	13030	2990	12020
Namibia	19090	4350	3000	3780	11290	4260	3910	17160	3090	15900
Nauru										
Nepal	8340	3330	4380	4040	8170	4970	2960	14580	4060	13670
Netherlands	7120	3560	2700	2200	3970	3180	3170		3690	7080
New Caledonia										
New Zealand	6570	3640	4140	2120	6530	3540	3250	11450	2500	10550
Nicaragua	9130	3900	4420	3020	10710	5200	4820	17660	4230	16470
Niger	23300	4270	4900	3380	13140	6010	5560	21100	5190	19750
Nigeria	23110	4440	4620	3660	14500	5780	5310	22660	4950	21240
Niue										
Norway	2200	3970	3180	3170	3600	3690	4010	8340	3290	3520
Oman	11130	4490	5960	4300	12450	7040	6560	19810	5490	18230
Pakistan	11900	4520	7100	4760	9900	4540	2430	18370	6490	17150
Panama	7320	4460	3380	2820	9340	4670	4520	15160	3470	13460
Palestine										
Papua New Guinea	7000	3530	3150	2630	8040	4390	4140	13070	3290	12090
Paraguay	7880	4000	2460	3560	11140	4180	3850	16420	3650	15290
Peru	8170	4170	3450	3400	9200	4940	4590	14800	3390	13650
Philippines	7840	3380	3860	3320	8250	4630	3630	14020	3800	13040
Poland	7120	3560	2700	2200	3970	3180	3170		3690	
Portugal	9000	3590	3650	2960	4280	4340	4270		3610	
Puerto Rico	12520	2870	7180	3510	13010	6140	5700	19570	4580	17700
Qatar	8530	4020	4330	3040	8740	5340	4970	14980	3250	13840
Réunion	15310	3560	8430	4420	15980	7750	7200	24010	5770	21730
Romania	7120	3560	2700	2200	3970	3180	3170		3690	
Russian Federation	7120	3560	2700	2200	3970	3180	3170		3690	7080
Rwanda										
Saint Kitts and Nevis	15610	4050	3900	3180	9070	5070	4710	15010	3990	13860
Saint Lucia	12420									

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Saint Vincent/Grenadines										
Samoa										
Sao Tome and Principe										
Saudi Arabia	9540	5640	4080	3600	10060	6390	4120	18500	3940	16850
Senegal	14220	3120	3100	2470	7940	3980	3690	12900	3230	11980
Seychelles	19050	4560	4450	3580	10490	5780	5370	17310	4580	16010
Sierra Leone	14220	3120	3100	2470	7940	3980	3690	12900	3230	11980
Singapore	7810	3560	3640	3180	8720	4950	4250	14460	3690	13430
Slovakia	7580	3570	3470	3000	8550	4800	4240	14070	3570	13040
Slovenia	7352						4240			
Solomon Islands										12000
Somalia	23110									
South Africa	8970	4030	5290	2670	9030	5930	4380	17370	4210	15920
Spain	6230	3450	4200	2450	7430	4090	3800	12130	3380	11350
Sri Lanka	8970	5590	5640	4570	8280	6870	6640		5620	
Sudan	7520	3080	3620	3030	8060	4480	3690	13540	3630	12580
Suriname	15800	5750	8280	5620	17110	9250	8620	25900	7180	24750
Swaziland	8740	4400	3950	3490	9260	5400	5030	15340	3880	14130
Sweden	7120	3560	2700	2200	3970	3180	3170		3690	
Switzerland	7120	3560	2700	2200	3970	3180	3170		3690	
Syrian Arab Republic	9540	5640	4080	3600	10060	6390	4120	18500	3940	16850
Tajikistan	15340	1740	8790	3270	15350	6240	5760	22000	4410	19600
Tanzania	16780	3370	3090	2800	9680	4020	3710	15140	3260	14120
Thailand	12440	2440	2180	2050	7260	2850	2620	11210	2290	10460
Togo	8390	4700	4370	4260	8780	5740	4460	16870	3950	15450
Tonga	15440	3160	3130	2550	8760	4000	3700	13970	3290	13020
Trinidad and Tobago	9430	4270	4900	3190	9790	5820	5410	16830	3530	15580
Tunisia	8110	3710	3950	2860	8890	4860	4520	14880	3470	13800
Turkey	7880	1260	4790	1900	8030	3500	3240	11730	2530	10520
Turkmenistan	6700	5150	3820	3500	7330	4390	1540	12980	2400	11760
Tuvalu										
Uganda	16780	3370	3090	2800	9680	4020	3710	15140	3260	14120
Ukraine	18360	3730	3600	3040	9070	5070	4270	16590	3770	15460
United Arab Emirates	9540	5640	4080	3600	10060	6390	4120	18500	3940	16850
United Kingdom	7120	3560	2700	2200	3970	3180	3170		3690	5140
United States of America	7120	3560	2700	2200	3970	3180	3170		3690	6340
Uruguay	6570	3640	4140	2120	6530	3540	3250	11450	2500	10550
Uzbekistan	5600	2760	2430	2580	8840	2690	2450	12590	2890	11780
Vanuatu										
Venezuela	6560	3120	3040	2460	7390	3940	3660	12110	3130	11210
Viet Nam	7410	3580	3660	2740	7690	4650	4330	13030	2990	12020
Virgins	7050	3390	3180	3160	8170	5020	4110	13550	3190	12620
Wallis and Futuna Is	9840	4570	5060	3440	10180	6140	5720	17440	3800	16120
West Bank										
Western Sahara	9900	3110	5410	3230	10570	5450	5060	16380	4170	14950
Yemen	9310	3590	4810	3340	10160	5490	5100	16130	4270	14810
Yugoslavia	5570	4100	4190	3400	4390	4930	4890		4130	
Zaire	14220	3150	2960	2550	8010	3850	3570	12880	3080	11960
Zambia	18070	4900	3710	4050	10150	5180	4800	16380	3760	15050
Zimbabwe	18470	4060	2750	3570	10990	3910	3580	16590	2860	15400

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetable
Afghanistan	4200	2960	4450	5300	6960	12740	6300	5790	7640	4040
Albania	3240	6640	5230	6870	8190	11640	6040	5730	7700	4900
Algeria	3520	6920	7550	5520	5710	23310	9100	5280	8350	4230
American Samoa										
Angola	3690	4130	3260	4230	4850	11620	3710	3550	4610	3160
Antille	5740	6880	5030	6660	8960	21000	6800	5710	8600	5480
Antigua	4570	5630	4070	5400	7530	17970	5770	4660	7280	4600
Argentina	4050	5290	4210	6020	6700	12850	3770	4090	4490	2430
Armenia	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Australia	5790	4680	4880	5810	5780	18520	5550	5350	6330	4490
Austria	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Azerbaijan	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Bahamas	3120	4740	3830	3780	6550	14160	5050	3420	6320	3760
Bahrain										
Bangladesh	3420	3520	3270	5210	5270	13450	4030	4280	4830	3360
Barbados	4680	4070	3000	3970	5360	12930	3980	3440	5050	4560
Belarus	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Belgium-Luxembourg	3110	2610	2670	3450	3970	6670	2990	2840	3740	2440
Belize	3370	5230	4280	5660	6930	17490	5370	4860	6810	3280
Benin	4940	4230	3880	5730	6640	15540	4210	4620	6330	3550
Bermuda	2250	4360	2890	2570	6180	11950	4730	4030	5860	3110
Bhutan										
Bolivia	3520	4000	3150	4330	4980	12070	3280	3520	4080	2480
Bosnia and Herzegovina	3110	2610	2670	3450	3970	6670	2990	2840	3740	2440
Botswana	6570	4260	3010	6290	7770	17270	3360	5380	5940	5230
Bahrain	3300	5750	6530	4570	5640	21130	8100	4340	6990	3460
Brazil	4400	4980	3920	5330	6170	14250	4120	4210	5120	3160
Brunei Darussalam										
Bulgaria	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Burkina Faso	3520	6920	7550	5520	5710	23310	9100	5280	8350	4230
Burundi	4360	5400	3830	4430	5340	16240	4560	3610	5030	3620
Burma	3790	4650	2920	5460	4710	14300	3490	4470	4350	2890
Cambodia	3830	3780	2950	3780	4580	13320	3590	3360	4620	3080
Cameroon	3880	3570	3060	4400	5140	12470	3380	3560	4860	2850
Canary Islands	3410	7000	5140	4340	4530	18070	6200	3000	5450	2950
Canada	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Cape Verde	5090	6000	4900	5830	6770	18780	5580	4640	6830	3860
Cayman Islands	4630	5650	4180	5550	7570	18190	5830	4810	7370	4720
Central African Republic	4820	5050	3980	5190	6040	14500	4550	4280	5690	3770
Chad	7850	6880	6540	9500	10880	22930	7010	7590	10680	5440
Chile	4610	5410	4290	5740	6640	13830	4330	3740	5250	3120
China	4070	4320	4450	5580	6530	9870	4730	4650	6220	3710
Colombia	3790	3940	3090	4020	4790	12690	3550	3240	4510	2920
Comoros	5830	4690	3490	5840	7100	17120	3940	4900	5930	4600
Congo, Dem Republic	4310	3780	3050	4650	5510	13400	3390	3810	4970	3270
Congo, Republic of										
Cook Islands										
Costa Rica	2380	3580	2980	2790	3320	8600	3530	3000	4280	2620
Côte d'Ivoire	4920	4200	3560	5460	6430	15150	3910	4460	5890	3640
Croatia	2590	5500	4340	5600	6720	10920	4940	4730	6300	4070
Cuba	4240	5350	3950	5250	7290	17240	5670	4630	7160	4630
Cyprus	6000	6300	4950	6150	7790	14790	5700	5390	7330	4630
Czech Republic	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Denmark	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Djibouti	5200	7280	5810	5620	6620	22320	6930	4430	6940	4350
Dominica	4470	5410	4100	5440	7250	17540	5600	4730	7080	4610
Dominican Republic										
Ecuador	3730	4060	3190	4280	5000	12570	3490	3440	4380	2760
Egypt	4570	4730	4790	7790	7580	21420	7380	6110	5890	5170
El Salvador	5060	4910	4550	5980	6230	17210	4770	4990	6110	4320
Equatorial Guinea	4110	3860	3280	4630	5420	13230	3640	3760	5100	3000
Estonia	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Ethiopia	5170	5410	4840	6250	7150	18090	5320	4940	7280	3720
Falkland	1730	2400	2470	2780	3060	5660	2420	1910	3550	960
Fiji Islands										
Finland	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
France	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
French Guiana	3970	4210	3290	4500	5250	14890	3710	4390	4740	3060
Gabon	3470	3250	2710	3860	4530	11200	3050	3130	4240	2680
Gambia	5680	6010	5940	7500	8340	20220	6390	5830	9000	3670
Georgia	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Germany	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Ghana	4920	4200	3560	5460	6430	15150	3910	4460	5890	3640
Greece	3240	6640	5230	6870	8190	11640	6040	5730	7700	4900
Grenada	4400			4730		12000				
Guadeloupe	3990	4920	3570	4730	6500	15650	4980	4110	6290	4020
Guatemala	2380	3580	2980	2790	3320	8600	3530	3000	4280	2620
Guinea	4510	3880	3640	5420	6220	14160	3900	4350	6030	3130
Guinea-Bissau	5020	4690	4490	6240	7080	16540	4820	4950	7140	3420

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetable
Guyana	3600	3740	2920	3980	4670	13740	3370	4080	4320	2830
Haiti	3730	4870	3260	4340	6440	15040	4890	3780	6160	3810
Honduras	2380	3580	2980	2790	3320	8600	3530	3000	4280	2620
Hungary	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Iceland	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
India	4720	4920	5030	6910	8250	20300	6490	6870	7470	5460
Indonesia	5150	5170	4030	4890	6180	16480	4440	3980	5830	3620
Iran	6170	4780	3450	5820	6380	24710	9270	7000	8700	4400
Iraq	2310	5590	7840	3690	5460	23840	10210	3900	7130	2880
Ireland	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Israel	6170	4780	3450	5820	6380	24710	9270	7000	8700	4400
Italy	2590	5500	4340	5600	6720	10920	4940	4730	6300	4070
Jamaica	4330	5500	3860	5130	7330	17320	5610	4470	7080	4450
Japan	2790	2410	2500	4580	5260	10100	4130	3940	5270	2810
Jordan	2100	4050	4670	3140	3680	14640	5770	3030	4940	2400
Kampuchia	4140	4680	3420	5400	5450	15170	4080	4420	5040	3380
Kazakhstan	2600	2610		3400	3990		2990	4120	6200	
Kenya	5430	3940	3470	6000	7070	15400	3890	4950	6250	3920
Kiribati										
Korea	2360	2300	3460	4270	5610	10600	4480	3550	5060	3790
Korea, Republic of										
Kuwait								7000		
Kyrgyzstan	3350	7550	8070	5400	6760	27860	12150	5460	9410	4170
Laos	3580	3860	3080	4740	4900	13180	3680	3890	4530	3050
Latvia	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Lebanon	2010	3360	3860	2680	3470	12750	4840	2530	4090	2020
Lesotho	5230	2600	2680	4810	6080	12130	3480	4250	4110	4190
Liberia	4100	3900	3280	4600	5390	13360	3650	3730	5100	3050
Libyan	2700	5200	5720	4130	4470	17810	6940	3950	6280	3160
Lithuania	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Macedonia	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Macao	3410	2480	3660	3830	5720	12010	4350	3150	5290	3620
Madagascar	6040	5850	4170	5950	7270	19500	4860	4950	6270	4960
Maderia	3300	4790	3630	4180	4370	12380	4340	3360	3900	2560
Malawi	4630	3670	2540	4430	5470	13460	3200	3740	4390	3800
Malaysia	4220	4480	3580	5110	5640	15020	4190	4180	5240	3460
Maldives	4720	5350	3740	5700	5900	16470	4350	4680	5490	3590
Mali	6950	5750	5730	8610	9790	21490	6050	6880	9630	4630
Malta		4200				15672	5670			
Martinique	4310	4890	3870	5110	6370	16050	4870	4370	6180	4090
Mauritania	6920	9070	6890	8940	7980	24430	7290	7580	10290	6590
Mauritius	5400	3250	2600	5440	6620	13760	2960	4620	5210	4060
Mexico	4250	4260	3620	4550	4700	12300	3980	3840	5270	3510
Micronesia										
Moldova	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Mongolia		3200								
Montserrat	5350	6400	4730	6270	8550	20580	6580	5440	8320	5330
Morocco	2570	4110	4000	3560	3570	13270	4720	3240	4850	2680
Mozambique	5150	3550	2590	5030	6170	13960	3020	4270	4870	4070
Myanmar	3830	3780	2950	3780	4580	13320	3590	3360	4620	3080
Namibia	6770	4330	3000	6370	7930	17490	3380	5500	6090	5360
Nauru										
Nepal	3320	3100	3930	6490	6490	15050	5160	5370	5850	4350
Netherlands	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
New Caledonia										
New Zealand	4050	5290	4210	6020	6700	12850	3770	4090	4490	2430
Nicaragua	5080	4900	5000	6590	6580	18050	5250	5660	6740	4990
Niger	6950	5750	5730	8610	9790	21490	6050	6880	9630	4630
Nigeria	8130	5560	5620	9130	11160	22830	5810	7870	10360	5490
Niue										
Norway	3400	3990	7000	2990	2830	4580	2450	2990	3740	
Oman	4880	6810	5990	6300	6440	20790	6810	5520	7900	4680
Pakistan	4360	2640	6300	8140	10230	19660	8180	6540	9330	6920
Panama	5940	6130	4830	5870	7200	16670	5620	3540	6960	4500
Palestine										
Papua New Guinea	4110	4380	3190	4240	4950	13630	3590	3450	4650	2950
Paraguay	5400	6720	5330	7550	8480	18060	5020	5620	6110	3460
Peru	4210	4640	3640	4690	5810	15340	3940	4570	4970	3130
Philippines	3780	3840	3680	5290	5870	14600	4460	4340	5400	3720
Poland	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Portugal	4220	4440	3500	4590	5400	8680	4030	3820	5060	3300
Puerto Rico	3300	5750	6530	4570	5640	21130	8100	4340	6990	3460
Qatar	3900	5010	3380	4490	6560	15470	4960	3890	6250	3870
Réunion	3940	7240	8210	5720	6640	29090	10090	5460	8810	4350
Romania	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Russian Federation	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Rwanda							5810			
Saint Kitts and Nevis	4490	5000	3790	4760	5670	15770	4400	3880	5330	3530
Saint Lucia										

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	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetable
Saint Vincent/Grenadines										
Samoa										
Sao Tome and Principe										
Saudi Arabia	5420	4820	4680	6910	6900	18270	6360	6120	7020	4630
Senegal	4100	3900	3280	4600	5390	13360	3650	3730	5100	3050
Seychelles	5230	5680	4410	5610	6660	18150	5080	4560	6290	4200
Sierra Leone	4100	3900	3280	4600	5390	13360	3650	3730	5100	3050
Singapore	4220	4480	3580	5110	5640	15020	4190	4180	5240	3460
Slovakia	4230	4480	3460	4820	5420	14620	3980	3940	5060	3280
Slovenia		4480				13564				
Solomon Islands										
Somalia										
South Africa	5790	4680	4880	5810	5780	18520	5550	5350	6330	4490
Spain	3960	4140	3280	4230	4660	12170	3700	3680	4540	3390
Sri Lanka	6600	6930	5460	5100	8450	15790	6270	5920	7910	5140
Sudan	3890	3900	3520	4900	5560	14110	4170	4010	5150	3450
Suriname	6370	8910	8110	8150	8820	27190	9430	7190	10400	6060
Swaziland	4350	4510	3520	5030	5550	15700	4080	4440	5190	3390
Sweden	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Switzerland	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Syrian Arab Republic	5420	4820	4680	6910	6900	18270	6360	6120	7020	4630
Tajikistan	2130	5630	8100	3590	5380	24320	10610	3870	7210	2810
Tanzania	5430	3940	3470	6000	7070	15400	3890	4950	6250	3920
Thailand	4210	3000	2450	4550	5410	11350	2640	3800	4600	3020
Togo	5200	5310	4120	6330	6990	17390	5540	5150	5950	4600
Tonga	4700	3900	3460	5330	6230	14320	3760	4340	5770	3400
Trinidad and Tobago	4240	5350	3950	5250	7290	17240	5670	4630	7160	4630
Tunisia	4160	4630	3760	4870	6000	15340	4590	4250	5840	3930
Turkey	1470	3200	4200	2260	3030	12850	5370	2290	4020	1740
Turkmenistan	4210	4390	5160	5210	5330	12030	5450	5650	5970	3950
Tuvalu										
Uganda	5430	3940	3470	6000	7070	15400	3890	4950	6250	3920
Ukraine	5800	4520	3950	6430	7570	16960	4290	5290	6790	4180
United Arab Emirates	5420	4820	4680	6910	6900	18270	6360	6120	7020	4630
United Kingdom	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
United States of America	3130	3290	2600	3400	3990	12830	2990	2830	3740	2450
Uruguay	4050	5290	4210	6020	6700	12850	3770	4090	4490	2430
Uzbekistan	4500	5730	4550	6430	7210	14260	4190	4410	5030	2780
Vanuatu										
Venezuela	3790	3940	3090	4020	4790	12690	3550	3240	4510	2920
Viet Nam	3830	3780	2950	3780	4580	13320	3590	3360	4620	3080
Virgins	3760	4300	3090	5040	4950	13910	3700	4120	4570	3060
Wallis and Futuna Is	4550	5710	4000	5300	7600	17990	5810	4590	7320	4570
West Bank										
Western Sahara	3460	5200	5130	4550	5090	17430	6130	4100	6150	3400
Yemen	4020	5300	4720	4960	5430	16990	5480	4300	6170	3660
Yugoslavia	4810	5070	4010	5240	6160	9200	4610	4370	5770	3770
Zaire	4220	3790	3120	4620	5450	13310	3460	3770	5000	3180
Zambia	5240	5250	3380	4840	6030	17220	4040	4050	5010	4580
Zimbabwe	6630	3970	2890	6420	7910	16800	3170	5510	6470	5150

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	W.melon	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Afghanistan	5600	4350	7410	2700						
Albania	6130	8010					3000			
Algeria	6250	5900	6060	2930						
American Samoa										
Angola	3660	3540	5470	3240						
Antille	6630	5480	8960	1180						
Antigua	5600	4440	7180	3740						
Argentina	4670	3030	5110	3020	6730	6100	4360	4150	5740	5330
Armenia	2990	3740								
Australia	5750	4730	8710	3200	6730	6100	5010	4150	5740	5330
Austria	2990	3740	3880	1600	3760	3410	3000	2300	3220	2980
Azerbaijan	2990	3740		1800			4600	3120		3200
Bahamas	4910	3120	4970	2780			4860			
Bahrain										
Bangladesh	3980	4260	6360							
Barbados	3880	4660	7380	3660						
Belarus	2990	3740		1960	3760		3000		2220	2980
Belgium-Luxembourg	3000	3540		1800	3760	3410	3000	2300	3220	2980
Belize	5150	3270	5290	2790						
Benin	4960	4560	6840	3500						4440
Bermuda	4660	2470	4330	2550						
Bhutan										
Bolivia	3770	2920	6090	3200			3670	3190		
Bosnia and Herzegovina	3000	3540		1800			3000		3220	
Botswana	5440	3830	5940	5150						
Bahrain	5190	4890	5680	2540						
Brazil	4530	3320	6660	4000	6120	5400	4410	3850	5040	4840
Brunei Darussalam										
Bulgaria	2990	3740		1960			3000		2300	2980
Burkina Faso	6250	5900	6060	2930						
Burundi	3830	3800	7400	3960						
Burma	3470	4260	6290							
Cambodia	3450	3440	5480	3200						
Cameroon	3810	3520	5500	2860						
Canary Islands	3420	4620	9710	3660						
Canada	2990	3740	4872	1642	4220	4720	5280	4110	5790	4450
Cape Verde	5040	5180	8920	4080						
Cayman Islands	5640	4570	7300	3760						
Central African Republic	4490	4250	6590	3870						
Chad	8230	7770	11280	5270						
Chile	4240	3720	7660	3440	3180	5090	3980	3730	5450	4860
China	4990	4040	6780	2250	4560	4640	4410	3440	5470	4610
Colombia	3430	3310	5670	2940	4660	4910	3390	2860	3760	3600
Comoros	5060	4070	6670	4640						
Congo, Dem Republic	4030	3520	5620	3320						
Congo, Republic of										
Cook Islands										
Costa Rica	3280	2300	4280	2470	3410	2670	3540	2160	2590	2590
Côte d'Ivoire	4730	4180	6440	3620						
Croatia	5020	6540		2790		3410	3000	2300	3220	2980
Cuba	5450	4340	6770	3460	3410					
Cyprus	5780	8400		3960			5620	4430		5040
Czech Republic	2990	3740		2020	3760	3410	3000	2300	3220	2980
Denmark	2990	3740		1720	3760	3410	3000	2300	3220	2980
Djibouti	4850	5530	11020	4980						
Dominica	5400	4480	7080	3610						
Dominican Republic							3600			
Ecuador	3680	3170	6000	3130		4250	3600	3100		3890
Egypt	6740	6380	11430	4580	3860		5790	4200	6240	5570
El Salvador	4580	4910	7900	3790					5290	
Equatorial Guinea	4000	3690	5900	2970						
Estonia	2990	3740	3880				3000		3220	
Ethiopia	5410	5450	8520	3800						
Falkland	2170	1240	3730	1760						
Fiji Islands										
Finland	2990	3740		1800	3760	4540	3790	3110	3510	3450
France	2990	3740		1960	3600	4540	3790	3110	3510	3450
French Guiana	4490	3470	6680	3970						
Gabon	3340	3060	4910	2610						
Gambia	6500	6810	10070	3670						
Georgia	2990	3740	5600	1960					3510	
Germany	2990	3740	3880	1940	3600	4540	3790	3110	3510	3450
Ghana	4730	4180	6440	3620						
Greece	6130	8010	10168	3100	5510	6150	5670	3550	6500	5010
Grenada				3290						
Guadeloupe	4830	3900	6280	3800						
Guatemala	3280	2300	4280	2300	5080	5460	4200	3830	4020	5760
Guinea	4690	4350	6310	3060						
Guinea-Bissau	5400	5250	7710	3360						

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	W.melon	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Guyana	4120	3180	6000	3690						
Haiti	4780	3570	5840	3150						
Honduras	3280	2300	4280				4570	3570		4620
Hungary	2990	3740		1960	3600	4540	3790	3110	3510	3450
Iceland	2990	3740								
India	6390	6910	9190	3660		5090	6120	6010	6570	4400
Indonesia	4410	3950	7080	4080	6160	5600	4390	3530	4910	4980
Iran	6860	6100	13080	3210		6260	8000	3920		5780
Iraq	5110	4780	4590	1560						4330
Ireland	2990	3740		1960	4220	4720	3790	3110	3510	3450
Israel	6860	6100	11920	4200	4680		6250	2540		4210
Italy	5020	6540	8752	2800	6380	5770	4720	3870	5010	4300
Jamaica	5450	4220	6810	3600	5450		5480	4630	5720	5670
Japan	4170	3760	6510	2700	4470	4860	3990	3310		4230
Jordan	3660	3450	3690	1650	5820	5990	5350	4450		5580
Kampuchia	4040	4330	6930							
Kazakhstan		6440	3880	1800	4220		5200		5600	3450
Kenya	5190	4310	6210	3770						5100
Kiribati										
Korea	4400	3820	7020	3672	4590		4230	3580	4910	4590
Korea, Republic of										
Kuwait				2530						
Kyrgyzstan	6860	6440	6250	1800	4220		4600			3450
Laos	3640	3840	6210							
Latvia	2990	3740		1720					3220	3450
Lebanon	3030	2850	3470	1520	6110	4960		3670		4760
Lesotho	4160	3490	3490	3950						
Liberia	3980	3710	5920	3060						
Libyan	4700	4430	4660	2200						6630
Lithuania	2990	3740		1960	3600	4720	3000		3510	3450
Macedonia	2990	3740		1960			3000			3450
Macao	4390	3380	6620							
Madagascar	5150	4490	8080	5150			5230	3940		6030
Maderia	3410	3320	6760	2400						
Malawi	3840	2970	5020	3890						
Malaysia	4150	4150	6930	3878	5480	5240	4200	3700	4790	4460
Maldives	4320	4550	7350							
Mali	7450	6950	9730	4390						
Malta									2590	
Martinique	4710	4200	6770	3430						
Mauritania	8080	7650	10440	6030						
Mauritius	4700	3370	4860	3830				2440		3190
Mexico	3930	4030	6270	3280	4220	5200	6780	4110	5790	5550
Micronesia										
Moldova	2990	3740		1960		4720	3000			3450
Mongolia		6460								
Montserrat	6360	5160	8270	4270						
Morocco	3690	3480	4210				4350	3800		4450
Mozambique	4350	3200	5020	4020						
Myanmar	3450	3440	5480	3200			4030			3780
Namibia	5510	3750	5970	5210						
Nauru										
Nepal	5080	5440	8730							
Netherlands	2990	3740	5600	1960	3600	3410	3000	2300	3220	2980
New Caledonia										
New Zealand	4670	3030	5110	2600	6730	6100	4360	4150	5740	5330
Nicaragua	4910	5450	8180	3020					5120	4480
Niger	7450	6950	9730							8940
Nigeria	8300	7220	9540	5080						5130
Niue										
Norway		3672		1960		5570		2300		3780
Oman	6090	5760	7660	4070	6130	5460	6200		4840	6550
Pakistan	7240	7040	10500							8650
Panama	3950	5160	7290	4320						
Palestine										
Papua New Guinea	3570	3410	5860							
Paraguay	6220	4200	9910	5150					3790	3570
Peru	4770	3600	7300	4140				3760	3220	4410
Philippines	4410	4370	7410							4630
Poland	2990	3740		1960	3760	4720	3000		3510	2980
Portugal	4040	5200	6790	2230	4710	4650	3830	3150	3980	3850
Puerto Rico	5190	4890	5680	3300						
Qatar	4850	3690	6090	3110						
Réunion	6550	6170	6790							
Romania	2990	3740		1960			3000		3510	2980
Russian Federation	2990	3740		1960			3600	2300	3510	3570
Rwanda				3730						
Saint Kitts and Nevis	4110	3960	7130							
Saint Lucia										

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	W.melon	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Saint Vincent/Grenadines										
Samoa										
Sao Tome and Principe										
Saudi Arabia	6450	5650	8830	3650	5400	5120	6200	5290		4570
Senegal	3980	3710	5920	4240				5840		
Seychelles	4850	4660	8210							
Sierra Leone	3980	3710	5920	3060						
Singapore	4150	4150	6930	4026	5320	4850		3410	4410	4200
Slovakia	3950	3890	6560	1960	3670	4720	3000		3510	2980
Slovenia				1960	3760					
Solomon Islands										
Somalia				4560						
South Africa	5750	4730	8710	3440	5960	3040		3860	5100	4460
Spain	3650	3450	5090	3950	4390	4120	5990	4960	6770	6350
Sri Lanka	6270	8730					4210	3570		4350
Sudan	4130	4020	6830	5210						6240
Suriname	7980	7540	10140	4010						
Swaziland	4540	3830	6920							
Sweden	2990	3740		1960	3670	4720	3000	2300	3510	2980
Switzerland	2990	3740								
Syrian Arab Republic	6450	5650	8830	3650	4150	4410	4150	4030		4620
Tajikistan	5140	4810	4390	1960	3670					2980
Tanzania	5190	4310	6210	2840						3950
Thailand	3940	3100	4400	3690	6020	5080	5110	4580	5570	4550
Togo	5280	5140	8010	3320				3430		
Tonga	4610	4110	6140							
Trinidad and Tobago	5450	4340	6770	3460			4900			4870
Tunisia	4430	4090	6540	2260					5610	5220
Turkey	2910	2730	2750	2150	4140		5490	2640	6260	5380
Turkmenistan	5880	4270	8720	2080			4200			2980
Tuvalu										
Uganda	5190	4310	6210	4010		5940				5340
Ukraine	5560	4740	7070	2660	3670		5280		3510	2980
United Arab Emirates	6450	5650	8830	3650	5400	6200	5490			5600
United Kingdom	2990	3740		1960	3670	4720	3000	3110	3510	3450
United States of America	2990	3740	6210	2100	4220	5390	5280	4110	6370	4450
Uruguay	4670	3030	5110	4050					6110	3450
Uzbekistan	5000	3430	8640	2430	3670		4600			2980
Vanuatu										
Venezuela	3430	3310	5670	3030	5410				4400	4280
Viet Nam	3450	3440	5480	3200	5080	5240	4030			3780
Virgins	3670	4020	6350	3760						
Wallis and Futuna Is	5650	4360	7110							
West Bank										
Western Sahara	4670	4400	5630	2800						
Yemen	4740	4480	6310	3270	5060			3920		5410
Yugoslavia	4620	5730		2390			3620		4160	4200
Zaire	4000	3580	5690	3210						
Zambia	4190	3560	6860	4950	5570					
Zimbabwe	5560	3800	5640	4990						4000

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Afghanistan							8660	
Albania								5900
Algeria							14490	
American Samoa								
Angola							7780	
Antille							3000	
Antigua							11180	
Argentina	6620	4490	5970		6430		7680	8600
Armenia								6200
Australia	6620	4490	5970	3700	6430	10850	7680	8600
Austria	3970	2730	3370	2330	3500	4680		5900
Azerbaijan								5900
Bahamas							9400	
Bahrain								6700
Bangladesh		3670						8200
Barbados					5480		11630	8950
Belarus		2730						5900
Belgium-Luxembourg	3970	2730	3370	2330	3500	4680	4910	5900
Belize		3600					8550	6780
Benin							10380	7200
Bermuda							7870	6570
Bhutan								
Bolivia							7670	6800
Bosnia and Herzegovina		2730					4910	
Botswana							11420	
Bahrain							13020	
Brazil	6530	4100			5760		9400	7600
Brunei Darussalam								
Bulgaria	3970	2730						5900
Burkina Faso								
Burundi							10300	
Burma								
Cambodia								8200
Cameroon		3000					8260	
Canary Islands							11190	
Canada	5920	3400	6120	3280				6200
Cape Verde							12190	
Cayman Islands							2570	
Central African Republic							9570	
Chad							16780	
Chile	6670	4020	5490			11370	8390	7340
China	5580	4170	5680	3900	4960	9370	7360	6800
Colombia		4020				10940	8230	7200
Comoros							11220	
Congo, Dem Republic		3430					8840	
Congo, Republic of								
Cook Islands								
Costa Rica	3350	3000					8770	7340
Côte d'Ivoire								8450
Croatia	3970	2730	3370	2330	3500	4680		5900
Cuba							11500	
Cyprus		5180		4400			9740	
Czech Republic	3970	2730	3370	2330	3500	4680		5900
Denmark	3970	3780	3370	2330	3500	4680		5900
Djibouti							14040	
Dominica		3780			6940		11660	
Dominican Republic								
Ecuador	5260	4210				10710	8050	6870
Egypt	6720	5420	6800		6810	13800	13650	9600
El Salvador	6800	4020					11390	8200
Equatorial Guinea							8740	
Estonia		3780						5900
Ethiopia		4020					11960	
Falkland							3320	
Fiji Islands								
Finland	5590	3780	4680	3610	4370	7490		5900
France	5590	3780	4680	3610	4370	7490	4250	5900
French Guiana							9820	
Gabon							7380	6250
Gambia		4020					13580	9600
Georgia								5900
Germany	5590	3780	4680	3610	4370	7490	4250	5900
Ghana					5090		10060	9200
Greece	8190	5550	6820	4710		11040	8370	7820
Grenada							10230	9120
Guadeloupe							11940	
Guatemala		3370	5680					7650
Guinea							9530	
Guinea-Bissau							11120	

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Guyana							9130	8820
Haiti							9920	
Honduras		4130					8260	7920
Hungary	5590	3780	4680	3610	4370	7490		6200
Iceland								
India	6400	6020	8080		7100	18410	13600	9880
Indonesia		3680	4850	3190	5670		12400	9300
Iran		8210					16300	10210
Iraq								
Ireland	5590	3780						5900
Israel	5170	8120	9200		5620		14800	12000
Italy	6760	4190	5640	3870	4030	9550	7360	6400
Jamaica				4260	6820		11460	
Japan	5710	3560		3210	5050		7060	7600
Jordan		5420					9010	8210
Kampuchia								
Kazakhstan	3970							6200
Kenya		4570	3760	3570		13920	10370	9230
Kiribati								
Korea	6190	3860		3520			6880	6570
Korea, Republic of								
Kuwait							17640	
Kyrgyzstan	3970						7600	6200
Laos								8720
Latvia								5900
Lebanon		3960			5860	10290	7820	5900
Lesotho							8120	
Liberia							8810	
Libyan		4020					11080	
Lithuania		3780						5900
Macedonia	3970	3780						5900
Macao								
Madagascar	7030	4170					12560	11200
Maderia							7710	
Malawi		4570					8760	
Malaysia	6220	3900		3320	5450		10100	8900
Maldives								
Mali							14610	
Malta								7450
Martinique							10620	
Mauritania							16330	
Mauritius		4020					9250	6410
Mexico	6000	4800	6200	3260		10700	10230	7980
Micronesia								
Moldova		3790						
Mongolia								
Montserrat							13640	12000
Morocco		4200	3370			3000	8450	
Mozambique		5670					9230	7620
Myanmar	5140	3670	4810					8720
Namibia							11560	
Nauru								
Nepal								9800
Netherlands	3970	2730	3370	2930	3500	4680	3910	5900
New Caledonia								
New Zealand	6620	4490	5970		6430		7680	
Nicaragua							12170	10420
Niger	8920	5500						12300
Nigeria		5490			6300		15680	12600
Niue								
Norway		2730						5900
Oman		6040					13440	11670
Pakistan								10970
Panama							9530	7620
Palestine								
Papua New Guinea								
Paraguay			7580		6180		11110	7840
Peru	5490	4180					9960	8230
Philippines	4970				5860			8720
Poland	3970	3790			3500			5900
Portugal	5450	4300	4550	3120	4860		5870	6800
Puerto Rico							10180	
Qatar							16000	
Réunion								
Romania	3970	2730						5900
Russian Federation	3970	3790		3370				5900
Rwanda							10160	
Saint Kitts and Nevis								
Saint Lucia								

Appendix I. Crop water requirements (m^3/ha). Source: CropWat model (www.fao.org).

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Saint Vincent/Grenadines								
Samoa								
Sao Tome and Principe								
Saudi Arabia		5640				16480	12400	11600
Senegal		6140					11740	10600
Seychelles								
Sierra Leone								
Singapore	5740	4600	4520				9570	8720
Slovakia	3970	3790						5900
Slovenia								5900
Solomon Islands								
Somalia							11750	
South Africa		4010	5210		5630	11060	8330	7260
Spain	6570	5330	4200	4830	4600	13790	10520	8350
Sri Lanka		6200						7600
Sudan	8710		6690				18220	12600
Suriname					5320		10340	8900
Swaziland								
Sweden	3970	3790	3370					5900
Switzerland								
Syrian Arab Republic	7120	8410				18830	14410	12000
Tajikistan	3970							6200
Tanzania		3270					7670	6800
Thailand	7140	4640	5080	3840	5860		11400	9600
Togo							9570	7230
Tonga					5300			
Trinidad and Tobago		3850					10170	9200
Tunisia	7100	4800				10170	7740	7200
Turkey	7910	4860	6640		6130		8610	7680
Turkmenistan								
Tuvalu								
Uganda		4500	6070				11360	9850
Ukraine		3780						6200
United Arab Emirates	7120	6200						9340
United Kingdom	3790	3790		2680			4910	5900
United States of America	4630	4750	6800	3620	6860		7260	8600
Uruguay		4770					8560	7680
Uzbekistan	3970							6200
Vanuatu								
Venezuela		3770					8830	7680
Viet Nam	5140	3670	4810				9270	8720
Virgins							11870	
Wallis and Futuna Is								
West Bank								
Western Sahara							11000	
Yemen							10900	8670
Yugoslavia	5220	3490					10520	8960
Zaire							8780	
Zambia		4370					10940	9000
Zimbabwe		4490					11210	10340

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Afghanistan		1.2			6.9		1.5		0.8	
Albania	3.2	1.8	1.1	1.2	13.9	0.6	3.7			
Algeria		0.9	0.5	3.7	3.9	1.1	2.2			
American Samoa	2.5									
Angola	9.7		0.4			0.3	0.6		0.5	11.4
Antille										
Antigua	11.0			3.6			1.7	5.7		
Argentina	2.6	2.3	1.6	7.0	11.8	1.5	5.2	9.0	1.5	
Armenia		1.3	2.5		7.3		4.0			
Australia	19.7	1.9	0.9	5.1	13.3	1.6	5.3	4.4	1.0	11.2
Austria		4.7	1.3	12.3	7.6	0.9	9.6		1.6	11.4
Azerbaijan		1.0	2.7		3.4		3.6		0.6	
Bahamas	2.2	0.9			3.2		2.2			
Bahrain	9.3				2.6					
Bangladesh	14.3	0.6	0.7	4.7		1.1	1.0	3.7	0.7	
Barbados	5.6					2.3	2.5			
Belarus		1.5	0.9		4.3	1.0	2.6			
Belgium	24.0	7.4	3.4	16.6	18.9	1.0	12.2		1.6	14.1
Belize	18.8		1.0		7.2		2.1	5.9		
Benin	5.2		0.7			0.8	1.1	5.2	0.7	8.7
Bermuda	16.5	1.0		4.0			4.1			
Bhutan		1.0					1.6		0.9	
Bolivia	11.2	0.6	1.0		7.6	1.1	2.2	9.4		
Bosnia		2.6	2.0	4.0	3.6		3.9			
Botswana						0.5	0.3		0.2	
Bahrain										
Brazil	16.0	2.3	0.7		15.8	1.8	2.8	7.4		9.9
Brunei	4.3									
Bulgaria		2.6	0.8	3.3	3.3	1.0	3.8			
Burkina Faso				1.4		1.0	1.4	5.0	0.7	
Burundi	5.1		1.0			0.8	1.1		1.1	11.2
Burma										
Cambodia	4.6		0.4			0.8	1.6	1.3		
Cameroon	14.4		0.9	7.3	9.0	0.6	1.9	6.9	1.1	2.2
Canary Islands										
Canada	12.0	3.2	2.0	6.2	1.4	3.0	8.3		1.2	16.7
Cape Verde	3.0			1.0			0.3	45.0		
Cayman Islands	1.3									
Central African Republic	6.5					1.1	1.6	4.8	1.0	8.0
Chad			0.6			1.0	0.7	4.9	0.4	
Chile	12.0	3.7	1.6	6.3	11.4	2.0	8.5			
China	2.8	2.5	1.4	11.2	12.4	3.0	4.9	12.5	1.7	14.7
Colombia	31.2	2.2	1.3		12.9	1.4	1.8	12.7		19.2
Comoros	5.9					1.0	2.4			
Congo, D	3.7	0.6	0.5		6.3	0.8	0.8	16.8	0.6	5.0
Congo, R	1.4		0.8			1.1	0.7			12.5
Cook Islands	3.3							27.0		
Costa Rica	54.0		0.5	6.3	7.0	1.2	1.9	1.4		16.9
Côte d'Ivoire	14.7				7.0	1.0	0.8	1.5	0.6	9.6
Croatia		2.9	3.4	5.8	7.2	1.1	5.6		3.6	
Cuba	11.7		0.4		7.0	1.0	2.9	34.3		
Cyprus	43.5	2.1	1.5	14.0	5.9	4.0	4.1			
Czech Republic		3.9	1.3	5.0	6.4	1.1	6.6		2.0	
Denmark		5.2	1.3	8.0	6.0	1.1	12.0		1.6	
Djibouti							1.6			
Dominica	1.0	1.7			12.0		1.4	1.0		
Dominican Republic	12.3		0.8	6.2	12.0	1.2	1.2	7.8		15.1
Ecuador	33.2	0.7	0.5	1.5	4.0	0.7	1.3	1.5		1.6
Egypt	37.5	2.1	2.6	12.5	19.2	3.5	8.9	9.8	0.9	
El Salvador	1.8		0.9	2.9	11.0	1.0	2.5	6.7		15.0
Equatorial Guinea	4.5									1.0
Estonia		1.2	2.2		3.3	1.1	12.0		0.8	
Ethiopia	15.9	0.9	0.8	4.6	4.0	1.3	1.7		0.9	
Falkland										
Fiji Islands	7.6					1.0	2.5	12.0		
Finland		2.6		2.3	7.2		4.1			
France		6.2	2.3	11.2	9.3	1.1	9.0		0.8	11.4
French Guiana	6.2			11.1			0.8	3.8		
Gabon	6.4					1.0	1.7			8.0
Gambia			0.6	5.2		1.1	1.5	4.7	0.9	1.0
Georgia		1.8	0.9		3.5	0.3	2.2			
Germany		6.2	1.3	1.7	16.4	1.1	6.7			11.4
Ghana	3.0			8.5		1.3	1.4	8.0	0.9	8.8
Greece	2.0	2.5	2.7	8.2	9.3	2.9	9.3			8.8
Grenada	4.0		1.0				1.0	1.0		
Guadeloupe	24.5			11.1				0.7		
Guatemala	29.3	0.9	0.7	2.9	3.0	0.9	1.8			21.3
Guinea	3.8					1.3	1.4	1.8	0.8	2.7
Guinea-Bissau	9.5					1.2	1.0	6.4	0.9	8.6

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Guyana	6.8					0.9	1.2	6.3		
Haiti	6.4		0.7	2.9		0.9	0.8	7.3		
Honduras	38.6		0.5	2.9	6.0	1.0	1.2	6.7		21.4
Hungary		3.1	1.3	8.4	5.8	0.9	6.4		1.4	14.1
Iceland										
India	31.2	1.9	0.4	2.7	23.5	0.8	1.7	12.3	0.7	11.4
Indonesia	12.5		1.7	5.9	7.5	1.8	2.7	5.1		16.9
Iran	26.1	1.4	1.6	2.3	8.9	2.3	6.2	8.8	0.8	11.4
Iraq		0.5	1.0	2.3	5.9	3.8	1.9		0.6	
Ireland		6.7	4.6	1.0	7.0		12.0			11.4
Israel	51.8	1.5		9.0	16.3	6.9	12.6	11.2		11.4
Italy	26.7	3.8	2.0	8.8	1.7	1.1	9.7			11.4
Jamaica	8.1		1.2		7.9	1.2	1.2	7.5		
Japan	4.4	4.0	1.8	7.0	11.8	2.3	2.4		1.0	11.4
Jordan	21.6	0.7		9.6	2.8		11.9			
Kampuchia										
Kazakhstan		1.3	0.9	7.1	2.9	1.6	3.2		0.4	
Kenya	5.5	2.4		2.8	6.2	0.6	1.5	5.4	0.6	
Kiribati	5.2									
Korea	4.2	2.0	0.8	9.0	13.3	2.0	2.5		1.0	
Korea, Republic of		4.4	1.9		13.3	1.8	3.9		1.0	
Kuwait		2.5		15.7	0.6		23.0			
Kyrgyzstan		2.0		8.1	2.5	1.0	5.3			
Laos	11.0		0.9			1.3	2.4	8.3		
Latvia		1.6	1.4		4.3					
Lebanon	25.7	2.4	2.4	1.6	9.9	2.9	2.3			
Lesotho		0.3	0.8				0.9			
Liberia	1.6					0.6				1.7
Libyan		0.5	3.0		5.0	1.7	2.0		1.2	
Lithuania		1.8	1.0	8.0	4.4	1.1	12.0		0.9	
Macedonia		2.5	3.0	0.9	8.5		4.4		0.9	
Macao										
Madagascar	5.9		0.9	3.3	5.3	0.7	0.9	11.4		12.2
Maderia										
Malawi	5.1		0.5			0.9	1.8	5.6	0.5	
Malaysia	17.6	1.6	0.6	6.0	7.0	3.6	2.1	4.8		19.8
Maldives	2.5								2.5	
Mali	6.0		0.6	6.0		1.0	1.7	5.0	0.8	
Malta		3.4	2.3		5.8					
Martinique	28.7			1.0				4.4		
Mauritania		0.9				0.8	0.6		0.4	
Mauritius	19.9			3.5	10.0	2.1	4.5			8.8
Mexico	24.4	2.2	0.6	6.5	12.4	1.5	2.6	9.4	0.7	8.3
Micronesia	5.2						1.2			
Moldova		1.7	0.8	3.0	3.2		2.8		0.5	
Mongolia		0.7					3.3			
Montserrat	4.5						1.9	6.7		
Morocco	32.0	0.7	0.6	11.9	7.1	1.9	0.4		1.3	
Mozambique	6.5				6.3	0.6	1.8	7.3	0.6	
Myanmar		1.2	0.7			1.1	1.7		0.7	11.4
Namibia						0.6	0.5		0.2	
Nauru										
Nepal		1.0	0.6				1.7		1.1	
Netherlands		6.3	2.9	8.7	6.7	1.1	7.1		0.8	11.4
New Caledonia	2.0						4.2			
New Zealand		5.7	1.3	7.6	9.1	1.1	1.1			11.4
Nicaragua	44.0		0.7	3.0		3.0	1.2			26.5
Niger	7.0	1.0	0.7	7.0		0.4	1.3		0.4	10.5
Nigeria					9.0	1.5	1.4	6.0	1.6	2.7
Niue	2.0									
Norway		3.5	0.6	7.8	7.0	1.1	12.0			
Oman	14.0	0.8	0.6			1.8	4.0	2.7		
Pakistan	3.6	1.2	0.5	7.9	8.4	0.8	1.5	9.9	0.5	
Panama	39.5		0.5	6.0	6.8	1.1	1.6	6.7		9.6
Palestine		0.4			6.7					
Papua New Guinea	14.3			1.8		0.8	5.4			14.8
Paraguay	20.0	1.5	0.7	3.0	17.8	0.9	2.3	7.5		9.6
Peru	22.0	1.2	0.9	2.8	9.5	1.8	2.4	17.6		26.0
Philippines	2.0		0.9	2.8	4.4	0.9	1.7	6.2		12.5
Poland		3.7	1.9	2.0	4.3	1.3	5.8			
Portugal	29.2	1.3	0.5	8.4	4.4	2.5	5.3			
Puerto Rico	21.1		0.6				4.0	2.9		
Qatar	20.0	3.0			3.2		12.5			
Réunion	8.3		0.7	1.4	1.0	0.9	6.8	12.5		
Romania	23.0	2.5	1.6	4.4	4.4		3.6		0.8	
Russian Federation	23.0	1.4	0.8		4.3	1.1	2.0		0.9	11.4
Rwanda			0.6			0.6	0.8		0.8	
Saint Kitts and Nevis						0.9				
Saint Lucia	1.0							7.5		

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Saint Vincent/Grenadines	1.0					1.0	3.3	5.7		
Samoa	4.5							8.4		
Sao Tome and Principe	6.9						2.1			12.8
Saudi Arabia		4.7		3.0	13.7	4.0	1.6		2.0	
Senegal	17.2		0.6	7.9		1.7	0.9	6.8	0.6	1.0
Seychelles	4.9									
Sierra Leone						0.8	1.2	1.6	1.0	8.3
Singapore	25.0	1.7	3.0	3.0	7.5	1.6	8.0		0.9	16.5
Slovakia	22.0	3.0	1.5	3.4	3.5	1.1	6.0		1.9	
Slovenia	21.3	3.2	2.5		6.6		6.9		1.5	
Solomon Islands	2.9									16.0
Somalia	16.1		0.3			0.7	0.7	7.2		
South Africa	15.4	0.9	1.2	5.0	13.5	1.7	2.2	11.4	0.6	10.5
Spain	44.7	2.4	1.1	12.9	4.7	2.3	9.5		2.4	14.1
Sri Lanka	33.0		0.5	4.8	7.9	0.6	1.9	3.3	0.7	
Sudan	33.9		1.9	5.0	11.0	0.7	0.6	2.5	0.3	10.5
Suriname	21.4			1.6		1.4	2.3			2.8
Swaziland	4.2		1.2			1.4	1.8			
Sweden	22.0	3.8	1.8		11.2	1.1	9.2			
Switzerland		5.3		8.7	11.2		9.2			
Syrian Arab Republic	4.1	0.4	1.6	8.2	5.5	2.7	3.2		0.6	
Tajikistan		0.9		7.0	1.2	1.1	3.5			
Tanzania	8.4	2.3	0.8	7.0	5.2	0.6	1.4	1.2	1.0	13.8
Thailand	12.8	0.7	0.8	4.0	16.5	1.5	3.4	1.0	0.9	17.6
Togo	1.7		0.3			0.5	2.0		0.4	8.8
Tonga	1.5					0.5				
Trinidad and Tobago	5.1						2.9	6.6		
Tunisia		0.9	0.5	6.8	5.4	1.1				
Turkey	26.9	1.9	1.4	8.3	6.3	2.6	3.7		1.7	12.4
Turkmenistan		0.4			5.8		0.8			
Tuvalu										
Uganda	4.6		0.4	7.0		0.7	1.2		1.6	3.5
Ukraine		1.8	2.0		2.5	1.1	2.5		0.9	
United Arab Emirates	8.0		0.6	13.2	1.7		4.0	16.9	1.0	
United Kingdom		5.6	1.3	13.3	1.7	1.1	8.0		1.0	14.1
United States of America	17.7	3.2	2.0	5.6	15.8	3.0	8.4	4.8	1.9	14.1
Uruguay	21.0	2.2	0.6	2.9	14.0	0.5	4.9		1.2	
Uzbekistan		0.8			3.4	1.9	2.2		3.5	
Vanuatu	11.9					1.0	0.5			
Venezuela	19.4	1.1	0.8	3.0	13.3	1.8	3.0	15.5		12.1
Viet Nam	15.6	0.9	0.7	5.2	6.2	1.3	2.6	7.2	0.9	11.4
Virgins										
Wallis and Futuna Is	5.5							6.0		
West Bank					5.7					
Western Sahara										
Yemen	9.3	1.1	1.5	5.7	6.9		1.5	4.1	0.6	
Yugoslavia		2.6	1.3	4.2	3.6	1.3	4.8		0.6	
Zaire										
Zambia	2.9	1.0		7.1	7.0	0.4	1.4		0.7	10.5
Zimbabwe	4.8	1.6	0.8	7.1	7.1	0.6	1.6	4.7	0.2	

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetables
Afghanistan		16.8			14.3	19.0	1.4			9.5
Albania		14.2	0.9	1.7	3.7		1.7	1.9	3.2	8.6
Algeria		15.4	2.7				0.5	1.0	17.3	6.6
American Samoa						1.0				7.8
Angola		5.5				37.8	0.6	1.0	3.7	7.3
Antille										
Antigua									7.8	5.7
Argentina	1.2	29.5	4.4	2.4	26.0	6.7	1.8	1.7	3.2	12.8
Armenia		12.9		2.0				1.0	27.7	18.7
Australia	1.2	32.1	3.2	2.0		95.9	1.2	2.5	46.1	36.5
Austria	0.6	3.7		2.7	68.4	12.0	2.6	2.4	43.0	26.1
Azerbaijan		9.5	0.2	1.3	0.5			1.2	18.1	16.6
Bahamas						25.0	1.2		17.8	8.8
Bahrain		14.0							28.5	3.5
Bangladesh	1.2	11.4	1.6			39.9		0.9	6.9	5.4
Barbados	0.6					58.1			7.6	1.0
Belarus		11.2			21.6	22.0	1.9	1.8	14.4	14.3
Belgium	0.6	45.1	9.2	1.2	7.3	22.0	1.1	3.4	32.9	4.0
Belize	0.8			0.8		48.2		1.0		6.1
Benin	0.3	5.5	0.8	0.7		34.5		0.8	5.2	6.6
Bermuda		23.7		0.8					11.5	1.5
Bhutan		13.6		0.7		31.2		1.5		2.6
Bolivia		6.5	2.1	1.3		46.4	0.9	0.9	12.4	5.1
Bosnia		8.5		2.2			0.4	1.6	7.8	4.6
Botswana			0.2				1.8			4.5
Bahrain										
Brazil	3.0	16.4	1.6	2.4	28.0	68.1	0.8	1.8	5.4	11.6
Brunei	0.4									0.8
Bulgaria		1.9		0.6	17.7	73.0	1.3	1.3	15.4	4.9
Burkina Faso		6.0	0.8	1.0		1.0		0.5	11.3	8.5
Burundi		2.4	1.2	0.8		64.8		1.0		9.1
Burma										
Cambodia	6.8			1.8		27.6		0.7		6.3
Cameroon	0.3	2.9	1.4	0.6		1.0		1.4	4.5	7.5
Canary Islands										
Canada	0.6	27.3	2.9	2.8	42.8		1.5	2.8	77.9	25.7
Cape Verde		16.7				15.6			20.0	12.5
Cayman Islands								1.0	27.0	9.0
Central African Republic		2.6	1.3			7.3		0.8		8.6
Chad		6.2	0.7			95.5		1.4		9.5
Chile	1.2	16.5	4.0	1.6	61.9		1.5	2.9	65.5	2.0
China	1.5	13.9	3.3	1.8	29.2	75.0	2.0	1.8	23.9	17.7
Colombia	1.2	17.0	3.2	2.5	26.0	94.8		1.8	21.7	9.0
Comoros		14.4						1.2	9.0	7.0
Congo, D		6.3	0.6	0.5		47.2		0.5	7.4	5.4
Congo, R		8.9				2.0		0.4	7.5	7.0
Cook Islands								0.7	5.0	1.0
Costa Rica	3.8	22.3		1.2		85.9		1.9	25.9	13.6
Côte d'Ivoire	0.5		0.3	1.2		67.9		0.5	1.0	8.2
Croatia	0.5	11.5	4.1	2.5	4.3		1.7	1.5	11.5	7.1
Cuba		24.7	1.0		12.0	34.1		0.7	4.8	5.0
Cyprus	0.8	23.7				73.0		4.2	11.1	7.0
Czech Republic	0.5	19.6		1.5	45.6	73.0	2.2	2.0	17.7	1.9
Denmark	0.5	39.5		1.6	56.3		1.2	1.9	43.0	23.0
Djibouti										5.8
Dominica	1.0	1.0				2.0		1.1	1.0	1.2
Dominican Republic		1.9	2.5			43.7		1.3	36.4	12.9
Ecuador		9.4	1.4	1.8	6.3	67.7	1.5	2.2	9.4	6.7
Egypt	1.2	21.5	5.8	2.6	47.4	118.5	2.3	1.2	36.9	17.4
El Salvador		5.7	1.3	2.4		68.6		1.8	28.8	13.8
Equatorial Guinea										
Estonia		13.0		3.2	22.0		1.2	1.1	44.2	6.8
Ethiopia	0.7	7.3	1.3	3.6		115.8		0.7	12.6	2.7
Falkland										
Fiji Islands	0.9	8.0	3.0			39.5		0.8	9.3	8.0
Finland	0.5	19.8			34.5	73.0		0.9	28.2	25.3
France	0.5	39.0	6.2	2.7	74.2	36.0	2.3	2.8	28.2	12.1
French Guiana						7.7			28.8	15.0
Gabon				1.5		58.3				6.6
Gambia	1.2		1.0					1.2		4.8
Georgia		13.7		0.6			0.7	1.2	1.5	16.7
Germany	0.5	38.9	7.0	2.6	56.6		2.5	2.8	41.6	2.0
Ghana	0.7	11.5	1.7			25.5		0.6	1.2	
Greece	1.0	18.2	2.0	2.0	56.7	63.0	1.5	2.8	44.3	23.8
Grenada	1.0			1.2		44.0			8.6	1.0
Guadeloupe						39.9			16.4	11.5
Guatemala	0.6	9.4	1.2	2.8		9.8		2.2	28.3	8.6
Guinea			0.7			51.2		0.9		4.0
Guinea-Bissau			0.9			27.5				5.1

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetables
Guyana						65.2		0.9	4.2	6.8
Haiti		12.2	0.8			58.8		1.4	15.5	5.7
Honduras	0.5	1.0	0.9	2.1	32.0	81.8		0.5	1.5	1.0
Hungary	0.5	21.3	2.3	2.4	44.6		1.5	2.0	28.4	14.2
Iceland		12.9					1.2		41.7	
India	0.4	18.8	0.8	1.1	24.0	72.1	0.6	1.5	15.7	1.0
Indonesia	0.7	14.7	1.2	1.2		68.9		0.6	7.4	7.5
Iran	0.8	21.3	1.2	1.6	29.8	86.2	0.7	1.1	27.2	16.7
Iraq		14.4	0.3	1.3	22.4	21.3	1.3	1.0	11.4	6.1
Ireland	0.5	31.9	4.2	1.2	5.7		1.2	1.1	7.0	
Israel	1.2	38.7	7.7	1.2		70.0	1.3	1.0	1.4	17.4
Italy	0.5	24.2	6.4	3.5	46.3		2.7	2.8	53.2	15.7
Jamaica	0.8	15.8				63.2		1.5	17.9	1.7
Japan	1.2	3.3		1.7	54.3	67.5	1.0	2.6	56.5	26.3
Jordan	0.5	25.9	0.7					0.2	36.5	14.9
Kampuchia										
Kazakhstan	0.8	1.8	0.6	1.3	17.2		0.5	1.7	14.3	15.9
Kenya	0.7	3.8	0.8	1.2	13.0	86.7	0.6	2.2	12.4	8.9
Kiribati										14.5
Korea	0.8	7.6	1.0	1.1		62.0		1.4	7.4	11.9
Korea, Republic of		24.5	1.4	1.3				2.6	48.3	31.9
Kuwait		22.3						1.5	64.5	56.9
Kyrgyzstan		15.0	0.4	1.2	2.3		1.2	2.4	15.8	14.7
Laos		6.6		0.9		36.7		5.4		5.7
Latvia		15.9		0.9	29.2	70.0	1.2		8.4	22.5
Lebanon	1.2	19.8	1.7		47.5	24.4	2.3	1.3	29.5	18.4
Lesotho			1.1							6.8
Liberia				0.4		1.2			1.0	5.0
Libyan		7.8	1.2					2.3	13.2	11.6
Lithuania	0.5	14.1		0.8	28.4	12.0	0.8	1.1	7.6	2.4
Macedonia	0.7	12.4	1.3		39.4		1.4	1.3	18.4	15.7
Macao										
Madagascar	0.4	5.9	0.5	1.2		33.3		0.9	9.2	8.3
Maderia										
Malawi	0.8	11.0	0.7	0.9		1.0	0.5	0.9	8.8	8.3
Malaysia	1.8	15.0		1.0	22.0	68.9	1.0	0.8	17.5	13.6
Maldives										15.0
Mali			1.0			75.0		0.8	37.3	5.3
Malta		2.3				24.0	1.0		65.9	12.5
Martinique	1.2					62.9		0.7	16.5	12.7
Mauritania		5.0	0.4			63.0		0.8		6.4
Mauritius	0.8	18.5				59.7		1.6	9.5	17.3
Mexico	1.7	22.3	3.2	1.6	18.0	63.9	0.8	1.9	29.3	7.7
Micronesia			2.5							11.7
Moldova	1.2	5.0	2.6	0.9	16.6	35.0	1.3	1.2	14.2	1.3
Mongolia		7.4								8.2
Montserrat		3.5							6.7	6.5
Morocco	1.3	18.3	0.6	1.0	62.0	76.5	0.7	1.0	48.7	17.4
Mozambique		12.5	0.8			18.0	0.6	1.7	8.8	6.2
Myanmar		1.4	0.9	0.8		44.2	0.8	1.7		13.4
Namibia			0.3				0.8			4.5
Nauru										7.5
Nepal		9.2		0.8		36.6		0.9		8.9
Netherlands	2.0	44.9	8.0	1.8	46.0	42.0	1.2	1.0	42.6	39.4
New Caledonia		13.7	1.4							1.8
New Zealand	1.2	41.7		1.6				1.5	47.0	23.6
Nicaragua	1.0	13.3	1.9	2.2		66.2		1.4	1.8	7.6
Niger		1.0	0.2	0.8		23.3		0.8	16.3	8.0
Nigeria	1.1	6.4	1.1	0.7		28.4	0.9	0.4	7.0	6.9
Niue										6.7
Norway		23.7			26.0		1.2	1.1	32.3	22.9
Oman	1.7	21.9	3.0	1.2	16.0	20.0		4.5	22.7	14.4
Pakistan		16.6	0.6	1.2	26.5	47.8	1.3	1.9	2.0	13.8
Panama		16.0	2.4	0.8		53.2	1.0	1.6	12.3	12.0
Palestine		21.9							53.3	19.7
Papua New Guinea		4.2	4.0			53.8		1.2	4.3	16.2
Paraguay		6.0	1.4	2.8		47.0	1.4	1.6	37.5	6.2
Peru	1.2	11.3	4.6	1.4		118.8		1.2	24.4	15.0
Philippines	1.5	12.1		1.2		63.4		1.2	8.6	8.6
Poland	2.0	15.7		1.5	33.8	63.0	1.1	2.9	15.4	19.6
Portugal	2.0	15.7	8.0	2.5	6.6	8.0	0.7	2.6	66.6	18.8
Puerto Rico						3.8		1.0	12.9	
Qatar		9.3							31.9	1.8
Réunion		18.0				69.3		1.0	12.2	7.6
Romania		14.4	1.5	1.8	21.7		1.2	1.3	16.6	1.8
Russian Federation		9.7	1.0	0.8	18.6	34.0	0.8	0.9	12.3	15.3
Rwanda		6.0	0.8	0.5		47.6	1.0	1.3		7.4
Saint Kitts and Nevis		14.7				52.8				6.7
Saint Lucia	0.8									7.1

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetables
Saint Vincent/Grenadines						25.0		1.2		7.5
Samoa	0.5					13.0		3.4		6.7
Sao Tome and Principe										5.8
Saudi Arabia	1.7	25.9	1.3			23.0		1.3	24.3	21.8
Senegal	1.2	17.1	0.6			19.8		1.1	19.5	18.0
Seychelles									6.1	7.8
Sierra Leone			0.8			7.0		0.7	9.9	6.3
Singapore	1.8	14.0	1.2	1.2	12.0	22.0	0.9	0.8	23.0	17.1
Slovakia	2.0	14.3	2.4	1.5	4.8		1.3	1.5	19.9	7.7
Slovenia		19.7			43.2	16.0	1.7		27.0	
Solomon Islands								0.9		16.4
Somalia			0.3			35.0		0.3		6.4
South Africa	1.2	26.6	2.3	1.3	16.0	67.2	1.3	2.1	31.9	14.2
Spain	2.0	24.7	5.0	2.2	6.5	76.8	0.7	2.6	59.5	21.3
Sri Lanka	0.6	12.5	0.8	1.0		55.2		1.3	7.5	1.0
Sudan		7.3	0.6	1.2		7.1	0.8		12.0	7.8
Suriname	0.8			0.9		5.0		1.2	8.4	15.8
Swaziland		2.0	0.6			18.8		1.0	12.5	8.2
Sweden	2.0	3.2			46.0				32.9	21.0
Switzerland		35.2		3.3	68.0		2.8	1.6	36.7	23.3
Syrian Arab Republic	1.5	23.2	0.6	0.8	45.4	55.0	1.8	1.5	38.7	8.9
Tajikistan		13.2	1.0	1.4				2.6	19.9	18.0
Tanzania		6.9	0.9	0.4		96.8	0.4	0.8	7.9	6.8
Thailand	2.8	7.8	1.6	1.5	16.0	56.7	1.1	1.4	9.1	7.4
Togo			0.7			28.0		0.5	4.0	5.0
Tonga									14.7	1.3
Trinidad and Tobago	1.0	22.0		1.1		48.4		1.2	12.6	9.0
Tunisia		12.8	0.3		42.6	40.0	0.6	0.8	37.2	12.5
Turkey	1.8	25.9	1.6	2.1	43.9	32.0	1.5	0.9	41.7	15.9
Turkmenistan		5.6						2.5	11.6	11.0
Tuvalu										7.5
Uganda	0.7	7.2	1.5	1.2		13.3	0.6	1.3	6.5	7.4
Ukraine	1.4	8.2	1.2	1.2	15.4		1.0	0.8	13.4	8.3
United Arab Emirates	1.2	19.5		1.5	17.4	63.0		12.6	68.2	25.7
United Kingdom	2.0	4.2	1.2	2.7	57.8	44.0	0.9	2.0	36.6	3.1
United States of America	2.0	4.2	4.4	2.5	49.5	79.7	1.4	2.2	48.5	31.8
Uruguay	1.6	16.4	3.6	1.9		51.6	1.2	3.3	18.2	8.3
Uzbekistan	1.2	13.6	2.6	1.1	11.8		1.7	1.9	34.0	4.6
Vanuatu										15.8
Venezuela	1.2	18.4	2.6	0.8		61.5	1.4	1.9	2.6	17.5
Viet Nam	1.2	11.8		1.1		5.6		1.9		12.9
Virgins										
Wallis and Futuna Is						2.0				2.4
West Bank										
Western Sahara										
Yemen	1.2	12.7	1.7					2.1	12.7	8.9
Yugoslavia	1.5	8.2	4.7	2.7	35.2		1.5	1.7	8.3	7.6
Zaire										
Zambia	0.7	10.0	0.7	2.3		13.1	0.6	1.9	1.0	6.4
Zimbabwe	0.9	15.8	0.6	2.1		18.3	0.7	2.2	6.7	6.9

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	W.melon	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Afghanistan	11.5	1.2	1.1							
Albania		2.5	1.0				12		1.6	
Algeria	15.3	0.8	0.6	9.0	13.7	11.2	13.1783		0.8	
American Samoa										
Angola		1.3	1.0							1.0
Antille										
Antigua			0.1	5.0	4.0		7.6923			
Argentina	13.9	2.5	1.0	15.0	26.3		11	18.0	2.1	22.0
Armenia	21.7	1.9	2.0	22.6	17.1	50.0	13.3333		1.4	
Australia	15.9	2.3	3.6	30.9	37.3	9.2	15.60005	22.6	2.0	22.0
Austria		5.4	2.0	46.5	31.4	18.0	72.242	27.9	4.1	20.0
Azerbaijan	9.2	1.9	1.3	13.1	8.3		8.40215	23.0	0.8	22.0
Bahamas				14.0			12			
Bahrain	6.5			20.4	15.2	10.8	10.0091	19.8		
Bangladesh		2.3	1.3	10.3		7.6	4.1111	4.9		
Barbados				7.5	6.0		7.6471	10.3		
Belarus		1.7		17.1	16.5		12.9354		1.7	23.0
Belgium		8.3		19.1	45.1	18.1	65	64.6	3.4	9.6
Belize										
Benin			0.9							22.0
Bermuda		1.5								
Bhutan		1.5								
Bolivia	9.6	0.9	1.2	10.3	9.2	7.2	6.9091	9.6	0.9	
Bosnia	15.0	3.1		7.4	6.6		30		2.4	
Botswana		1.7	2.5							
Bahrain										
Brazil	7.6	1.9	2.2		26.0	15.0	11	19.0	1.1	22.0
Brunei										
Bulgaria	12.8	2.7	1.1	16.9	12.9	10.8	15.82375	8.1	1.4	9.1
Burkina Faso			1.7							17.0
Burundi		0.8	0.9							
Burma										
Cambodia			1.4							
Cameroon	27.1	1.3	1.9	12.9						
Canary Islands										
Canada	18.3	2.6	1.2	21.7	36.6	16.3	32.1399	27.5	2.5	22.0
Cape Verde	15.0			24.0	24.0	12.0	15.3333	16.0		
Cayman Islands										
Central African Republic			0.5							
Chad		2.1	0.8							
Chile	16.4	3.5		27.0	27.0	21.0	23.1579	13.8	3.3	22.0
China	26.3	3.9	3.8	20.3	17.8	22.9	15.83625	21.7	1.9	23.7
Colombia	12.0	2.2	3.0	4.6	31.9	12.9	17.8759	13.8	1.4	22.0
Comoros										
Congo, D		1.3	0.4	20.8	2.8		4.07145	31.3		
Congo, R										
Cook Islands	6.0									
Costa Rica			1.0	7.4	10.0	10.3	4.5		1.8	22.0
Côte d'Ivoire			1.1							
Croatia	18.5	3.3		14.0	9.0	16.8	6.6323	7.4	2.6	20.0
Cuba				15.6	10.0		2.883			
Cyprus	56.3	2.6		36.7	38.0	23.4	90.78945	10.0	1.2	6.2
Czech Republic		4.6		34.9	20.6	16.5	11.2232	7.6	3.1	20.0
Denmark		7.2		27.7	42.7	9.6	328.5714	25.0	5.1	20.0
Djibouti										
Dominica				10.0	10.0		6.1901	10.0		
Dominican Republic				14.5	10.0		31.25	14.7		
Ecuador	9.8	0.7	0.7	9.1	8.0	5.7	12.7875	7.1	0.7	5.1
Egypt	29.3	6.3	2.4	29.2	26.2	23.4	13.81505	25.9	0.7	12.0
El Salvador	18.6	2.3	1.8	8.0			10		1.2	
Equatorial Guinea										
Estonia		1.3	2.0	11.8	12.8	3.5	32.2937		1.6	
Ethiopia		1.1	1.6	14.6					1.0	10.0
Falkland										
Fiji Islands	1.0						14.2857			
Finland		2.0		19.0	31.6	9.2	75.2621	24.0	2.5	20.0
France	32.8	7.2		22.7	42.2	12.1	116.9438	27.5	4.4	19.1
French Guiana				15.1			21.7353			
Gabon										
Gambia			0.3							
Georgia	14.1	2.3		7.6	8.3		8.54165		0.6	
Germany		7.5	2.0	51.6	44.4	26.7	40.76265	24.0	4.8	19.1
Ghana		1.8	0.8				10		0.7	
Greece	42.8	2.3	2.8	23.5	31.4	19.4	82.1579	18.7	1.9	24.2
Grenada			0.3	10.0	5.3		10	7.0		
Guadeloupe	19.0			9.0	9.0		34.49035	19.9		
Guatemala	25.0	2.0	2.0	11.5	10.0	11.5	4.5	16.7	1.2	22.0
Guinea			1.3							
Guinea-Bissau			1.2							

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	W.melon	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Guyana				5.7						
Haiti			0.4	6.0				2.8		
Honduras	9.7	0.7	2.0	30.8	11.7	8.0	22.7273	14.4		16.0
Hungary	17.3	3.6		27.4	25.9	18.2	23.7472	23.5	2.6	15.0
Iceland				34.6	32.0	12.0	120.40475			
India	13.2	2.6	0.7	18.3	14.5	17.3	6.6434	6.6	1.5	18.0
Indonesia		0.8	1.3	24.0	15.9	16.0	8.31485	17.0	1.2	18.0
Iran	21.3	1.8	2.0	18.0		11.0	19.33925			12.0
Iraq	1.5	0.5	1.5	16.2	10.0	11.3	7.55	11.7	0.8	12.1
Ireland		8.8		34.0	24.4	9.8	166.6667	24.0	6.1	20.0
Israel	22.6	1.5	3.6	29.3	73.2	26.0	65.625	36.6	0.4	31.8
Italy	33.8	3.2	0.9	19.4	48.1	20.9	27.2059	19.3	2.5	20.0
Jamaica	19.9			15.8	13.9	12.6	14.2105	12.4	1.8	11.5
Japan	33.6	3.5		39.2	28.9	10.5	49.5831	23.5	1.4	21.2
Jordan	38.1	0.2		25.7	36.7	17.2	81.94265	29.2		12.3
Kampuchia										
Kazakhstan	9.7	1.3	1.8	11.5	11.5	0.0	8.0847	0.0	0.4	12.0
Kenya		1.4	0.4	22.0	0.0	0.0		10.0	1.1	12.0
Kiribati										
Korea	19.9	3.0	1.8	15.6	25.9	0.0	11.9811	21.2	1.4	13.1
Korea, Republic of	27.2	3.7		58.3	25.9	0.0	53.08535	21.2		25.2
Kuwait	24.3	1.5		44.3	38.4	42.6	42.03475	50.2		
Kyrgyzstan	15.9	2.4	2.5	16.1	15.9	0.0	14.97915	0.0	2.2	12.0
Laos			2.9	0.0	0.0	0.0	0	0.0		
Latvia		2.4		14.8	9.1	0.0	11.7219	0.0	1.7	20.0
Lebanon	26.0	2.4		26.0	21.3	23.9	31.3329	123.7	1.3	12.0
Lesotho		1.2		0.0	0.0				1.3	
Liberia				0.0	0.0					
Libyan	16.2	1.2		16.9	3.9	9.8	15.1923		0.0	17.1
Lithuania		2.7		22.6	14.1	15.4	16		2.0	20.0
Macedonia	14.5	3.3		18.4	8.6		20		1.3	20.0
Macao										
Madagascar		2.5	1.6	18.5	3.7	12.4	4.3409	2.6		2.9
Maderia										
Malawi		0.8	0.8	10.0	0.0	0.0				
Malaysia	21.7	0.8		38.5	16.0	16.0	24.88095	17.0		12.0
Maldives				0.0	0.0	0.0				
Mali		2.3	1.7	0.0	0.0	0.0				
Malta		5.0		44.0	0.0	16.2			1.9	
Martinique				15.0	5.0	0.0	21.1111	31.2		
Mauritania	1.0	1.0		0.0	0.0	0.0				
Mauritius				17.6	14.6	18.8	15.33025	13.9		20.0
Mexico	22.7	4.9	2.9	34.1	23.0	12.3	26.5625	19.0	1.4	22.9
Micronesia										
Moldova	4.4	2.3		13.3	10.9	10.0	7.833		1.6	20.0
Mongolia		0.6		0.0	0.0	0.0	7.32145	0.0		
Montserrat			0.9	0.0	6.1	0.0	1	0.0		
Morocco	21.1	0.8	2.0	20.6	22.4	19.2	28.09645	0.0	0.7	14.4
Mozambique		1.1	0.5	0.0	0.0	0.0		0.0		
Myanmar		1.1	0.7	0.0	0.0	0.0	16	0.0		12.0
Namibia		5.6	1.4	0.0	0.0	0.0		0.0		
Nauru										
Nepal		1.7		0.0	0.0	0.0		0.0		
Netherlands		8.3	0.9	33.4	33.4	10.6	664.2857	28.7	5.0	20.0
New Caledonia		1.8								
New Zealand	1.0	7.1		37.5	73.3	45.0		36.0	4.0	45.2
Nicaragua			2.8	1.5	0.0	0.0		0.0	1.2	22.0
Niger		2.0	1.3	0.0	0.0	0.0		0.0		6.8
Nigeria		2.1	0.7	0.0	8.7	0.0		0.0		20.0
Niue										
Norway		4.5		35.4	29.3	14.2	127.3375	22.8	4.1	31.3
Oman	2.0	2.3		22.0	20.0	16.0	12	0.0	0.8	20.0
Pakistan	22.2	2.2	1.9	15.2	18.4	18.5	12.5	1.4		12.5
Panama	12.8	1.9		13.6	7.5	0.0	3.8016	13.2		
Palestine	1.0	0.7								
Papua New Guinea										
Paraguay	5.2	1.8	1.2	0.0	12.1	0.0		0.0	1.2	7.2
Peru	2.3	1.3	1.7	13.2	16.4	12.0	11.27695	13.5	1.0	22.0
Philippines	15.5		0.9	11.6	0.0	0.0	4.0357	0.0		5.0
Poland		3.5		39.6	29.7	20.1	13.48725	0.0	2.6	20.0
Portugal	6.7	1.6	1.8	17.5	32.2	18.7	23.3333	21.1	0.6	18.7
Puerto Rico				5.6	0.0	0.0		0.0		
Qatar	9.5	2.4		15.5	12.0	12.0	15.0265	12.9		
Réunion	2.3			14.7	20.0	20.0		17.0		16.0
Romania		2.8	0.9	22.5	0.0	0.0	17.47915		1.6	20.0
Russian Federation	4.8	1.6		18.6	16.5	6.1	10.0344	23.0	1.2	20.0
Rwanda		0.8								
Saint Kitts and Nevis			0.4							
Saint Lucia										

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	W.melon	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Saint Vincent/Grenadines					10.0					
Samoa										
Sao Tome and Principe										
Saudi Arabia	11.9	4.3		22.0	13.8	18.0	22.65995			12.0
Senegal	12.9		1.0					23.0		
Seychelles										
Sierra Leone										
Singapore		1.2		21.0	12.0	10.0		17.0		12.0
Slovakia	2.0	4.1		26.4	16.1	10.5	11.24215	8.2	2.5	20.0
Slovenia		3.8		32.8	21.6				2.6	
Solomon Islands	22.9									
Somalia	11.9	0.3	0.4							
South Africa	14.5	2.4	1.3	33.1	24.5	24.6	13.18185	14.2	1.0	12.5
Spain	37.8	3.0	3.8	28.8	51.3	20.9	63.4612	27.9	1.8	21.0
Sri Lanka				13.4	11.5		9.3333			20.0
Sudan	28.6	1.2	0.9							12.0
Suriname	12.5			22.7			10.6771			
Swaziland		1.5	0.7	0.0						
Sweden		6.2		43.0	53.7	21.9	54	24.0	3.6	61.6
Switzerland		5.4		22.9	40.4	17.0	88.2353	24.9	5.7	61.6
Syrian Arab Republic	22.3	1.7	3.8	22.1	13.8	21.9	11.41915	20.9	1.2	15.8
Tajikistan	4.8	1.1	1.0	7.1	11.0		3.58335		0.5	12.0
Tanzania		1.4	0.4	0.0						12.5
Thailand	14.5	0.6	1.5	11.9	12.0	6.9	8.33945	16.7	1.5	12.0
Togo		1.2	1.0	22.0				17.0		
Tonga	8.4									
Trinidad and Tobago	12.5	4.6		20.5		6.6	11.579	5.2		22.0
Tunisia	13.0	1.5	1.5	11.4	7.3	20.0	22	0.0	0.1	21.2
Turkey	29.2	2.0	2.9	22.3	21.1	18.3	28.67225	17.4	1.9	10.5
Turkmenistan	12.8	3.2	1.9	6.2	18.3		4.75			12.0
Tuvalu										
Uganda		1.8	0.3			18.5				12.0
Ukraine	4.4	2.3		14.4	11.5	10.0	10.3859	13.0	1.4	20.0
United Arab Emirates	2.3	0.4		36.2	13.4	35.0	55.00105	19.7		16.5
United Kingdom		8.6		28.4	56.1	13.3	410	27.4	6.0	13.0
United States of America	26.3	2.9	1.7	23.0	38.7	17.5	16.4046	33.4	2.2	20.0
Uruguay	14.0	1.9		8.4	11.1				1.0	22.0
Uzbekistan	11.7	2.7	2.4	53.2	36.3		10			20.0
Vanuatu										
Venezuela	15.4	0.4	0.8	30.0	28.9	16.4	14.03265	24.3	1.2	22.0
Viet Nam	11.5		1.0	23.0	12.0	17.2	16			12.5
Virgins										
Wallis and Futuna Is										
West Bank	22.7									
Western Sahara										
Yemen	13.5	1.6	1.4	9.2	8.7		17.11075	4.5		12.0
Yugoslavia	13.6	3.3		13.4	7.5		7.36665		1.9	20.0
Zaire										
Zambia		7.5	1.3		7.0					
Zimbabwe		5.6	1.0						1.6	12.0

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Afghanistan		7.1875						2.25
Albania		2.5263						2.3
Algeria	14.5	6.78635				8.1		1.5
American Samoa								
Angola					8.5			0.8375
Antille								
Antigua	7.9				5.8			
Argentina	27.4	24.26765	0.776		18.0	18.7	5.4	5.2566
Armenia	18.0	7.1699						3.2
Australia	38.9	20.4492	0.77925	15.2	17.1	14.4	12	9.5518
Austria	51.9	41.07015		11.6	11.0			6.2
Azerbaijan	10.6	4.4309					5	4.62185
Bahamas	5.5				4.2			
Bahrain	29.9							3
Bangladesh	4.0	8		4.8	9.4			3.076
Barbados	13.3				8.5			3.2
Belarus	7.5	2.125						2.3
Belgium	26.7	30.12615	1.2	19.1	14.0	9.7	15.5	6.2
Belize	0.0	4.5						2.0167
Benin	9.9				5.0			2.08705
Bermuda					11.3			3.2
Bhutan								1.6667
Bolivia	7.5	5.8239			4.3			1.79305
Bosnia	7.5	5.1704					15.5	
Botswana	14.5							
Bahrain								4
Brazil	12.4	8.9022			10.2		5.4	2.7941
Brunei					5.2			1.6519
Bulgaria	7.8	21.9422		7.2				3.0691
Burkina Faso					5.5			1.9259
Burundi					6.2			3.12495
Burma								
Cambodia					3.4			1.86585
Cameroon	5.7	6			7.2			3.25195
Canary Islands								
Canada	33.5	11.11915	1.5	5.8				5.7
Cape Verde	27.5				5.3			
Cayman Islands					3.5			
Central African Republic								1.46155
Chad	20.0				2.5			1.48545
Chile	36.5	25.81115			7.0	7.5	6.8	4.02985
China	20.6	7.97325	2.16665	14.0	20.3	4.0	12.4	6.34365
Colombia	16.7	14		6.8		14.0	6.8	4.89515
Comoros					2.6			1.2143
Congo, D	5.9	6			3.7			0.755
Congo, R					7.5			0.8571
Cook Islands					28.0			
Costa Rica	23.5	4.5			11.0			4.30975
Côte d'Ivoire					3.0		11.2	1.57235
Croatia	7.9	5.82635						5.2
Cuba	6.6				4.2		5.1	2.77285
Cyprus	37.5	6.25		9.3		19.0	8.8	
Czech Republic	15.5	4.523	1.2	11.5				5.3
Denmark	30.4	14.69855		10.0	14.0	9.7		5.2
Djibouti								
Dominica		14			4.0			
Dominican Republic	7.7				4.1			4.43805
Ecuador	9.0	5.0724			3.7	13.5	5.3	3.36425
Egypt	23.8	9.3316	0.6	18.9	24.0	18.0	17.5	8.75905
El Salvador	8.2	14			6.5			6.07815
Equatorial Guinea					2.5			
Estonia	4.4	14						5.2
Ethiopia	10.0	5	0.52145		8.1			
Falkland								
Fiji Islands					9.5			1.37705
Finland	17.2	9.5		0.0				5.2
France	40.2	19.56075	1.2	17.2	14.2	6.2	5.4	5.95475
French Guiana								2.6919
Gabon					1.8			2
Gambia		6						1.68265
Georgia	18.0	12.074						3.2
Germany	38.4	15.3646		15.9	14.0	9.7	5.4	5.2
Ghana	7.7	0			1.4			1.5491
Greece	19.1	7.40965		13.4	20.0	10.0	12	7.63025
Grenada					2.7		7.8	3.2
Guadeloupe	8.0				10.5			
Guatemala	6.3	5.2	1.2					2.41405
Guinea					6.1		5.1	1.50935
Guinea-Bissau								1.51415

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Guyana								4.1243
Haiti	4.7			13.3	3.0			1.99
Honduras	5.7	6.5			3.3		3.2	2.4201
Hungary	24.4	5.36845	1.2	17.5	11.0			3.00945
Iceland						9.7		5.2
India	11.4	7.38065	0.6		8.5	7.8	16	2.94915
Indonesia	7.3	8.5	0.8	2.0	9.5	7.5	12.4	4.22555
Iran	25.2	9.9121					8.5	4.25235
Iraq	8.8	4.91935		6.1				1.8642
Ireland	31.0	9.5				9.7		5.2
Israel	30.3	16.6805	0.8	56.3	33.4	10.0	7.4	5.5
Italy	28.2	20.11925		13.2	12.6	10.0	11.5	6.214
Jamaica	8.7			7.6	16.1		6.8	1.49105
Japan	50.7	22.13145		12.5	23.8		20	6.31655
Jordan	15.1	4.0192		20.2				2.3
Kampuchia								
Kazakhstan	13.6	2.5966	0.4347					3.0116
Kenya	5.6	5.7143		20.0	9.5	11.0	6.1	2.6238
Kiribati								
Korea	11.9	9.6154		14.7	12.9		12.4	4.00865
Korea, Republic of	58.9	10.3224		14.7	21.2			6.50645
Kuwait	25.9			41.5				
Kyrgyzstan	16.5						12	2.4424
Laos					5.6			2.81975
Latvia	8.6							3.2
Lebanon	18.8	19.29555		14.9	4.5	16.0		2.8
Lesotho								
Liberia					10.0			1.2916
Libyan	19.0	8.10715						
Lithuania	8.6	6.3						5.2
Macedonia	8.0	13.2863						5.03615
Macao								
Madagascar	8.5	1.83335			5.5			2.0916
Maderia								
Malawi	7.2	5.2					7.3	1.85515
Malaysia	8.2	8.5		12.0	11.1		5.5	2.9122
Maldives	0.5				0.2			
Mali	29.0				4.6			2.24415
Malta	12.6						7.1	3.2
Martinique	0.0				8.9		9	0
Mauritania	0.0				1.0			4.54265
Mauritius	22.1	6			11.7			3.3
Mexico	12.4	6.2204	1.48765	11.7	19.0	12.0	7.1	4.6435
Micronesia					5.9			1.125
Moldova	7.9	4.3423						
Mongolia	0.0							
Montserrat	3.0				2.0			3.3
Morocco	21.5	10.6394			15.9	12.0	9	5.2059
Mozambique	5.7	6			6.9			1.07465
Myanmar	8.2	10	0.8		4.6			3.1844
Namibia								
Nauru								
Nepal								2.4335
Netherlands	36.0	22.3658	1.2	20.5	14.0	9.7	5.4	5.2
New Caledonia					4.3			
New Zealand	20.0	42.5		6.7	15.2		10	
Nicaragua	2.2						6.8	3.30695
Niger	24.5	6			6.1			2.71135
Nigeria		6			5.0		4.4	1.549
Niue					17.9			
Norway	0.0	5.2108						5.2
Oman	15.1	7.4						3.9
Pakistan	13.2	12.94155	0.75	10.9	11.0			2.9837
Panama	19.7							2.75565
Palestine								
Papua New Guinea					4.7			1.7857
Paraguay	6.7	6.93335			7.8			3.9396
Peru	22.0	6.2485		11.6	14.8	18.0	3.2	6.0153
Philippines	6.8				4.2			2.8226
Poland	21.5	4.07495			14.0			5.2
Portugal	25.3	8.8916		16.5	7.3			6.0007
Puerto Rico					5.9			
Qatar	25.9			9.8			4.5	
Réunion	0.0				2.6			2
Romania	10.1	9.58715						2.8352
Russian Federation	10.6	2.92515	1.04165	25.0				2.88645
Rwanda					4.9			1.864
Saint Kitts and Nevis					4.6			
Saint Lucia					10.9			

Appendix II. Actual crop yields (ton/ha) in 1999. Source: FAOSTAT database (www.fao.org).

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Saint Vincent/Grenadines		4.0865			1.5			
Samoa								
Sao Tome and Principe								
Saudi Arabia	12.3	7.5				12.0	6.2	3.3
Senegal	20.3	5			4.6			2.6106
Seychelles								
Sierra Leone					2.7			1.15665
Singapore	12.0	7.4	0.8				12.5	3.3
Slovakia	11.0	16.8		4.5				5.2
Slovenia	20.2	4.9055						5.2
Solomon Islands					14.5			3.9679
Somalia					10.0			1.6667
South Africa	20.6	21.62995			3.9	12.0	5.6	2.26925
Spain	42.3	16.1121	1.49405	17.1	16.2	14.0	12	7.30225
Sri Lanka	7.8	8			5.5			3.264
Sudan	7.1				13.4			0.8598
Suriname					11.7			3.7621
Swaziland					1.8			6.83335
Sweden	29.4	12.9167	1.2					5.2
Switzerland		38.36145		12.0				
Syrian Arab Republic	19.0	9.0304				11.0	24	4.28635
Tajikistan	7.7							2.53045
Tanzania	3.0	6			1.7		5.1	1.53665
Thailand	14.7	12	0.9	12.0	15.4		3.8	2.372
Togo					7.2		4.5	1.92265
Tonga					12.2			
Trinidad and Tobago		4.5			6.7		8.2	2.9244
Tunisia	16.1	4.156		15.2		8.2		2.3
Turkey	21.6	9.828	1.0286	9.6	16.0	11.5	11.6	4.75415
Turkmenistan	6.5							0.8975
Tuvalu								
Uganda	4.0	5.2			4.2			1.40165
Ukraine	7.9	3.2409						2.96635
United Arab Emirates	12.0	8		109.6			14.2	3.3
United Kingdom	36.0	10.1948		12.0	14.0	9.7	15.5	5.2
United States of America	44.0	33.6443	1.676	16.3	16.5	12.5	24.8	6.46125
Uruguay	8.1	9.6311			10.0		6.8	5.80615
Uzbekistan	27.0	2.928	0.9272					2.44815
Vanuatu								
Venezuela	25.6	5.3			9.1		7	4.8423
Viet Nam	3.0	8			6.3		15.5	4.03165
Virgins								
Wallis and Futuna Is								
West Bank								
Western Sahara								
Yemen	14.0	2.7895			10.0		3.7	2.1
Yugoslavia	5.5	5.57055					15	2.3
Zaire								
Zambia	15.2	6			14.8			0.80885
Zimbabwe	14.4	1.9986			2.1		5	2

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Afghanistan		3142			941		2227		5621	
Albania	2066	2990	3470	3542	908	6317	577			
Algeria		3910	14897	1151	3717	6611	3066			
American Samoa	3760									
Angola	604		6710			11845	5172		6328	929
Antille										
Antigua	887			939			3375	3084		
Argentina	2538	1599	2656	303	555	2405	627	1272	1710	
Armenia		2789	1069		543		799			
Australia	454	2069	5640	520	680	3801	829	3952	4346	1421
Austria		753	2077	178	522	3533	330		2306	451
Azerbaijan		3622	1012		1057		888		6458	
Bahamas	3726	4211			2434		2258			
Bahrain	0				0					
Bangladesh	492	5982	4759	700		4140	3350	3533	4730	
Barbados	1665					2476	2072			
Belarus		2445	3087		923	3180	1205			
Belgium	147	377	796	128	142	3400	256		1700	365
Belize	374		3588		1029		1885	2132		
Benin	3212		5251			5484	3692	2210	4916	1627
Bermuda	440	3490		615			1127			
Bhutan		0					0		0	
Bolivia	529	5148	2368		952	2998	1459	1211		
Bosnia		1089	1372	530	861		803			
Botswana						8400	15400		16424	
Brahain										
Brazil	483	1823	5846		485	2701	1261	1878		1286
Brunei Darussalam	0									
Bulgaria		1392	3557	660	1220	3209	839			
Burkina Faso				3043		7729	4900	4332	7681	
Burundi	3281		4157			7139	4521		3732	1257
Burma										
Cambodia	1613		8366			6110	2706	10069		
Cameroon	929		3329	314	830	6353	1750	1745	2607	5122
Canary Islands										
Canada	593	1098	1377	353	2763	1060	381		3075	308
Cape Verde	6547			3540			17162	397		
Cayman Islands	7754									
Central African Republic	1215					4645	3059	2941	4090	1625
Chad			9912			7405	9228	4331	13683	
Chile	465	679	1646	362	726	1870	295			
China	1839	1640	3145	366	418	1676	708	864	1680	681
Colombia	211	1437	2417		572	2769	2088	951		584
Comoros	3115					4690	1840			
Congo, Dem Republic	3837	5367	5379		1287	4923	4431	773	5303	2415
Congo, Republic of	0		0			0	0			0
Cook Islands	0							0		
Costa Rica	117		8433	476	1000	3468	1528	7718		724
Côte d'Ivoire	1110				1317	4309	4855	9820	5421	1432
Croatia		1524	983	612	796	4882	443		847	
Cuba	804		12994		1399	5820	1840	491		
Cyprus	199	2375	3575	299	1294	1633	1478			
Czech Republic		904	2023	440	623	2891	478		1845	
Denmark		680	2077	275	662	2891	264		2306	
Djibouti							4628			
Dominica	9480	2547			835		3929	17080		
Dominican Republic	768		0	526	0	0	0	0		0
Ecuador	190	4382	5028	1671	1866	5605	2627	8141		6965
Egypt	258	2619	1772	336	533	1953	506	2046	4678	14230
El Salvador	4929		4621	1066	1007	5060	1893	2494		971
Equatorial Guinea	3102									11890
Estonia		2920	1241		1191	2891	264		4613	
Ethiopia	1207	4417	5647	689	2638	4345	3015		5468	
Falkland										
Fiji Islands	0					0	0	0		
Finland		1352		943	551		773			
France		572	1158	196	426	2891	354		4613	621
French Guiana	1353			308			6287	3814		
Gabon	1867					3320	1783			1255
Gambia			8700	598		5495	4030	4137	5849	18310
Georgia		1984	2907		1134	11357	1444			
Germany		577	2077	1308	243	2891	476			621
Ghana	5427			333		3370	2733	1841	3790	1564
Greece	3305	2178	1492	516	1363	1327	232			0
Grenada	0		0				0	0		
Guadeloupe	347			268				20326		
Guatemala	215	4565	5797	1034	2333	4372	1678			576
Guinea	4075					3136	2734	7504	4092	4826
Guinea-Bissau	1863					4109	4520	2504	4527	1755

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Guyana	1177					5622	3925	2171		
Haiti	1277		6134	1010		5952	5832	1995		
Honduras	163		8359	1034	1167	4080	2425	1641		573
Hungary		1140	2117	263	686	3533	494		2553	365
Iceland										
India	272	2008	13775	1899	482	8318	2852	1600	7177	1619
Indonesia	690		2346	511	1291	2806	1821	3065		857
Iran	500	6176	2609	0	1488	2563	1019	2839	4752	1983
Iraq		3775	8626	1399	2533	1640	3008		7968	
Ireland		535	588	2200	567		264			621
Israel	252	5867		0	811	873	502	2227		1983
Italy	207	1160	1697	402	3447	4882	252			854
Jamaica	1169		4094		1241	4747	4497	2254		
Japan	1229	924	1740	428	430	1977	1317		2910	833
Jordan	404	2796		256	3285		338			
Kampuchia										
Kazakhstan		2403	0	376	1392	0	2027		7146	
Kenya	3051	1415		991	1561	6395	2473	2807	5335	
Kiribati	0									
Korea	1548	1230	4561	331	398	1685	880		3560	
Korea, Republic of		0	0		0	0	0		0	
Kuwait		0		0	0		0			
Kyrgyzstan		1520		557	7303	8210	1428			
Laos	622		3631			3450	1555	1532		
Latvia		2254	1929		923					
Lebanon	294	702	1792	1284	792	1228	1452			
Lesotho		11341	3012				2423			
Liberia	9141					6633				7090
Libyan		5270	2055		2200	3190	2622		3568	
Lithuania		2015	2700	275	902	2891	264		4100	
Macedonia		1438	907	2405	469		722		4341	
Macao										
Madagascar	3495		4684	1270	2179	8087	5056	1630		1407
Maderia										
Malawi	2810		4895			4003	1891	2338	5207	
Malaysia	444	2225	6067	530	1246	1386	2013	3044		678
Maldives	3376								1544	
Mali	3883		8167	563		6225	3304	4220	6262	
Malta		0	0		0					
Martinique	297			3000				3554		
Mauritania		7514				11550	13431		17719	
Mauritius	763			785	897	1525	667			1440
Mexico	239	1453	6084	451	510	3121	1338	1277	4785	1336
Micronesia	0						0			
Moldova		2099	3204	733	1259		1121		7410	
Mongolia		0					1273			
Montserrat	2455						3413	3000		
Morocco	236	3370	6413	216	1134	2209	9733		2593	
Mozambique	2327				1410	6359	1779	1859	4108	
Myanmar		2983	5330			4060	2523		4454	1054
Namibia						6816	8389		17934	
Nauru										
Nepal		3335	6826				1764		3565	
Netherlands		566	933	254	595	2891	445		4613	621
New Caledonia	0						0			
New Zealand		635	3185	279	715	3218	2861			925
Nicaragua	208		6774	1007		1749	4176			622
Niger	3329	4270	7000	483		13819	4170		12393	1881
Nigeria					1611	3973	3845	3792	3024	7965
Niue	0									
Norway		1123	5300	409	514	3355	334			
Oman	795	5613	9933			3911	1640	7429		
Pakistan	3294	3930	14727	603	1172	6034	1608	1853	13056	
Panama	185		7310	470	1374	4245	2906	2248		1402
Palestine		0			0					
Papua New Guinea	490			1461		5488	764			819
Paraguay	394	2667	3287	1187	627	4564	1680	2189		1599
Peru	371	3492	3903	1233	966	2762	1922	841		525
Philippines	4007		4371	1172	1856	4881	2092	2272		1046
Poland		959	1388	1100	923	2446	551			
Portugal	309	2784	6657	351	971	1736	809			
Puerto Rico	592		12207				1425	6826		
Qatar	427	1340			2760		399			
Réunion	1837		11802	3069	15980	8396	1059	1921		
Romania	310	1448	1646	505	892		874		4428	
Russian Federation	310	2492	3240		931	2891	1608		3941	621
Rwanda			0			0	0		0	
Saint Kitts and Nevis						5704				
Saint Lucia	12420							0		

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Banana	Barley	Bean dry	Bean green	Grapes	Groundnut	Maize	Mango	Millet	Palm
Saint Vincent/Grenadines	0					0	0	0		
Samoa	0							0		
Sao Tome and Principe	0						0			0
Saudi Arabia		1212		1200	734	1598	2501		2019	
Senegal	827		5167	314		2383	3931	1886	5667	11980
Seychelles	3908									
Sierra Leone						4871	2983	7970	3383	1448
Singapore	312	2094	1213	1060	1163	3094	531		4100	814
Slovakia	345	1191	2379	886	2455	4364	707		1909	
Slovenia	345	0	0		0		611		0	
Solomon Islands	0									750
Somalia	1433		0			0	0	0		
South Africa	581	4514	4511	537	670	3434	1966	1519	7655	1516
Spain	139	1442	3753	189	1594	1804	401		1394	805
Sri Lanka	272		11011	957	1048	10768	3500	0	7566	
Sudan	222		1887	606	733	6482	6325	5320	12347	1198
Suriname	739			3434		6607	3775			8736
Swaziland	2098		3191			3900	2760			
Sweden	324	926	1519		354	2891	345			
Switzerland		674		252	354		346			
Syrian Arab Republic	2309	14462	2572	437	1816	2388	1299		6964	
Tajikistan		2042		467	13276	5673	1646			
Tanzania	2009	1438	3946	400	1862	6302	2663	12449	3284	1025
Thailand	969	3718	2798	515	439	1884	776	11210	2544	594
Togo	4840		15885			10548	2266		9037	1747
Tonga	10406					7750				
Trinidad and Tobago	1839						1839	2544		
Tunisia		4064	7315	424	1653	4418				
Turkey	293	658	3340	228	1275	1361	878		1476	848
Turkmenistan		13205			1264		1878			
Tuvalu										
Uganda	3636		6891	400		5751	3222		2023	4034
Ukraine		2018	1800		3699	4609	1693		4113	
United Arab Emirates	1193		6800	272	6016		1030	1096	3940	
United Kingdom		638	2077	166	2382	2891	396		3690	365
United States of America	402	1118	1367	391	251	1064	377	0	1985	450
Uruguay	313	1670	6727	742	466	7080	664		2083	
Uzbekistan		3266			2621	1388	1089		826	
Vanuatu	0					0	0			
Venezuela	338	2836	3985	820	556	2167	1220	781		925
Viet Nam	476	3978	5413	527	1240	3621	1695	1805	3322	1054
Virgins										
Wallis and Futuna Is	1800							2907		
West Bank					0					
Western Sahara										
Yemen	1003	3159	3131	589	1462		3451	3892	6700	
Yugoslavia		1599	3136	816	1237	3944	1009		6883	
Zaire										
Zambia	6325	4945		570	1450	13214	3338		5159	1433
Zimbabwe	3829	2538	3587	503	1548	6517	2238	3530	14300	

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetables
Afghanistan		176			487	671	4528			426
Albania		467	5627	4007	2218		3579	3022	2415	568
Algeria		451	2796				18200	5349	483	638
American Samoa						0				0
Angola		753				308	5771	3668	1257	431
Antille										
Antigua									929	805
Argentina	3375	179	960	2458	258	1910	2137	2460	1389	191
Armenia		254		1700				2979	135	131
Australia	4825	146	1515	2933		193	4531	2125	137	123
Austria	5217	879		1261	58	1069	1133	1194	87	94
Azerbaijan		345	15205	2720	7586			2358	206	148
Bahamas						566	4208		356	430
Bahrain		0							0	0
Bangladesh	2850	308	2012			337		4659	698	625
Barbados	7800					222			660	4560
Belarus		293			184	583	1574	1617	260	171
Belgium	5183	58	290	2875	545	303	2718	826	114	617
Belize	4213			7075		363		4860		536
Benin	19760	769	4706	8206		450		6035	1209	542
Bermuda		184		3213					510	2073
Bhutan		0		0		0		0		0
Bolivia		611	1488	3450		260	3489	3830	329	484
Bosnia		309		1601			7645	1746	478	526
Botswana			16209				1833			1151
Brahain										
Brazil	1470	305	2467	2244	220	209	5351	2295	954	273
Brunei Darussalam	0									0
Bulgaria		1746		6120	226	176	2231	2197	243	501
Burkina Faso		1153	9609	5520		23310		10560	742	498
Burundi		2214	3192	5696		251		3610		396
Burma										
Cambodia	566			2048		483		5040		491
Cameroon	14413	1239	2235	7774		12470		2575	1076	382
Canary Islands										
Canada	5217	121	897	1227	93		1935	1006	48	95
Cape Verde		360				1202			342	309
Cayman Islands								4810	273	524
Central African Republic		1978	3096			1989		5632		441
Chad		1118	9997			240		5241		571
Chile	3842	329	1073	3588	107		2887	1279	80	1560
China	2678	311	1339	3119	224	132	2385	2585	260	210
Colombia	3158	232	973	1616	184	134		1779	208	324
Comoros		325						4083	662	657
Congo, Dem Republic		605	4697	9627		284		8150	674	610
Congo, Republic of		0				0		0	0	0
Cook Islands								0	0	0
Costa Rica	619	160		2325		100		1622	165	193
Côte d'Ivoire	9840		10304	4550		223		8920	5890	446
Croatia	5180	478	1055	2213	1556		2866	3054	547	570
Cuba		217	3950		608	505		6936	1486	926
Cyprus	7500	266				203		1295	660	661
Czech Republic	6260	168		2220	88	176	1345	1415	212	1302
Denmark	6260	83		2125	71		2492	1489	87	107
Djibouti										757
Dominica	4470	5410				8770		4300	7080	3756
Dominican Republic		0	0			0		0	0	0
Ecuador		433	2355	2361	788	186	2379	1550	464	414
Egypt	3808	220	824	2954	160	181	3218	5092	159	297
El Salvador		855	3509	2492		251		2722	212	314
Equatorial Guinea										
Estonia		253		1063	181		2492	2573	85	359
Ethiopia	7821	745	3756	1750		156		7101	580	1366
Falkland										
Fiji Islands	0	411	0			0		0	0	0
Finland	6260	166			116	176		3144	133	97
France	6260	108	419	1277	54	356	1279	1013	133	202
French Guiana						1942			164	204
Gabon				2615		192				404
Gambia	4733		6114					4858		757
Georgia		240		5832			4428	2387	2493	147
Germany	6260	84	371	1303	71		1173	999	90	1225
Ghana	7443	365	2132			595		7493	4757	
Greece	3240	364	2615	3435	144	185	4166	2032	174	206
Grenada	4400			3942		273			0	0
Guadeloupe						392			383	348
Guatemala	3867	379	2569	985		875		1356	151	306
Guinea			4959			277		4833		783
Guinea-Bissau			4835			601				668

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetables
Guyana						211		4533	1037	416
Haiti		398	4238			256		2749	397	667
Honduras	4760	3580	3466	1302	104	105		6048	2788	2620
Hungary	6260	155	1134	1395	89		1966	1450	132	172
Iceland		256					2492		90	
India	13371	262	6087	6077	344	281	10449	4535	476	5460
Indonesia	7894	351	3358	4031		239		6303	785	486
Iran	7713	224	2875	3741	214	287	13484	6146	320	264
Iraq		389	23086	2795	244	1122	7735	4070	624	470
Ireland	6260	103	619	2833	705		2492	2573	534	
Israel	5142	123	449	4850		353	6931	7000	6378	253
Italy	5180	227	677	1586	145		1843	1693	118	259
Jamaica	5413	348				274		2918	396	2596
Japan	2325	724		2646	97	150	4130	1507	93	107
Jordan	4200	156	6839					15667	135	161
Kampuchia										
Kazakhstan	3250	1416	0	2615	232		6115	2369	434	0
Kenya	8145	1047	4101	5000	544	178	6224	2235	504	439
Kiribati										0
Korea	2950	304	3460	3768		171		2462	686	319
Korea, Republic of		0	0	0				0	0	0
Kuwait		0						4667	0	0
Kyrgyzstan		505	18050	4500	2899		10125	2229	594	284
Laos		585		5492		359		716		531
Latvia		207		3778	137	183	2492		447	109
Lebanon	1675	169	2316		73	523	2119	1953	138	110
Lesotho			2405							617
Liberia				11500		10766			5100	610
Libyan		663	4767					1685	474	272
Lithuania	6260	233		4250	140	1069	3738	2573	495	1032
Macedonia	4471	264	2000		101		2136	2211	204	156
Macao										
Madagascar	13591	985	8340	4958		585		5351	682	595
Maderia										
Malawi	5788	334	3810	4922		13460	5942	4068	500	456
Malaysia	2411	299		5110	256	218	4190	5225	299	255
Maldives										240
Mali			5779			287		8791	258	868
Malta		1792				653	5670		0	0
Martinique	3592					255		6243	374	321
Mauritania		1814	15659			388		9475		1036
Mauritius	6750	176				230		2863	551	235
Mexico	2550	191	1146	2780	261	192	4776	1973	180	456
Micronesia			0							0
Moldova	2608	664	1010	3977	241	367	2269	2279	264	1838
Mongolia		435								0
Montserrat		1829							1248	820
Morocco	1977	224	6436	3560	58	173	7225	3240	100	154
Mozambique		285	3355			777	5096	2491	553	656
Myanmar		2628	3278	4517		301	4265	1988		230
Namibia			10949				4507			1179
Nauru										0
Nepal		335		8394		411		6072		487
Netherlands	1565	73	325	1889	87	305	2492	2830	88	62
New Caledonia		0	0							0
New Zealand	3375	127		3763				2727	96	103
Nicaragua	5080	368	2694	3008		272		3945	3769	654
Niger		5750	24989	10763		921		8220	593	579
Nigeria	7391	875	4991	13990		803	6456	18819	1485	794
Niue										0
Norway		169			109		2042	2718	116	0
Oman	2922	311	1997	5250	403	1040		1239	349	325
Pakistan		159	10216	6593	386	411	6063	3444	4748	503
Panama		383	1989	7631		313	5620	2213	564	375
Palestine		0							0	0
Papua New Guinea		1051	799			254		2875	1085	182
Paraguay		1121	3767	2664		385	3591	3555	163	556
Peru	3508	412	799	3238		129		3691	204	209
Philippines	2520	317		4342		230		3652	624	435
Poland	1565	209		2267	118	204	2718	965	242	125
Portugal	2110	283	438	1836	818	1085	5841	1450	76	176
Puerto Rico						5603		4340	544	
Qatar		537							196	2116
Réunion		402				420		5460	725	573
Romania		228	1700	1848	184		2405	2098	226	1336
Russian Federation		339	2690	4112	215	377	3586	2997	304	160
Rwanda		0	0	0		0	5810	0		0
Saint Kitts and Nevis		341				298				529
Saint Lucia	0									0

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Pepper	Potato	Sorghum	Soybean	Sugarbeet	Sugarcane	Sunflower	Tobacco	Tomato	Vegetables
Saint Vincent/Grenadines						0		0		0
Samoa	0					0		0		0
Sao Tome and Principe										0
Saudi Arabia	3188	186	3565			794		4708	288	212
Senegal	3417	227	5085			676		3391	262	169
Seychelles									1026	540
Sierra Leone			4271			1909		5595	514	484
Singapore	2344	320	2983	4258	470	683	4656	5225	228	202
Slovakia	2115	313	1461	3308	1136		3028	2552	255	426
Slovenia		227			0	848	0		0	
Solomon Islands								0		0
Somalia			0			0		0		0
South Africa	4825	176	2157	4337	361	276	4144	2498	198	317
Spain	1980	167	656	1927	714	158	5428	1390	76	160
Sri Lanka	10319	553	7020	5228		286		4709	1057	5140
Sudan		538	6241	4083		1981	5213		429	444
Suriname	7963			9056		5448		5992	1236	384
Swaziland		2296	5867			837		4440	415	412
Sweden	1565	1030			87				114	117
Switzerland		93		1023	59		1070	1786	102	105
Syrian Arab Republic	3613	208	8255	8692	152	332	3497	4005	181	519
Tajikistan		426	8100	2564				1491	363	156
Tanzania		572	4073	16438		159	8683	5940	795	574
Thailand	1504	386	1557	3048	338	200	2400	2653	504	410
Togo			5962			621		10300	1488	920
Tonga									393	2720
Trinidad and Tobago	4240	243		4773		357		3858	570	514
Tunisia		362	11281		141	384	7344	5196	157	314
Turkey	817	123	2625	1055	69	402	3625	2554	96	110
Turkmenistan		781						2260	515	359
Tuvalu										0
Uganda	7602	551	2286	4902		1155	6483	3714	962	533
Ukraine	4143	549	3185	5415	490		4337	6496	507	504
United Arab Emirates	4517	248		4607	397	290		487	103	180
United Kingdom	1565	792	2167	1259	69	292	3322	1415	102	784
United States of America	1565	778	595	1380	81	161	2115	1264	77	77
Uruguay	2531	323	1178	3225		249	3151	1258	247	295
Uzbekistan	3750	422	1776	5845	609		2444	2327	148	607
Vanuatu										0
Venezuela	3158	214	1188	4738		206	2470	1722	1716	167
Viet Nam	3227	321		3322		2373		1805		239
Virgins										
Wallis and Futuna Is						8995				1919
West Bank										
Western Sahara										
Yemen	3350	418	2711					2021	487	413
Yugoslavia	3207	621	861	1925	175		3107	2646	697	496
Zaire										
Zambia	7336	526	4630	2124		1312	7319	2158	5010	720
Zimbabwe	7367	251	4817	3057		918	4529	2505	966	746

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	W.melons	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Afghanistan	485	3528	6736							
Albania		3210	0				250		0	
Algeria	408	7222	9774	325	0	0	0		0	
American Samoa										
Angola		2655	5470							0
Antille										
Antigua			49347	748	0		0			
Argentina	336	1218	5292	201	256		396	231	2690	242
Armenia	138	1954	0	0	0	0	0		0	
Australia	362	2082	2402	104	181	661	321	184	2902	242
Austria		688	1940	34	120	189	42	82	794	149
Azerbaijan	324	1928	0	138	0		547	136	0	145
Bahamas				199			405			
Bahrain	0			0	0	0	0	0		
Bangladesh		1890	4947	0		0	0	0		
Barbados				488	0		0	0		
Belarus		2159		115	228		232		1297	130
Belgium		424		94	83	189	46	36	957	310
Belize										
Benin			7339							202
Bermuda		1647								
Bhutan		0								
Bolivia	394	3338	5083	311	0	0	531	332	0	
Bosnia	200	1130		243	0		100		1363	
Botswana		2298	2351							
Brahain										
Brazil	596	1706	3095		235	360	401	203	4592	220
Brunei Darussalam										
Bulgaria	234	1370	0	116	0	0	190	0	1607	328
Burkina Faso			3536							0
Burundi		4841	8605							
Burma										
Cambodia			4005							
Cameroon	140	2640	2919	222						
Canary Islands										
Canada	164	1441	4060	76	115	290	164	149	2328	202
Cape Verde	336			170	0	0	0	0		
Cayman Islands										
Central African Republic			13874							
Chad		3634	14879							
Chile	258	1053		127	118	242	172	271	1632	221
China	189	1024	1769	111	256	202	278	158	2887	195
Colombia	287	1525	1893	644	146	381	190	207	2686	164
Comoros										
Congo, Dem Republic		2739	15637	159	0		0	0		
Congo, Republic of										
Cook Islands	0									
Costa Rica			4280	334	341	259	787		1439	118
Côte d'Ivoire			5724							
Croatia	271	1983		199	0	203	452	313	1244	149
Cuba				222	341		0			
Cyprus	103	3246		108	0	0	62	443	0	817
Czech Republic		805		58	183	206	267	301	1034	149
Denmark		518		62	88	356	9	92	630	149
Djibouti										
Dominica				361	0		0	0		
Dominican Republic				0	0		115	0		
Ecuador	374	4465	8075	343	0	745	282	437	0	764
Egypt	230	1005	4811	157	147	0	419	162	8914	464
El Salvador	246	2135	4514	474			0		4408	
Equatorial Guinea										
Estonia		2796	1940	0	0	0	93		1953	
Ethiopia		4881	5389	261					0	0
Falkland										
Fiji Islands	0						0			
Finland		1884		95	119	493	50	130	1391	173
France	91	516		86	85	374	32	113	798	181
French Guiana				263			0			
Gabon										
Gambia			30213							
Georgia	211	1609		257	0		0		5565	
Germany		498	1940	38	81	170	93	129	725	181
Ghana		2322	7854				0		0	
Greece	143	3440	3641	132	175	317	69	190	3411	207
Grenada			0	329	0		0	0		
Guadeloupe	254			423	0		0	0		
Guatemala	131	1150	2140	200	508	474	933	230	3350	262
Guinea			5048							
Guinea-Bissau			6361							

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	W.melons	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Guyana				647						
Haiti			13626	525				0		
Honduras	339	3450	2140	0	0	0	201	247		289
Hungary	173	1040		72	139	250	160	132	1371	230
Iceland				0	0	0	0			
India	486	2675	13402	200	0	294	921	913	4380	244
Indonesia		4938	5507	170	388	350	528	208	4092	277
Iran	323	3330	6540	178		569	414			482
Iraq	3348	9560	3115	97	0	0	0	0	0	358
Ireland		427		58	173	483	23	130	572	173
Israel	304	4067	3332	143	64	0	95	69	0	132
Italy	148	2016	9724	145	133	276	173	201	2019	215
Jamaica	273			228	391	0	386	374	3178	493
Japan	124	1088		69	154	464	80	141	0	200
Jordan	96	15245		64	159	348	65	152		455
Kampuchia										
Kazakhstan	0	5005	2198	157	368		643		13264	288
Kenya		3193	17060	171				0	0	425
Kiribati										
Korea	221	1273	3981	235	177		353	169	3437	351
Korea, Republic of	0	0		0	0		0	0		0
Kuwait	0	0		57	0	0	0	0		
Kyrgyzstan	433	2652	2485	112	265		307		0	288
Laos			2148							
Latvia		1550		117	0		0		1856	173
Lebanon	117	1169		58	287	207	0	30	0	397
Lesotho		2819							0	
Liberia										
Libyan	290	3748		130	0	0	0			387
Lithuania		1386		87	255	306	188		1791	173
Macedonia	207	1143		107	0		150		0	173
Macao										
Madagascar		1796	4918	278	0	0	1205	1539		2097
Maderia										
Malawi		3713	6077	389						
Malaysia	192	5188		101	343	328	169	218		372
Maldives										
Mali		2998	5837							
Malta		0		0		0			1363	
Martinique				229	0		0	0		
Mauritania	8080	7650								
Mauritius				218	0	0	0	175		160
Mexico	173	824	2143	96	183	423	255	216	4233	243
Micronesia										
Moldova	680	1597		148	0	472	383		0	173
Mongolia		10540					0			
Montserrat			9021		0		0			
Morocco	174	4143	2105	0	0	0	155		0	308
Mozambique		2880	10482							
Myanmar		3092	8083				252			315
Namibia		675	4148							
Nauru										
Nepal		3208								
Netherlands		449	6222	59	108	321	5	80	644	149
New Caledonia		0								
New Zealand	4670	426		69	92	136		115	1428	118
Nicaragua			2975	1963					4267	204
Niger		3475	7784							1315
Nigeria		3406	12871		0					257
Niue										
Norway		810		55	0	391	0	101	0	121
Oman	3045	2469		185	307	341	517		6050	328
Pakistan	327	3245	5461	0	0	0	0	0		692
Panama	310	2716		318	0		0	0		
Palestine	0	0								
Papua New Guinea										
Paraguay	1187	2319	8142		0				3158	498
Peru	2049	2782	4263	313	0	0	0	278	3220	200
Philippines	284		8246	0			0			926
Poland		1056		49	127	235	222		1349	149
Portugal	606	3154	3772	127	146	248	164	149	6682	206
Puerto Rico				584						
Qatar	508	1566		201	0	0	0	0		
Réunion	2807			0	0	0		0		0
Romania		1338	0	87			172		2211	149
Russian Federation	628	2384		105	0	0	359	100	2980	179
Rwanda		0								
Saint Kitts and Nevis			19609							
Saint Lucia										

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	W.melons	Wheat	Cotton seed	Cabbage	Carrots	Cauliflower	Cucumber	Lettuce	Oats	Onion green
Saint Vincent/Grenadines					0					
Samoa										
Sao Tome and Principe										
Saudi Arabia	544	1329		166	391	284	274			381
Senegal	309		6187					254		
Seychelles										
Sierra Leone										
Singapore		3458		192	443	485		201		350
Slovakia	1975	941		74	228	449	267	0	1394	149
Slovenia		0		60	174				0	
Solomon Islands	0									
Somalia	0	0	0							
South Africa	396	1951	6875	104	243	123	0	271	5100	357
Spain	96	1155	1342	137	86	197	94	178	3855	302
Sri Lanka				0	0		451			218
Sudan	145	3295	7962							520
Suriname	638			177			0			
Swaziland		2553	10563							
Sweden		600		46	68	215	56	96	962	48
Switzerland		696		0	0	0	0	0	0	0
Syrian Arab Republic	289	3365	2325	165	301	201	363	193	0	293
Tajikistan	1071	4314	4399	274	334		0		0	248
Tanzania		3002	14800							316
Thailand	271	4960	2933	310	502	735	613	275	3713	379
Togo		4283	8158	151				202		
Tonga	550									
Trinidad and Tobago	436	943		169		0	423	0		221
Tunisia	342	2678	4360	198	0	0	0		50495	247
Turkey	100	1382	933	97	196	0	191	151	3211	512
Turkmenistan	458	1347	4639	335	0		884			248
Tuvalu										
Uganda		2351	23523			321				445
Ukraine	1259	2067		184	319	0	508	0	2482	149
United Arab Emirates	2759	13697		101	404	177	100	0		339
United Kingdom		435		69	65	355	7	114	588	265
United States of America	114	1302	3551	91	109	308	322	123	2948	223
Uruguay	334	1578		483	0				6110	157
Uzbekistan	426	1250	3642	46	101		460			149
Vanuatu										
Venezuela	222	8323	6675	101	187	0	0	0	3667	195
Viet Nam	299		5580	139	423	305	252			302
Virgins										
Wallis and Futuna Is										
West Bank	0									
Western Sahara										
Yemen	352	2812	4576	355	585		0	866		451
Yugoslavia	340	1743		178	0		491		2188	210
Zaire										
Zambia		476	5142		796					
Zimbabwe		679	5726						0	333

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Afghanistan		0						0
Albania		0						2565
Algeria	0	0				0		0
American Samoa								
Angola					0			0
Antille								
Antigua	0				0			
Argentina	241	185	7693		356	0	1422	1636
Armenia	0	0						1938
Australia	170	220	7661	244	375	753	640	900
Austria	76	66		202	318			952
Azerbaijan	0	0					0	1277
Bahamas	0				0			
Bahrain	0							2233
Bangladesh	0	459		0	0			2666
Barbados	0				645			2797
Belarus	0	1285						2565
Belgium	149	91	2808	122	250	482	317	952
Belize		800						3362
Benin	0				0			3450
Bermuda					0			2053
Bhutan								0
Bolivia	0	0			0			3792
Bosnia	0	528					317	
Botswana	0							
Brahain								0
Brazil	528	461			565		1741	2720
Brunei Darussalam					0			0
Bulgaria	512	124		0				1922
Burkina Faso					0			0
Burundi					0			0
Burma								
Cambodia					0			4395
Cameroon	0	500			0			0
Canary Islands								
Canada	177	306	4080	569				1088
Cape Verde	0				0			
Cayman Islands					0			
Central African Republic								0
Chad	0				0			0
Chile	183	156			0	1516	1234	1821
China	271	523	2622	278	244	2343	594	1072
Colombia	0	287		0		781	1210	1471
Comoros					0			0
Congo, Dem Republic	0	572			0			0
Congo, Republic of					0			0
Cook Islands					0			
Costa Rica	143	667			0			1703
Côte d'Ivoire					0		0	5374
Croatia	505	469						1135
Cuba	0				0		2255	0
Cyprus	0	829		471		0	1107	
Czech Republic	257	604	2808	203				1113
Denmark	131	257		233	250	482		1135
Djibouti								
Dominica		270			1735			
Dominican Republic	0				0			0
Ecuador	584	830			0	793	1519	2042
Egypt	282	581	11333	0	283	767	780	1096
El Salvador	827	287			0			1349
Equatorial Guinea					0			
Estonia	0	270						1135
Ethiopia	0	804	0		0			
Falkland								
Fiji Islands					0			0
Finland	326	398						1135
France	139	193	3900	210	308	1208	787	991
French Guiana								0
Gabon					0			3125
Gambia		670						5705
Georgia	0	0						1844
Germany	146	246		227	312	772	787	1135
Ghana	0				3707			5939
Greece	428	749		353	0	1104	698	1025
Grenada					0		1312	2850
Guadeloupe	0				0			
Guatemala	0	648	4733					3169
Guinea					0		1869	0
Guinea-Bissau								0

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Guyana								2139
Haiti	0			0	0			0
Honduras	0	635			0		2581	3273
Hungary	229	704	3900	207	397			2060
Iceland						0		0
India	562	816	13467		838	2360	850	3350
Indonesia	0	433	6063	1600	595	0	1000	2201
Iran	0	828					1918	2401
Iraq	0	0		0				0
Ireland	180	398				0		1135
Israel	171	487	11500	0	168	0	2000	2182
Italy	240	208		293	320	955	640	1030
Jamaica	0			563	424		1685	0
Japan	113	161		257	212		353	1203
Jordan	0	1349		0				3570
Kampuchia								
Kazakhstan	293	0	0					2059
Kenya	0	800		179	0	1265	1700	3518
Kiribati								
Korea	518	401		239	0		555	1639
Korea, Republic of	0	0		0	0			0
Kuwait	0			0				
Kyrgyzstan	241						633	2538
Laos					0			3092
Latvia	0							1844
Lebanon	0	205		0	1302	643		2107
Lesotho								
Liberia					0			0
Libyan	0	496						
Lithuania	0	600						1135
Macedonia	494	285						1172
Macao								
Madagascar	824	2275			0			5355
Maderia								
Malawi	0	879					1200	0
Malaysia	759	459		277	491		1836	3056
Maldives	0				0			
Mali	0				0			0
Malta	0						0	2328
Martinique					0		1180	
Mauritania					0			0
Mauritius	0	670			0			1942
Mexico	485	772	4168	278	0	892	1441	1719
Micronesia					0			0
Moldova	0	873						
Mongolia								
Montserrat	0				0			3636
Morocco	0	395			0	250	939	0
Mozambique	0	945			0			7091
Myanmar	629	367	6013		0			2738
Namibia								
Nauru								
Nepal								4027
Netherlands	110	122	2808	143	250	482	724	1135
New Caledonia					0			
New Zealand	331	106		0	424		768	
Nicaragua	0						1790	3151
Niger	365	917			0			4536
Nigeria		915			1270		3564	8134
Niue					0			
Norway		524						1135
Oman	0	816						2992
Pakistan	0	0	0	0	0			3677
Panama	0							2765
Palestine								
Papua New Guinea					0			0
Paraguay	0	0			793			1990
Peru	249	669		0	0	0	3113	1368
Philippines	730				1384			3089
Poland	185	930			250			1135
Portugal	216	484		189	663			1133
Puerto Rico					0			
Qatar	0			0			3556	
Réunion					0			0
Romania	393	285						2081
Russian Federation	373	1296	0	135				2044
Rwanda					0			0
Saint Kitts and Nevis					0			
Saint Lucia					0			

Appendix III. Specific water demands (m^3/ton) in 1999. Source: calculated on the basis of Appendices I and II.

	Onion dry	Peas	Safflower	Spinach	Sweet potato	Artichoke	Citrus	Rice
Saint Vincent/Grenadines		0			0			
Samoa								
Sao Tome and Principe								
Saudi Arabia	0	752				1373	2000	3515
Senegal	0	1228			0			4060
Seychelles								
Sierra Leone					0			0
Singapore	478	622	5650				766	2642
Slovakia	361	226		0				1135
Slovenia	0	0						1135
Solomon Islands					0			0
Somalia					0			0
South Africa	0	185			1448	922	1488	3199
Spain	155	331	2811	283	285	985	877	1143
Sri Lanka	0	775			0			2328
Sudan	1227				0			14655
Suriname					456			2366
Swaziland					0			0
Sweden	135	293	2808					1135
Switzerland		0		0				
Syrian Arab Republic	374	931				1712	600	2800
Tajikistan	516							2450
Tanzania	0	545			0		1504	4425
Thailand	487	387	5644	320	381		3000	4047
Togo					0		2127	3760
Tonga					435			
Trinidad and Tobago		856			0		1240	3146
Tunisia	442	1155		0		1240		3130
Turkey	366	495	6455	0	383	0	742	1615
Turkmenistan	0							0
Tuvalu								
Uganda	0	865			0			7027
Ukraine	0	1166						2090
United Arab Emirates	593	775		0			0	2830
United Kingdom	105	372		223	0	0	317	1135
United States of America	105	141	4057	222	415	0	293	1331
Uruguay	0	495			0		1259	1323
Uzbekistan	147	0	0					2533
Vanuatu								
Venezuela	0	711			0		1261	1586
Viet Nam	1732	459			0		598	2163
Virgins								
Wallis and Futuna Is								
West Bank								
Western Sahara								
Yemen	0	0			0		2946	4129
Yugoslavia	946	627					701	3896
Zaire								
Zambia	0	728			0			11127
Zimbabwe	0	2247			0		2242	5170

Appendix IV: FAO guidelines on crop water requirements in mm [=10 m^3/ha]

Crop	FAO guidelines	
	Min	Max
Bananas	700	1700
Beans	250	500
Corn (Maize)	400	750
Cotton	550	950
Dates	900	1300
Grains	300	450
Grapefruit	650	1000
Groundnut	500	700
Onions	350	600
Potato	350	625
Rice	590	950
Sorghum	300	650
Soybean	450	825
Sugar beet	450	850
Sugarcane	1000	1500
Sweet potato	400	675
Tobacco	300	500
Tomato	300	600
Wheat	450	650

Source: Gleick (1993, p.282-283)

Appendix Va: Gross virtual water import per country for the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
AFGHANISTAN	59.9	76.9	107.0	5.3	43.4	292.4
ALBANIA	105.7	665.9	240.2	256.3	120.3	1388.3
ALGERIA	9523.3	5683.6	11328.1	10687.4	11504.2	49053.2
ANDORRA	2.8	1.9	3.0	2.0	1.3	11.0
ANGOLA	223.9	230.5	92.4	164.6	157.9	869.4
ANGUILLA	2.3	3.5	0.2	0.2	0.1	6.4
ANTIGUA BARB	7.0	9.1	15.4	0.5	11.9	43.9
ARGENTINA	328.0	297.1	3598.7	1735.4	1475.5	7434.7
ARMENIA	307.9	220.6	510.8	182.2	359.3	1580.8
ARUBA	2.8	6.5	8.2	14.0	3.0	34.6
AUSTRALIA	1433.0	949.1	905.2	777.2	990.4	5055.0
AUSTRIA	863.1	1413.6	1325.0	1452.3	1352.4	6404.9
AZERBAIJAN	158.1	117.3	132.5	2112.6	2501.4	5022.0
BAHAMAS	51.2	16.9	23.8	12.0	18.1	122.0
BAHRAIN	144.2	114.6	47.3	294.1	86.6	686.9
BANGLADESH	12427.3	7349.0	4940.4	15034.2	1772.2	41523.0
BARBADOS	86.1	81.6	168.8	126.7	135.2	598.4
BELARUS	186.0	95.1	244.4	2208.3	3545.7	6279.5
BELGIUM-LUX	13948.1	14172.0	15308.7	14878.1	13755.1	72061.9
BELIZE	22.1	22.0	21.8	25.4	21.2	112.5
BENIN	717.7	304.7	269.6	562.5	508.4	2362.8
BERMUDA	235.2	69.6	437.4	28.7	24.4	795.3
BHUTAN	9.8	46.5	43.0	33.0	0.0	132.3
BOLIVIA	346.8	575.1	668.1	738.9	1045.3	3374.2
BOSNIA HERZG	88.4	154.3	284.6	409.6	242.0	1190.0
BRITISH INDIAN OCEAN TER	0.0	0.1	0.0	17.2	0.0	17.3
BR.VIRGIN IS	24.6	80.7	187.4	58.8	1.3	352.9
BRAZIL	16261.0	26101.0	22776.5	25724.2	24945.1	115807.8
BRUNEI DAR.	177.7	217.5	287.6	569.8	366.5	1619.1
BULGARIA	102.7	657.0	353.7	155.6	167.0	1441.8
BURKINA FASO	29.6	41.8	81.9	154.9	35.0	343.2
BURUNDI	1.9	1.5	0.0	5.4	9.5	18.3
CAMBODIA	266.3	85.9	74.8	132.1	91.4	650.4
CAMEROON	161.2	90.0	241.6	194.0	189.8	876.6
CANADA	3982.1	4565.6	5310.6	4882.8	5331.0	24072.1
CAPE VERDE	39.8	40.6	34.3	37.9	69.3	221.8
CAYMAN ISLDS	48.6	137.3	188.3	1.3	106.6	482.0
CENT.AF.REP	0.1	2.1	0.0	6.6	0.0	8.9
CHAD	3.2	0.0	2.9	0.1	0.7	6.8
CHILE	2735.6	3316.0	2933.7	2983.3	4344.2	16312.8
CHINA	47926.2	36450.2	21541.0	23307.6	23529.5	152752.2
COCOS ISLNDS	0.0	1.8	7.5	0.0	0.9	10.3
COLOMBIA	6352.3	8178.9	7905.1	8485.7	6755.1	37677.0
COMOROS	13.0	43.7	32.7	46.7	60.5	196.6
CONGO	22.8	25.3	95.9	160.1	162.9	467.0
CONGO, D.R.	645.6	628.1	140.8	110.9	73.8	1599.3
COOK ISLANDS	4.1	0.0	0.0	0.0	0.0	4.2
COSTA RICA	1510.8	2956.3	1688.5	1707.5	1875.2	9738.3
COTE DIVOIRE	754.3	322.7	400.8	1271.6	1118.3	3867.7
CROATIA	458.5	448.6	886.6	623.3	415.3	2849.3
CUBA	1052.0	1248.9	869.8	1304.4	937.2	5412.3
CYPRUS	965.6	1208.5	1360.8	1192.5	1164.6	6318.3
CZECH REP	1136.4	1267.0	1380.4	1372.7	1072.1	6228.6
DENMARK	1181.8	1234.5	1270.9	1681.0	1544.9	6913.1
DJIBOUTI	102.2	95.4	56.5	111.2	182.2	547.5
DOMINICA	3.1	1.2	3.5	0.8	5.2	13.8
DOMINICAN RP	642.9	578.6	791.6	695.7	950.1	3658.8
ECUADOR	1171.1	1176.5	1524.6	2460.3	1638.7	7971.2
EGYPT	15892.2	16736.0	17371.4	17799.3	16886.5	84685.3
EL SALVADOR	1006.4	942.0	1308.7	923.5	1530.9	5711.5
EQ.GUINEA	0.0	0.5	0.1	5.4	0.3	6.4
ERITREA	26.8	87.5	69.9	177.6	12.3	374.1
ESTONIA	233.6	146.9	1376.6	823.0	574.9	3154.9
ETHIOPIA	512.7	257.4	160.3	387.9	427.4	1745.7
FAEROE ISLDS	1.0	0.5	1.3	1.5	1.8	6.2
FALKLAND ISL	0.0	0.0	3.1	0.1	0.0	3.3
FIJI	68.4	125.4	270.6	248.4	160.5	873.0
FINLAND	667.4	888.4	1021.0	1047.6	970.3	4594.7
FR.GUIANA	1.9	0.0	0.0	0.0	0.0	1.9
FR.POLYNESIA	8.7	17.2	16.1	13.7	12.2	68.0
FRANCE	8721.1	10242.3	9369.8	9523.1	9025.3	46881.6
GABON	63.7	113.6	83.9	93.1	149.3	503.6
GAMBIA	275.8	511.5	380.3	367.7	61.4	1596.6

Appendix Va: Gross virtual water import per country for the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
GEORGIA	206.8	501.8	259.3	392.1	181.9	1541.9
GERMANY	20653.3	23907.8	21815.3	24692.0	25206.0	116301.9
GHANA	320.2	617.4	657.0	727.2	1034.5	3356.2
GIBRALTAR	0.5	0.4	0.8	12.1	40.6	54.4
GREECE	2740.6	3193.6	3093.2	3584.7	2977.2	15607.0
GREENLAND	1.0	0.4	1.3	1.7	1.8	6.2
GRENADA	29.7	49.7	30.7	32.7	52.4	195.1
GUADELOUPE	49.4	0.0	0.0	0.0	0.0	49.4
GUATEMALA	851.9	1209.5	1120.2	1186.3	1607.5	5975.4
GUINEA	93.4	53.5	33.4	63.0	167.2	410.5
GUINEABISSAU	14.7	14.0	3.1	0.4	9.4	41.5
GUYANA	81.2	59.1	71.9	47.0	80.4	339.6
HAITI	363.9	321.6	305.2	376.3	578.2	1945.2
HONDURAS	528.8	625.1	846.7	996.6	998.4	3995.5
HONG KONG	3182.6	3344.2	3119.5	3046.2	2864.2	15556.7
HUNGARY	452.6	539.1	987.2	599.2	599.8	3177.9
ICELAND	57.0	59.7	66.1	68.9	72.3	324.1
INDIA	595.7	1517.0	4084.9	4449.0	1418.6	12065.2
INDONESIA	25841.8	24063.7	18687.4	28330.4	9907.7	106831.0
IRAN (ISLM.R)	5904.1	5393.2	8339.0	5144.5	7997.4	33115.7
IRAQ	50.8	172.7	1669.0	1985.9	1618.1	5503.3
IRELAND	813.1	877.6	886.6	1090.5	1061.1	4728.9
ISRAEL	2314.5	5270.7	5798.8	4895.4	7424.9	25940.3
ITALY	19087.4	19275.5	20528.5	20113.9	19123.8	98129.1
JAMAICA	414.6	423.9	375.3	368.1	382.3	1964.2
JAPAN	55326.2	60193.5	63662.0	60148.1	58830.0	298159.8
JORDAN	7731.2	1196.9	7585.9	3695.0	1425.3	22680.1
KAZAKHSTAN	16.4	74.6	40.6	51.2	29.2	209.1
KENYA	1998.6	635.5	612.4	922.9	681.5	4850.8
KIRIBATI	0.1	0.2	0.4	0.4	0.1	1.3
KOREA D P RP	563.0	440.1	1084.1	674.0	453.6	3214.9
KOREA REP.	19013.1	22870.1	23638.2	23933.4	23458.2	112913.0
KUWAIT	472.4	356.0	621.4	379.6	570.2	2488.8
KYRGYZSTAN	270.1	494.6	84.5	54.2	59.0	962.3
LAO P.DEM.R	89.0	127.0	169.4	61.5	23.9	470.9
LATVIA	235.8	470.8	319.4	290.1	191.1	1507.0
LEBANON	767.5	824.2	635.3	560.5	758.0	3880.8
LIBERIA	66.9	168.0	60.5	20.9	21.0	337.3
LIBYA	647.1	669.6	1273.8	822.5	532.5	3945.6
LITHUANIA	588.3	757.7	578.1	394.6	183.8	2502.1
MACAU	122.7	124.0	118.1	4.3	115.8	484.9
MACEDONIA, TFYR	21.3	149.6	294.8	211.3	67.7	744.8
MADAGASCAR	547.2	163.5	228.6	265.1	395.6	1600.0
MALAWI	42.4	13.4	12.3	2.8	58.5	129.4
MALAYSIA	10337.4	11549.1	12024.4	12571.0	11059.7	57541.6
MALDIVES	25.4	14.0	12.0	2.0	4.7	58.1
MALI	77.3	29.7	35.3	196.3	60.6	399.2
MALTA	306.9	325.6	306.9	294.5	353.2	1587.2
MARSHALL IS.	2.9	2.0	2.4	1.9	1.4	10.6
MARTINIQUE	10.3	0.0	0.0	0.0	0.0	10.3
MAURITANIA	160.8	442.6	517.3	676.4	81.6	1878.6
MAURITIUS	489.5	658.4	469.1	566.9	639.4	2823.4
MEXICO	16237.9	25277.9	22053.6	27729.9	30507.5	121806.7
MICRON, F.ST	8.8	14.0	10.7	8.0	5.6	47.1
MOLDOVA REP.	202.8	86.7	21.1	50.3	53.1	413.9
MONGOLIA	16.9	6.1	27.7	41.3	31.2	123.2
MONTSERRAT	0.0	0.0	0.0	0.2	0.0	0.2
MOROCCO	6838.3	6391.8	6433.2	3743.7	3632.1	28089.0
MOZAMBIQUE	445.8	219.0	247.5	499.9	272.6	1684.8
MYANMAR	9.2	4.9	31.2	33.4	26.8	105.5
N.CALEDONIA	14.7	13.5	42.6	14.0	13.9	98.7
N.MARIANA	16.1	0.4	1.9	2.8	4.1	25.3
NAURU	1.0	0.0	0.0	0.0	0.0	1.1
NEPAL	128.6	64.1	26.6	18.3	0.5	238.1
NETH.ANTILES	48.3	94.4	42.7	32.2	42.3	259.8
NETHERLANDS	33476.2	35300.6	37646.8	32509.4	35994.6	175011.7
NEW ZEALAND	931.3	971.8	1144.2	770.4	1188.8	5003.2
NICARAGUA	478.7	684.4	446.7	621.6	686.9	2918.2
NIGER	206.4	242.4	422.7	658.9	17.2	1547.6
NIGERIA	1010.8	4410.2	7711.9	9038.5	6810.9	28982.2
NORFOLK ISLD	0.0	1.8	1.7	0.0	0.0	3.5
NORWAY	2551.2	2085.8	1872.5	1832.7	2731.3	11073.4
OMAN	1263.4	1097.1	1198.2	1138.5	1407.1	6140.4

Appendix Va: Gross virtual water import per country for the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
PAKISTAN	2517.0	2335.3	4091.0	2125.6	1666.5	12735.3
PALAU	6.4	3.4	8.0	1.2	1.1	20.1
PANAMA	422.9	520.9	595.6	671.3	488.5	2699.2
PAPUA N.GUIN	47.1	65.0	68.9	48.7	14.9	244.5
PARAGUAY	224.9	388.5	265.4	284.4	551.6	1714.9
PERU	4912.5	5723.8	5788.4	6215.4	5191.5	27831.6
PHILIPPINES	3712.4	9576.3	10949.5	12125.7	4562.2	41033.6
PITCAIRN	0.0	0.0	0.2	0.0	0.0	0.2
POLAND	4579.4	6740.0	3099.2	3834.9	2797.6	21050.6
PORTUGAL	6469.1	6700.8	6365.3	7373.0	6882.0	33790.2
QATAR	48.9	36.2	55.5	123.6	32.2	296.4
REUNION	380.5	0.0	0.0	0.0	0.0	380.5
ROMANIA	798.4	1086.5	757.1	966.1	740.6	4388.4
RUSSIAN FED	2422.6	15072.4	17122.9	15768.6	22286.2	72672.6
RWANDA	112.4	119.8	28.3	116.1	88.4	465.0
S.AFR.CUS.UN	8609.4	7072.8	6058.6	7186.8	5710.5	34638.1
S.VINCENT-GR	58.4	54.7	67.6	57.2	43.4	281.3
SAMOA	0.3	0.9	0.5	1.1	0.6	3.4
SAO TOME PRN	2.6	7.9	4.2	0.6	1.9	17.1
SAUDI ARABIA	12240.6	14016.2	6480.1	14225.7	5063.8	56566.6
SENEGAL	1304.3	2721.0	2244.3	3327.1	3805.2	13401.9
SEYCHELLES	17.3	11.5	20.0	74.6	15.5	138.9
SIERRA LEONE	325.9	18.7	29.7	23.5	18.3	416.2
SINGAPORE	3889.2	3910.3	3785.8	3316.5	4294.7	19196.2
SLOVAKIA	245.2	401.3	709.7	325.4	251.6	1933.2
SLOVENIA	1266.1	1132.8	909.4	956.5	1049.7	5314.4
SOLOMON ISLS	0.6	0.3	0.1	0.6	1.3	3.0
SOMALIA	170.0	334.9	285.4	557.4	151.1	1498.7
SPAIN	21848.7	18177.9	20299.2	24763.4	25533.8	110623.1
SRI LANKA	1404.4	206708.4	173081.4	52171.3	3269.8	436635.3
ST.HELENA	0.0	0.0	0.0	3.5	4.0	7.5
ST.KITTS NEV	3.2	5.3	4.1	17.0	6.7	36.4
ST.LUCIA	1.3	0.9	1.5	1.6	0.7	6.1
ST.PIER.MIQU	0.0	0.3	0.1	0.2	0.0	0.6
SUDAN	258.6	561.3	752.0	1014.1	220.4	2806.3
SURINAME	30.2	32.4	21.5	23.3	30.4	137.7
SWEDEN	514.7	738.1	729.1	851.1	853.4	3686.4
SWITZ.LIECHT	2224.7	2088.1	2057.0	2034.5	2090.4	10494.6
SYRIA A. R.	1011.0	715.9	672.8	648.0	1375.0	4422.7
TAIWAN (POC)	7331.2	7553.6	7431.2	7155.4	6524.2	35995.5
TAJIKISTAN	50.8	52.6	60.3	59.0	10.7	233.4
TANZANIA, U.R	719.4	924.0	1905.0	1385.2	1124.2	6057.7
THAILAND	2718.4	3215.1	4232.1	4564.2	5760.1	20489.8
TOGO	599.4	388.8	856.8	1223.6	1189.2	4257.8
TOKELAU	0.0	0.0	0.0	0.0	0.0	0.0
TONGA	1.0	0.2	0.0	12.2	5.3	18.7
TRINIDAD TBG	805.0	842.4	823.5	593.4	333.8	3398.1
TUNISIA	6082.4	2885.5	3725.7	3401.1	2932.1	19625.6
TURKEY	6494.9	11644.9	11974.8	12108.4	9264.8	51487.8
TURKMENISTAN	139.0	121.3	20.5	4.8	1.5	287.1
TURKS CA.ISL	0.1	0.1	0.1	0.2	0.3	0.9
UGANDA	171.8	134.0	69.6	325.0	343.6	1043.9
UKRAINE	349.8	359.6	375.3	904.5	355.1	2344.3
UNTD ARAB EM	2658.5	1380.1	1710.8	2184.9	2241.9	10546.8
UNTD KINGDOM	11994.1	14326.6	15143.9	15099.5	14454.6	71020.6
URUGUAY	618.7	809.4	670.7	1022.0	988.2	4109.0
US MSC.PACIFIC	57.4	12.7	5.6	1.7	14.5	91.9
USA	23579.1	26513.8	36844.1	27793.3	31591.3	146321.5
UZBEKISTAN	435.7	981.3	586.7	607.5	52.7	2663.7
VANUATU	0.0	0.1	0.0	0.1	0.1	0.3
VENEZUELA	5158.6	5315.8	5786.9	8063.7	6928.9	31253.9
VIET NAM	173.6	100.2	113.1	176.6	205.1	768.8
WALLIS FUT.IS	0.0	0.0	0.0	0.0	0.0	0.0
YEMEN	1421.4	1947.1	1138.5	1374.4	1363.0	7244.5
YUGOSLAVIA	43.9	647.3	715.0	269.9	87.6	1763.6
ZAMBIA	29.0	68.8	5.9	12.3	57.9	173.9
ZIMBABWE	121.2	49.2	124.7	52.6	231.1	578.9
Grand Total	558839.1	812513.7	792869.1	699989.7	600677.0	3474587.7

Appendix Vb. Gross virtual water export per country in the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
AFGHANISTAN	31.4	122.1	979.7	154.3	150.1	1437.6
ALBANIA	6.2	11.4	37.1	12.6	4.9	72.2
ALGERIA	0.2	25.2	0.4	5.5	3.3	34.6
ANDORRA	0.0	0.0	0.0	0.0	0.0	0.0
ANGOLA	0.0	0.0	0.0	0.0	27.5	27.5
ANGUILLA	0.0	0.0	0.0	0.0	0.0	0.0
ANTIGUA BARB	0.0	0.0	0.0	0.0	0.0	0.0
ARGENTINA	37070.2	45187.6	40267.0	59010.8	52241.1	233776.8
ARMENIA	0.0	0.1	2.1	23.4	2.2	27.7
ARUBA	0.0	0.0	0.0	0.0	0.0	0.0
AUSTRALIA	14702.5	43171.3	35407.8	31600.0	25782.5	150651.5
AUSTRIA	918.1	649.6	978.2	1189.0	1145.4	4880.3
AZERBAIJAN	0.0	34.7	21.9	26.7	66.8	150.1
BAHAMAS	38.8	57.8	135.9	104.6	36.3	373.3
BAHRAIN	0.0	0.0	0.0	0.0	1.2	1.2
BANGLADESH	36.7	5162.7	1017.0	6592.4	4.1	12813.0
BARBADOS	8.3	15.0	30.7	23.9	9.5	87.3
BELARUS	43.6	6.0	6.9	64.7	54.0	175.2
BELGIUM-LUX	2218.1	1978.1	2836.2	2671.9	2780.8	12485.1
BELIZE	50.4	55.2	107.3	60.5	265.4	538.9
BENIN	620.9	1031.0	1160.3	1753.0	823.9	5389.1
BERMUDA	36.8	4.5	0.4	55.1	25.4	122.2
BHUTAN	0.0	0.0	0.0	0.0	0.0	0.0
BOLIVIA	1755.6	1977.2	1781.7	1481.9	1664.2	8660.5
BOSNIA HERZG	5.8	283.9	14.0	13.7	1.4	318.8
BRITISH INDIAN OCEAN TER	0.0	0.0	0.0	0.0	0.0	0.0
BR.VIRGIN.IS	0.0	0.0	0.0	0.0	0.0	0.0
BRAZIL	18204.4	20261.8	38566.1	40859.8	42916.8	160808.8
BRUNEI DAR.	0.0	0.0	0.0	0.0	0.1	0.1
BULGARIA	1230.6	413.2	226.1	815.9	1113.0	3798.7
BURKINA FASO	39.2	8.6	46.2	2628.3	2144.5	4866.8
BURUNDI	0.4	0.5	0.0	0.3	0.0	1.3
CAMBODIA	65.5	23.7	31.2	2.5	15.4	138.4
CAMEROON	176.3	190.2	157.5	163.3	252.5	939.7
CANADA	59311.3	58122.6	71206.1	56989.1	50913.0	296542.0
CAP VERDE	0.0	0.0	0.0	0.0	0.0	0.0
CAYMAN ISLDS	1.2	0.0	18.1	0.0	0.0	19.3
CENT.AF.REP	1.0	0.4	0.5	0.8	11.8	14.5
CHAD	0.0	0.0	0.0	0.0	0.0	0.0
CHILE	1227.0	1266.4	1188.1	1189.6	1184.7	6055.8
CHINA	5703.9	4456.6	12851.5	15344.9	12217.5	50574.4
COCOS ISLNDS	0.0	0.0	0.0	0.0	0.0	0.0
COLOMBIA	752.3	794.0	900.2	883.0	996.4	4325.8
COMOROS	0.1	0.0	0.0	0.0	0.0	0.1
CONGO	5.1	2.7	10.5	5.7	10.1	34.1
CONGO, D.R.	9.8	9.0	3.6	1.6	0.7	24.7
COOK ISLANDS	0.0	0.0	0.0	0.0	0.0	0.0
COSTA RICA	560.2	1007.0	573.2	637.3	672.2	3450.0
COTE DIVOIRE	173.0	47.1	33.7	112.7	51.3	417.7
CROATIA	624.7	621.0	115.4	227.6	141.2	1729.8
CUBA	849.4	1322.9	1770.5	1170.5	1406.8	6520.0
CYPRUS	262.6	278.3	131.9	143.0	178.6	994.4
CZECH REP	1746.2	418.5	173.0	338.7	1129.7	3806.1
DENMARK	2211.0	1707.3	1923.1	1840.1	1536.7	9218.2
DJIBOUTI	0.0	0.0	0.9	0.0	0.0	0.9
DOMINICA	662.6	801.1	738.0	334.7	568.5	3104.9
DOMINICAN RP	1833.0	2823.0	4581.4	2700.5	1381.5	13319.5
ECUADOR	1684.2	2285.9	2872.0	1835.9	2244.1	10922.1
EGYPT	590.3	1457.3	648.8	1099.5	711.9	4507.8
EL SALVADOR	88.4	78.4	106.9	77.0	122.4	473.1
EQ.GUINEA	0.0	0.0	0.0	0.0	0.0	0.0
ERITREA	0.0	0.0	1.2	0.0	0.0	1.3
ESTONIA	39.7	16.1	96.7	276.5	73.1	502.1
ETHIOPIA	26.0	39.3	24.7	9.5	14.0	113.4
FAEROE ISLDS	0.0	0.0	0.0	0.0	0.0	0.0
FALKLAND ISL	0.0	0.0	0.0	0.0	0.0	0.0
FIJI	0.0	0.0	0.0	0.0	0.0	0.0
FINLAND	1098.7	972.2	1343.6	1221.9	822.5	5459.0
FR. GUIANA	0.0	0.0	0.0	0.0	0.0	0.0
FR.POLYNESIA	0.0	0.0	0.0	0.0	0.0	0.0
FRANCE	27178.3	24851.6	26509.0	26532.0	30186.4	135257.2
GABON	0.0	0.0	0.3	3.1	0.0	3.5
GAMBIA	125.6	165.0	88.3	440.6	1.6	821.1

Appendix Vb. Gross virtual water export per country in the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
GEORGIA	0.0	1.7	82.7	239.1	191.3	514.8
GERMANY	8425.5	10269.3	8246.2	13410.9	8004.7	48356.6
GHANA	91.4	95.6	172.9	364.6	362.8	1087.3
GIBRALTAR	0.0	0.0	0.0	0.0	0.0	0.0
GREECE	5728.8	5235.5	5486.3	3571.3	5418.0	25439.8
GREENLAND	0.0	0.0	0.0	0.0	0.0	0.0
GRENADA	32.0	0.5	0.9	0.2	2.1	42.7
GUADELOUPE	31.3	0.0	0.0	0.0	0.0	31.3
GUATEMALA	1735.4	1658.0	69278.5	2527.4	2483.5	77682.8
GUINEA	21.5	19.5	27.5	52.7	83.1	204.4
GUINEABISSAU	6.4	6.2	8.8	5.5	0.0	26.9
GUYANA	95.3	101.2	250.3	351.8	334.4	1132.9
HAITI	0.0	0.0	0.0	0.2	0.0	0.2
HONDURAS	209.9	343.0	438.4	328.7	338.7	1658.7
HONG KONG	241.7	840.8	16.2	38.6	77.8	1215.1
HUNGARY	5988.5	2501.5	3897.5	6388.1	4104.6	22948.1
ICELAND	0.9	0.2	6.8	0.0	0.1	7.9
INDIA	25203.5	85625.4	28994.7	29101.4	4136.6	173061.6
INDONESIA	730.8	738.8	772.4	2538.3	915.6	5695.9
IRAN (ISLM.R)	409.7	1221.6	504.7	1259.0	622.1	4017.1
IRAQ	0.0	0.1	0.1	16.2	0.0	16.4
IRELAND	137.6	154.1	298.6	287.3	131.8	1009.3
ISRAEL	271.5	644.3	651.9	682.3	699.3	2949.3
ITALY	6380.9	7035.1	6948.7	6751.3	6694.4	33810.3
JAMAICA	143.3	163.1	143.4	126.1	110.5	686.5
JAPAN	128.7	40.2	79.7	498.0	195.5	942.0
JORDAN	102.3	7.1	122.6	31.3	11.6	275.0
KAZAKHSTAN	674.0	8164.1	10937.1	8188.2	11416.4	39379.8
KENYA	331.6	320.4	52.7	69.0	74.6	848.3
KIRIBATI	0.0	0.0	0.0	0.0	0.0	0.0
KOREA D P RP	1.7	1.7	7.3	0.4	0.0	11.1
KOREA REP.	48.8	38.9	35.3	80.5	141.5	345.1
KUWAIT	0.2	0.1	0.0	0.0	0.0	0.3
KYRGYZSTAN	126.7	245.2	93.9	133.2	127.0	726.1
LAO P.DEM.R	2.7	0.8	0.6	0.9	3.5	8.6
LATVIA	11.5	18.7	101.1	37.9	97.5	266.8
LEBANON	40.5	39.2	14.2	44.9	8.3	147.0
LIBERIA	0.0	0.0	0.0	8.7	0.0	8.7
LIBYA	36.7	25.6	31.3	66.4	67.0	227.0
LITHUANIA	145.7	130.7	329.5	513.7	800.1	1919.7
MACAU	0.9	0.6	0.9	0.0	0.1	2.5
MACEDONIA, TFYR	53.1	146.4	122.0	121.8	46.1	489.3
MADAGASCAR	97.7	176.2	245.4	72.3	67.1	658.6
MALAWI	429.7	926.6	883.0	849.2	844.7	3933.2
MALAYSIA	350.7	2579.4	1313.1	621.3	1415.3	6279.7
MALDIVES	0.0	0.0	0.0	0.0	0.0	0.0
MALI	9.9	7.5	16.8	39.2	0.9	74.3
MALTA	20.9	114.5	39.0	27.2	26.8	228.5
MARSHALL IS.	0.0	0.0	0.0	0.0	0.0	0.0
MARTINIQUE	59.5	0.0	0.0	0.0	0.0	59.5
MAURITANIA	0.0	0.2	2.9	0.0	0.0	3.1
MAURITIUS	242.1	317.7	271.5	291.6	251.7	1374.6
MEXICO	3804.7	11384.8	32768.8	24973.8	3941.3	76873.4
MICRON, F. ST	0.0	0.0	0.0	0.0	0.0	0.0
MOLDOVA REP.	412.5	205.0	213.1	323.6	1123.3	2277.5
MONGOLIA	44.0	0.0	0.0	0.0	9.0	50.7
MONTSERRAT	55.8	104.6	32.8	7.3	0.0	200.5
MOROCCO	128.4	88.7	95.8	51.1	72.8	436.8
MOZAMBIQUE	69.4	103.0	67.6	130.9	54.5	425.3
MYANMAR	1486.4	1141.4	12430.4	2044.7	403.7	17506.6
N.CALEDONIA	0.0	0.0	0.0	0.0	0.0	0.0
N.MARIANA	0.0	0.0	0.0	0.0	0.0	0.0
NAURU	0.0	0.0	0.0	0.0	0.0	0.0
NEPAL	0.0	1.7	2.7	90.5	0.0	95.0
NETH.ANTILES	0.0	0.0	0.0	0.0	0.0	0.0
NETHERLANDS	4164.9	4204.1	5069.3	6546.6	7328.3	27313.0
NEW ZEALAND	86.1	92.2	131.2	153.0	103.1	565.6
NICARAGUA	310.4	330.8	462.6	251.0	310.8	1665.5
NIGER	100.1	137.8	137.4	163.6	0.7	539.7
NIGERIA	190.6	777.6	127.4	194.2	3382.4	4672.1
NORFOLK ISLD	0.0	0.0	0.0	0.0	0.0	0.0
NORWAY	13.5	20.6	7.9	8.2	5.2	55.4
OMAN	105.0	93.2	122.9	141.6	135.2	597.9

Appendix Vb. Gross virtual water export per country in the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
PAKISTAN	2945.8	2756.1	1862.2	3585.7	1634.3	12784.2
PALAU	0.0	0.0	0.0	0.0	0.0	0.0
PANAMA	357.8	314.3	392.7	292.1	298.7	1655.6
PAPUA N.GUIN	17.1	22.2	21.2	21.5	20.0	102.1
PARAGUAY	7138.7	8439.5	11766.6	5593.9	10901.7	43840.4
PERU	123.2	111.7	129.9	263.9	89.0	717.7
PHILIPPINES	4366.0	9633.0	8821.6	8950.6	4438.9	36210.1
PITCAIRN	0.0	0.0	0.0	0.0	0.0	0.0
POLAND	281.6	218.4	357.9	444.7	959.4	2262.1
PORTUGAL	315.8	272.3	718.0	489.8	853.6	2649.5
QATAR	0.1	0.0	0.0	0.0	0.0	0.1
REUNION	68.7	0.0	0.0	0.0	0.0	68.7
ROMANIA	1538.0	3647.7	1744.5	2620.5	3955.3	13506.1
RUSSIAN FED	6422.8	16476.2	12951.4	17448.4	7104.9	60397.9
RWANDA	0.7	0.0	0.0	0.0	0.0	0.8
S.AFR.CUS.UN	2275.5	3487.6	2537.4	1597.9	2893.3	12791.7
S.VINCENT-GR	0.0	0.0	0.0	0.0	0.0	0.0
SAMOA	1.7	1.4	1.1	0.6	0.9	5.7
SAO TOME PRN	0.0	0.0	0.0	0.0	0.0	0.0
SAUDI ARABIA	1999.5	123.9	14.8	32.8	4.8	2175.9
SENEGAL	21.8	65.4	57.8	42.2	30.6	217.9
SEYCHELLES	0.0	0.0	0.0	0.0	0.0	0.0
SIERRA LEONE	2.1	0.2	0.2	0.2	0.5	3.2
SINGAPORE	291.4	301.4	712.4	695.8	174.9	2175.8
SLOVAKIA	1394.0	449.3	515.3	1160.7	1367.6	4887.0
SLOVENIA	11.1	9.3	16.4	45.7	26.4	109.0
SOLOMON ISLS	1.3	0.3	3.1	3.7	1.3	9.7
SOMALIA	32.3	36.0	31.0	14.0	0.0	113.4
SPAIN	4459.8	6038.5	5945.0	5661.1	6000.8	28105.2
SRI LANKA	71.3	3052.5	2613.8	2411.4	19.5	8168.6
ST.HELENA	0.0	0.0	0.0	0.0	0.0	0.0
ST.KITTS NEV	5.8	4.8	9.1	6.8	5.1	31.7
ST.LUCIA	1254.2	1335.7	884.0	899.5	837.5	5210.9
ST.PIER.MIQU	0.0	0.0	0.0	0.0	0.0	0.0
SUDAN	5417.3	511.8	381.4	946.0	1305.2	8561.7
SURINAME	60.9	130.1	147.5	135.5	98.5	572.5
SWEDEN	735.7	1352.5	1922.6	2091.1	1783.9	7885.8
SWITZ.LIECHT	186.2	124.5	133.4	176.2	192.0	812.3
SYRIA A. R.	9486.6	2610.1	10175.2	3949.5	94.5	26315.8
TAIWAN (POC)	259.8	208.0	102.1	151.5	112.3	833.7
TAJIKISTAN	1.5	69.0	124.5	143.4	80.2	418.6
TANZANIA, U.R	109.9	141.8	358.4	391.2	415.9	1417.3
THAILAND	41728.1	90840.7	37361.8	44381.4	39504.7	253816.7
TOGO	0.9	208.9	1.7	428.0	434.3	1073.9
TOKELAU	0.0	0.0	0.0	0.0	0.0	0.0
TONGA	0.0	0.0	0.1	0.0	0.0	0.1
TRINIDAD TBG	98.3	167.2	116.1	44.9	26.5	453.0
TUNISIA	34.4	61.4	86.8	98.4	7.8	288.8
TURKEY	5217.1	4154.0	4430.0	9058.6	8717.4	41222.2
TURKMENISTAN	0.0	0.2	1.5	0.8	0.4	2.8
TURKS CA.ISL	0.0	0.0	0.0	0.0	0.0	0.0
UGANDA	510.0	647.8	35.5	190.1	90.5	1473.8
UKRAINE	2128.8	6624.3	6344.1	9397.9	9668.0	34163.1
UNTD ARAB EM	376.8	246.4	409.7	507.1	550.5	2090.5
UNTD KINGDOM	5614.5	6313.7	52929.6	6408.6	4606.1	75872.5
URUGUAY	1617.1	5672.3	3413.9	2668.7	2744.5	16116.4
US MSC.PACIFIC	0.0	0.0	0.0	0.0	0.0	0.0
USA	191579.1	195159.6	172422.8	165017.7	180442.5	904621.7
UZBEKISTAN	1.6	103.7	296.5	118.5	98.2	618.5
VANUATU	0.0	0.0	0.0	0.0	0.0	0.0
VENEZUELA	1125.8	2831.3	969.2	1228.9	470.7	6625.9
VIET NAM	2770.0	62568.1	3048.8	21001.7	1539.9	90928.5
WALLIS FUT.I	1.4	0.0	0.0	0.0	0.0	1.4
YEMEN	5.5	11.4	0.0	40.5	0.0	57.3
YUGOSLAVIA	45.4	1312.3	223.1	707.5	153.2	2441.5
ZAMBIA	67.0	79.2	199.0	212.6	106.9	664.6
ZIMBABWE	461.6	708.7	806.4	663.2	526.4	3166.4
Grand Total	558839.1	812513.7	792869.1	699989.7	600677.0	3474587.7

Appendix Vc. Net virtual water import per country in the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
AFGHANISTAN	28.5	-45.2	-872.8	-149.0	-106.7	-1145.2
ALBANIA	99.5	654.4	203.2	243.7	115.4	1316.2
ALGERIA	9523.2	5658.4	11327.7	10681.9	11500.9	49018.6
ANDORRA	2.8	1.9	3.0	2.0	1.3	11.0
ANGOLA	223.9	230.5	92.4	164.6	130.3	841.8
ANGUILLA	2.3	3.5	0.2	0.2	0.1	6.4
ANTIGUA BARB	7.0	9.1	15.4	0.5	11.9	43.9
ARGENTINA	-36742.2	-44890.5	-36668.3	-57275.4	-50765.7	-226342.0
ARMENIA	307.9	220.5	508.8	158.8	357.0	1553.0
ARUBA	2.8	6.5	8.2	14.0	3.0	34.6
AUSTRALIA	-13269.4	-42222.2	-34502.6	-30822.8	-24792.1	-145596.6
AUSTRIA	-55.0	764.0	346.9	263.3	206.9	1524.6
AZERBAIJAN	158.1	82.6	110.6	2085.9	2434.6	4871.8
BAHAMAS	12.5	-40.9	-112.1	-92.6	-18.2	-251.3
BAHRAIN	144.2	114.6	47.3	294.1	85.3	685.6
BANGLADESH	12390.5	2186.3	3923.4	8441.8	1768.0	28710.0
BARBADOS	77.9	66.7	138.0	102.8	125.7	511.0
BELARUS	142.4	89.1	237.5	2143.6	3491.7	6104.3
BELGIUM-LUX	11730.1	12193.9	12472.4	12206.2	10974.3	59576.8
BELIZE	-28.3	-33.2	-85.5	-35.1	-244.2	-426.3
BENIN	96.8	-726.3	-890.7	-1190.6	-315.5	-3026.3
BERMUDA	198.4	65.1	437.1	-26.4	-1.0	673.1
BHUTAN	9.8	46.5	43.0	33.0	0.0	132.3
BOLIVIA	-1408.7	-1402.1	-1113.6	-742.9	-618.9	-5286.3
BOSNIA HERZG	82.5	-129.6	270.6	395.9	240.6	871.2
BRITISH INDIAN OCEAN TER	0.0	0.1	0.0	17.2	0.0	17.3
BR.VIRGIN.IS	24.6	80.7	187.4	58.8	1.3	352.9
BRAZIL	-1943.3	5839.2	-15789.6	-15135.6	-17971.8	-45001.1
BRUNEI DAR.	177.7	217.5	287.6	569.8	366.3	1619.0
BULGARIA	-1127.9	243.8	127.6	-660.3	-946.0	-2357.0
BURKINA FASO	-9.6	33.2	35.7	-2473.4	-2109.5	-4523.6
BURUNDI	1.5	1.0	0.0	5.1	9.5	17.1
CAMBODIA	200.8	62.1	43.6	129.6	76.0	512.0
CAMEROON	-15.1	-100.1	84.2	30.7	-62.7	-63.0
CANADA	-55329.2	-53557.0	-65895.5	-52106.3	-45582.0	-272470.0
CAP VERDE	39.8	40.6	34.3	37.9	69.3	221.8
CAYMAN ISLDS	47.3	137.3	170.2	1.3	106.6	462.7
CENT.AF.REP	-0.9	1.7	-0.5	5.9	-11.8	-5.6
CHAD	3.2	0.0	2.9	0.1	0.7	6.8
CHILE	1508.6	2049.6	1745.5	1793.7	3159.5	10256.9
CHINA	42222.3	31993.6	8689.5	7962.6	11312.0	102177.8
COCOS ISLNDS	0.0	1.8	7.5	0.0	0.9	10.3
COLOMBIA	5600.0	7384.9	7004.9	7602.7	5758.7	33351.2
COMOROS	12.9	43.7	32.7	46.7	60.5	196.5
CONGO	17.7	22.6	85.5	154.4	152.8	433.0
CONGO, D.R.	635.9	619.1	137.2	109.3	73.1	1574.6
COOK ISLANDS	4.1	0.0	0.0	0.0	0.0	4.2
COSTA RICA	950.6	1949.4	1115.3	1070.2	1203.0	6288.4
COTE DIVOIRE	581.3	275.7	367.1	1159.0	1067.0	3450.0
CROATIA	-166.2	-172.4	771.2	395.7	274.2	1119.5
CUBA	202.6	-73.9	-900.6	133.9	-469.6	-1107.6
CYPRUS	703.0	930.2	1228.9	1049.5	986.0	5323.9
CZECH REP	-609.8	848.5	1207.5	1034.0	-57.6	2422.5
DENMARK	-1029.3	-472.8	-652.2	-159.0	8.2	-2305.1
DJIBOUTI	102.2	95.4	55.6	111.2	182.2	546.6
DOMINICA	-659.5	-799.9	-734.5	-333.9	-563.3	-3091.1
DOMINICAN RP	-1190.1	-2244.4	-3789.8	-2004.8	-431.5	-9660.7
ECUADOR	-513.1	-1109.4	-1347.4	624.4	-605.5	-2950.9
EGYPT	15301.9	15278.7	16722.6	16699.8	16174.5	80177.5
EL SALVADOR	918.0	863.6	1201.9	846.5	1408.5	5238.4
EQ.GUINEA	0.0	0.5	0.1	5.4	0.3	6.4
ERITREA	26.8	87.5	68.7	177.6	12.3	372.9
ESTONIA	193.9	130.8	1279.9	546.5	501.8	2652.9
ETHIOPIA	486.7	218.1	135.6	378.5	413.3	1632.2
FAEROE ISLDS	1.0	0.5	1.3	1.5	1.8	6.2
FALKLAND ISL	0.0	0.0	3.1	0.1	0.0	3.3
FIJI	68.4	125.4	270.6	248.4	160.5	873.0
FINLAND	-431.4	-83.7	-322.6	-174.3	147.8	-864.3
FR. GUIANA	1.9	0.0	0.0	0.0	0.0	1.9
FR.POLYNESIA	8.7	17.2	16.1	13.7	12.2	68.0
FRANCE	-18457.2	-14609.3	-17139.2	-17008.9	-21161.0	-88375.7
GABON	63.7	113.6	83.6	89.9	149.3	500.1
GAMBIA	150.2	346.5	292.0	-72.9	59.8	775.5

Appendix Vc. Net virtual water import per country in the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
GEORGIA	206.8	500.1	176.7	153.0	-9.4	1027.2
GERMANY	12227.8	13638.5	13569.1	11281.1	17201.3	67945.3
GHANA	228.8	521.8	484.1	362.7	671.7	2268.9
GIBRALTAR	0.5	0.4	0.8	12.1	40.6	54.4
GREECE	-2988.3	-2041.9	-2393.1	13.4	-2440.8	-9832.8
GREENLAND	1.0	0.4	1.3	1.7	1.8	6.2
GRENADA	-2.4	49.2	29.9	32.4	50.3	152.5
GUADELOUPE	18.1	0.0	0.0	0.0	0.0	18.1
GUATEMALA	-883.5	-448.6	-68158.3	-1341.1	-876.0	-71707.4
GUINEA	71.9	34.0	5.9	10.2	84.0	206.1
GUINEABISSAU	8.2	7.8	-5.7	-5.1	9.4	14.5
GUYANA	-14.1	-42.1	-178.3	-304.8	-254.0	-793.3
HAITI	363.9	321.6	305.2	376.1	578.2	1945.1
HONDURAS	319.0	282.1	408.2	667.9	659.7	2336.8
HONG KONG	2940.9	2503.4	3103.4	3007.6	2786.4	14341.7
HUNGARY	-5535.9	-1962.4	-2910.3	-5788.9	-3504.8	-19770.2
ICELAND	56.0	59.6	59.3	68.9	72.2	316.2
INDIA	-24607.8	-84108.3	-24909.9	-24652.4	-2718.0	-160996.4
INDONESIA	25111.0	23324.8	17915.1	25792.0	8992.2	101135.1
IRAN (ISLM.R)	5494.4	4171.6	7834.3	3885.5	7375.3	29098.6
IRAQ	50.8	172.6	1669.0	1969.8	1618.1	5487.0
IRELAND	675.5	723.5	588.0	803.2	929.4	3719.6
ISRAEL	2043.0	4626.4	5146.9	4213.1	6725.6	22991.0
ITALY	12706.5	12240.5	13579.9	13362.6	12429.4	64318.7
JAMAICA	271.3	260.7	231.9	242.0	271.8	1277.7
JAPAN	55197.5	60153.3	63582.2	59650.2	58634.5	297217.8
JORDAN	7628.9	1189.8	7463.3	3663.7	1413.7	22405.1
KAZAKHSTAN	-657.7	-8089.5	-10896.5	-8137.0	-11387.2	-39170.8
KENYA	1667.0	315.0	559.6	853.9	606.9	4002.5
KIRIBATI	0.1	0.2	0.4	0.4	0.1	1.3
KOREA D P RP	561.3	438.5	1076.8	673.6	453.6	3203.8
KOREA REP.	18964.3	22831.2	23602.8	23852.9	23316.7	112567.9
KUWAIT	472.2	355.8	621.4	379.6	570.2	2488.5
KYRGYZSTAN	143.4	249.4	-9.4	-79.0	-68.1	236.3
LAO P.DEM.R	86.3	126.2	168.8	60.6	20.5	462.4
LATVIA	224.3	452.1	218.3	252.2	93.6	1240.2
LEBANON	727.0	785.1	621.1	515.7	749.7	3733.8
LIBERIA	66.9	168.0	60.5	12.2	21.0	328.6
LIBYA	610.3	644.0	1242.5	756.2	465.5	3718.6
LITHUANIA	442.6	627.0	248.6	-119.1	-616.3	582.4
MACAU	121.9	123.4	117.2	4.3	115.7	482.4
MACEDONIA, TFYR	-31.8	3.3	172.8	89.5	21.7	255.5
MADAGASCAR	449.6	-12.7	-16.8	192.8	328.5	941.4
MALAWI	-387.4	-913.1	-870.7	-846.3	-786.3	-3803.8
MALAYSIA	9986.7	8969.7	10711.3	11949.8	9644.4	51261.8
MALDIVES	25.4	14.0	12.0	2.0	4.7	58.1
MALI	67.5	22.3	18.4	157.1	59.6	325.0
MALTA	285.9	211.2	267.8	267.3	326.4	1358.6
MARSHALL IS.	2.9	2.0	2.4	1.9	1.4	10.6
MARTINIQUE	-49.3	0.0	0.0	0.0	0.0	-49.3
MAURITANIA	160.8	442.4	514.4	676.4	81.6	1875.6
MAURITIUS	247.4	340.8	197.6	275.2	387.7	1448.7
MEXICO	12433.2	13893.1	-10715.2	2756.1	26566.2	44933.3
MICRON, F. ST	8.8	14.0	10.7	8.0	5.6	47.1
MOLDOVA REP.	-209.7	-118.4	-192.0	-273.3	-1070.2	-1863.6
MONGOLIA	-27.1	6.1	27.7	41.3	22.2	72.5
MONTSERRAT	-55.8	-104.6	-32.8	-7.1	0.0	-200.3
MOROCCO	6709.9	6303.1	6337.4	3692.6	3559.3	27652.1
MOZAMBIQUE	376.4	116.0	179.9	369.1	218.1	1259.5
MYANMAR	-1477.2	-1136.5	-12399.3	-2011.3	-376.9	-17401.1
N.CALEDONIA	14.7	13.5	42.6	14.0	13.9	98.7
N.MARIANA	16.1	0.4	1.9	2.8	4.1	25.3
NAURU	1.0	0.0	0.0	0.0	0.0	1.1
NEPAL	128.5	62.4	24.0	-72.2	0.5	143.1
NETH.ANTILES	48.3	94.4	42.7	32.2	42.3	259.8
NETHERLANDS	29311.3	31096.6	32577.5	25962.8	28666.4	147698.7
NEW ZEALAND	845.2	879.6	1013.0	617.4	1085.7	4437.6
NICARAGUA	168.3	353.6	-15.9	370.6	376.1	1252.7
NIGER	106.3	104.5	285.3	495.3	16.5	1007.9
NIGERIA	820.2	3632.5	7584.5	8844.3	3428.5	24310.1
NORFOLK ISLD	0.0	1.8	1.7	0.0	0.0	3.5
NORWAY	2537.7	2065.3	1864.6	1824.5	2726.1	11018.1
OMAN	1158.5	1003.9	1075.4	996.9	1271.9	5542.5

Appendix Vc. Net virtual water import per country in the years 1995-1999 (10^6 m^3)

Country	1995	1996	1997	1998	1999	Total
PAKISTAN	-428.9	-420.9	2228.8	-1460.2	32.2	-48.9
PALAU	6.4	3.4	8.0	1.2	1.1	20.1
PANAMA	65.1	206.6	202.9	379.2	189.8	1043.6
PAPUA N.GUIN	30.0	42.8	47.6	27.2	-5.2	142.4
PARAGUAY	-6913.9	-8050.9	-11501.1	-5309.5	-10350.0	-42125.5
PERU	4789.3	5612.1	5658.4	5951.6	5102.5	27113.9
PHILIPPINES	-653.6	-56.7	2127.9	3175.1	123.3	4823.5
PITCAIRN	0.0	0.0	0.2	0.0	0.0	0.2
POLAND	4297.7	6521.6	2741.4	3390.2	1838.2	18788.6
PORTUGAL	6153.3	6428.5	5647.3	6883.3	6028.4	31140.7
QATAR	48.8	36.2	55.5	123.6	32.2	296.3
REUNION	311.8	0.0	0.0	0.0	0.0	311.8
ROMANIA	-739.5	-2561.2	-987.4	-1654.4	-3214.8	-9117.7
RUSSIAN FED	-4000.2	-1403.8	4171.4	-1679.8	15181.3	12274.7
RWANDA	111.7	119.8	28.3	116.1	88.3	464.3
S.AFR.CUS.UN	6333.9	3585.2	3521.2	5588.9	2817.2	21846.4
S.VINCENT-GR	58.4	54.7	67.6	57.2	43.4	281.3
SAMOA	-1.4	-0.5	-0.6	0.4	-0.3	-2.3
SAO TOME PRN	2.6	7.9	4.2	0.6	1.9	17.1
SAUDI ARABIA	10241.1	13892.3	6465.3	14192.9	5058.9	54390.7
SENEGAL	1282.5	2655.6	2186.5	3285.0	3774.6	13184.0
SEYCHELLES	17.3	11.5	20.0	74.6	15.5	138.9
SIERRA LEONE	323.8	18.6	29.5	23.3	17.8	413.0
SINGAPORE	3597.8	3608.9	3073.4	2620.7	4119.8	17020.4
SLOVAKIA	-1148.8	-48.0	194.4	-835.4	-1116.0	-2953.8
SLOVENIA	1254.9	1123.5	892.9	910.8	1023.3	5205.4
SOLOMON ISLS	-0.8	0.0	-2.9	-3.1	0.0	-6.7
SOMALIA	137.7	298.9	254.4	543.3	151.1	1385.4
SPAIN	17388.9	12139.4	14354.2	19102.3	19533.0	82517.9
SRI LANKA	1333.1	203655.9	170467.6	49759.9	3250.2	428466.7
ST.HELENA	0.0	0.0	0.0	3.5	4.0	7.5
ST.KITTS NEV	-2.6	0.5	-5.0	10.2	1.6	4.7
ST.LUCIA	-1252.8	-1334.8	-882.5	-897.9	-836.8	-5204.8
ST.PIER.MIQU	0.0	0.3	0.1	0.2	0.0	0.6
SUDAN	-5158.7	49.6	370.5	68.1	-1084.9	-5755.3
SURINAME	-30.8	-97.7	-126.0	-112.2	-68.1	-434.7
SWEDEN	-221.1	-614.4	-1193.5	-1240.0	-930.5	-4199.5
SWITZ.LIECHT	2038.5	1963.5	1923.6	1858.3	1898.3	9682.3
SYRIA A. R.	-8475.6	-1894.2	-9502.4	-3301.5	1280.5	-21893.2
TAIWAN (POC)	7071.4	7345.6	7329.1	7003.9	6411.9	35161.9
TAJIKISTAN	49.3	-16.3	-64.3	-84.5	-69.6	-185.3
TANZANIA, U.R	609.5	782.2	1546.5	994.0	708.3	4640.5
THAILAND	-39009.7	-87625.6	-33129.7	-39817.2	-33744.6	-233326.9
TOGO	598.5	179.9	855.1	795.6	754.9	3183.9
TOKELAU	0.0	0.0	0.0	0.0	0.0	0.0
TONGA	1.0	0.2	0.0	12.2	5.3	18.6
TRINIDAD TBG	706.7	675.3	707.4	548.5	307.2	2945.1
TUNISIA	6048.0	2824.1	3639.0	3302.7	2924.3	19336.8
TURKEY	1277.8	7491.0	7544.8	3049.8	547.4	10265.6
TURKMENISTAN	139.0	121.1	18.9	4.1	1.1	284.3
TURKS CA.ISL	0.1	0.1	0.1	0.2	0.3	0.9
UGANDA	-338.3	-513.8	34.1	134.9	253.1	-430.0
UKRAINE	-1778.9	-6264.7	-5968.8	-8493.4	-9312.9	-31818.9
UNTD ARAB EM	2281.6	1133.7	1301.1	1677.8	1691.4	8456.2
UNTD KINGDOM	6379.6	8012.9	-37785.8	8690.9	9848.5	-4852.0
URUGUAY	-998.4	-4862.9	-2743.2	-1646.7	-1756.3	-12007.5
US MSC.PACIFIC	57.4	12.7	5.6	1.7	14.5	91.9
USA	-168000.0	-168645.8	-135578.8	-137224.4	-148851.2	-758300.2
UZBEKISTAN	434.2	877.6	290.2	489.0	-45.5	2045.2
VANUATU	0.0	0.1	0.0	0.1	0.1	0.3
VENEZUELA	4032.8	2484.4	4817.7	6834.8	6458.2	24628.0
VIET NAM	-2596.4	-62467.8	-2935.6	-20825.0	-1334.8	-90159.7
WALLIS FUT.I	-1.4	0.0	0.0	0.0	0.0	-1.4
YEMEN	1415.9	1935.7	1138.5	1333.9	1363.0	7187.1
YUGOSLAVIA	-1.5	-665.0	491.9	-437.6	-65.6	-677.8
ZAMBIA	-37.9	-10.4	-193.1	-200.3	-49.0	-490.7
ZIMBABWE	-340.4	-659.5	-681.7	-610.6	-295.3	-2587.5
Grand Total	0.0	0.0	0.0	0.0	0.0	0.0

Appendix VI. Classification of countries into thirteen world regions

Central Africa	**Central and South Asia**	TURKEY	NAURU	PERU
BURUNDI	AFGHANISTAN	UNTD ARAB EM	NEW ZEALAND	SURINAME
CAMEROON	BERMUDA	YEMEN	NORFOLK ISLD	URUGUAY
CENT.AF.REP	BHUTAN	**North Africa**	PALAU	VENEZUELA
COMOROS	CHINA	ALGERIA	PAPUA N.GUIN	**South east Asia**
CONGO	HONG KONG	BENIN	PITCAIRN	BANGLADESH
CONGO, D.R.	INDIA	BURKINA FASO	SAMOA	BRUNEI DAR.
EQ.GUINEA	JAPAN	CAP VERDE	SOLOMON ISLS	CAMBODIA
GABON	KOREA D P RP	CHAD	TOKELAU	INDONESIA
KENYA	KOREA REP.	COTE DIVOIRE	TONGA	LAO P.DEM.R
RWANDA	MACAU	DJIBOUTI	VANUATU	MALAYSIA
SAO TOME PRN	MALDIVES	EGYPT	WALLIS FUT.I	MYANMAR
SEYCHELLES	MONGOLIA	ERITREA	**FSU**	PHILIPPINES
TANZANIA, U.R	NEPAL	ETHIOPIA	ARMENIA	SINGAPORE
UGANDA	PAKISTAN	GAMBIA	AZERBAIJAN	THAILAND
Central America	SRI LANKA	GHANA	BELARUS	VIET NAM
ANGUILLA	TAIWAN (POC)	GUINEA	GEORGIA	**Western Europe**
ANTIGUA BARB	**Eastern Europe**	GUINEABISSAU	KAZAKSTAN	ANDORRA
ARUBA	ALBANIA	LIBERIA	KYRGYZSTAN	AUSTRIA
BAHAMAS	BOSNIA HERZG	LIBYA	MOLDOVA REP.	BELGIUM-LUX
BARBADOS	BULGARIA	MALI	RUSSIAN FED	DENMARK
BELIZE	CROATIA	MAURITANIA	TAJIKISTAN	FAEROE ISLDS
BR.VIRGIN.IS	CYPRUS	MOROCCO	TURKMENISTAN	FINLAND
CAYMAN ISLDS	CZECH REP	NIGER	UKRAINE	FRANCE
COSTA RICA	ESTONIA	NIGERIA	UZBEKISTAN	GERMANY
CUBA	GREECE	SENEGAL	**South Africa**	GIBRALTAR
DOMINICA	HUNGARY	SIERRA LEONE	ANGOLA	GREENLAND
DOMINICAN RP	LATVIA	SOMALIA	MADAGASCAR	ICELAND
EL SALVADOR	LITHUANIA	SUDAN	MALAWI	IRELAND
GRENADA	MACEDONIA, TFYR	TOGO	MAURITIUS	ITALY
GUADELOUPE	POLAND	TUNISIA	MOZAMBIQUE	MALTA
GUATEMALA	ROMANIA	**North America**	REUNION	NETHERLANDS
HAITI	SLOVAKIA	CANADA	S.AFR.CUS.UN	NORWAY
HONDURAS	SLOVENIA	ST.PIERRE & MIQUELON	ST.HELENA	PORTUGAL
JAMAICA	YUGOSLAVIA	USA,PR,USVI	ZAMBIA	SPAIN
MARTINIQUE	**Middle East**	**Oceania**	ZIMBABWE	SWEDEN
MEXICO	BAHRAIN	AUSTRALIA	**South America**	SWITZ.LIECHT
MONTSERRAT	IRAN (ISLM.R)	BR.IND.OC.TR	ARGENTINA	UNTD KINGDOM
NETH.ANTILES	IRAQ	COCOS ISLNDS	BOLIVIA	
NICARAGUA	ISRAEL	COOK ISLANDS	BRAZIL	
PANAMA	JORDAN	FIJI	CHILE	
S.VINCENT-GR	KUWAIT	FR.POLYNESIA	COLOMBIA	
ST.KITTS NEV	LEBANON	KIRIBATI	ECUADOR	
ST.LUCIA	OMAN	MARSHALL IS.	FALKLAND ISL	
TRINIDAD TBG	QATAR	MICRON, F. ST	FR. GUIANA	
TURKS CA.ISL	SAUDI ARABIA	N.CALEDONIA	GUYANA	
US.MSC.PAC	SYRIA A. R.	N.MARIANA	PARAGUAY	

Appendix VII. Gross virtual water trade between and within regions (Gm^3)

Year	Importer / Exporter	Central Africa	Central America	Central & South Asia	Eastern Europe	Middle East	North Africa	North America
1995	Central Africa	0.4976	0.0000	0.0147	0.0148	0.0008	0.0051	0.0039
1996	Central Africa	0.6567	0.0002	0.0101	0.0175	0.0000	0.0155	0.0045
1997	Central Africa	0.0344	0.0002	0.0035	0.0218	0.0315	0.0051	0.0112
1998	Central Africa	0.2755	0.0001	0.0559	0.0369	0.0248	0.0156	0.0050
1999	Central Africa	0.1884	0.0000	0.0218	0.0274	0.0122	0.0099	0.0266
Total	Central Africa	1.6526	0.0005	0.1060	0.1185	0.0694	0.0512	0.0512
1995	Central America	0.0169	0.7178	0.9242	0.1236	0.0234	0.3731	5.8659
1996	Central America	0.0013	1.1950	7.9984	0.2523	0.0938	0.1906	7.7870
1997	Central America	0.0762	1.0331	93.3307	0.1892	0.2159	0.4837	13.0115
1998	Central America	0.1474	0.5410	21.5666	0.1490	0.0729	0.0967	7.3844
1999	Central America	0.0114	1.1329	0.6962	0.0615	0.0242	0.3849	6.3168
Total	Central America	0.2534	4.6198	124.5161	0.7756	0.4304	1.5290	40.3656
1995	Central & South Asia	1.7603	0.0218	3.4605	0.2895	4.6034	2.2978	0.4308
1996	Central & South Asia	0.8645	0.0327	61.7172	1.2141	7.1493	2.3960	0.9847
1997	Central & South Asia	0.1941	0.1746	20.8937	0.6079	3.5783	2.8211	1.0028
1998	Central & South Asia	0.5200	0.1800	8.4108	0.5264	5.6039	4.3142	0.4401
1999	Central & South Asia	0.1939	0.2623	5.9164	0.4313	0.7064	1.9312	0.4600
Total	Central & South Asia	3.5329	0.6714	100.3962	3.0692	21.6413	13.7603	3.3184
1995	Eastern Europe	0.0004	0.0189	0.0750	4.7491	1.9467	2.5848	0.0692
1996	Eastern Europe	0.0071	0.0995	0.0634	3.6900	2.4611	1.5212	0.0804
1997	Eastern Europe	0.0009	0.0030	0.4984	3.2317	1.2022	0.9695	0.1540
1998	Eastern Europe	0.0007	0.0229	1.4679	5.0361	2.0765	1.3279	0.1353
1999	Eastern Europe	0.0079	0.0064	0.7169	3.6283	2.6796	1.1580	0.1162
Total	Eastern Europe	0.0170	0.1507	2.8216	20.4032	10.3661	7.5614	0.5551
1995	Middle East	0.2902	0.0705	0.1083	0.4875	7.2631	3.9026	0.4917
1996	Middle East	0.0604	0.0119	2.3403	0.3581	1.0893	0.5779	0.5697
1997	Middle East	0.1064	0.0161	2.8098	0.4086	5.9675	2.5509	0.4971
1998	Middle East	0.0377	0.0173	4.5177	0.3684	3.0537	2.6701	0.4200
1999	Middle East	0.2996	0.0189	1.7832	0.4666	1.2827	1.5322	0.3671
Total	Middle East	0.7944	0.1346	11.5591	2.5394	25.6536	13.2090	2.3456
1995	North Africa	0.0108	0.0000	0.8781	0.1254	1.6840	0.3373	0.0037
1996	North Africa	0.0066	0.1341	0.6628	0.2632	0.3597	0.7116	0.1016
1997	North Africa	0.0715	0.0021	0.2092	0.2079	0.3088	0.5386	0.0035
1998	North Africa	0.0323	0.0109	0.1301	0.2822	1.0650	0.8993	0.1869
1999	North Africa	0.0083	0.0000	0.5750	0.2611	0.3208	0.2485	3.8797
Total	North Africa	0.1296	0.1471	2.4551	1.1398	3.7382	2.7353	4.1754
1995	North America	0.5246	22.4680	97.3939	1.7263	12.1025	25.7962	15.6483
1996	North America	0.3987	31.4015	86.3532	2.8439	13.4897	25.4160	14.5063
1997	North America	0.6078	28.0958	77.3522	1.8298	15.8272	24.3203	19.1281
1998	North America	0.7213	33.2296	65.2549	1.4994	9.8012	26.5783	15.9503
1999	North America	0.6205	38.0402	68.8541	1.6147	12.5528	26.4031	17.5477
Total	North America	2.8728	153.2352	395.2083	9.5140	63.7734	128.5138	82.7806
1995	Oceania	0.0004	0.0033	7.3305	0.0133	0.5766	0.0882	0.1710
1996	Oceania	0.1183	0.0684	26.9375	0.0344	1.6820	1.7303	0.4404
1997	Oceania	0.1549	0.1207	18.0507	0.0074	1.7365	4.3002	0.4029
1998	Oceania	0.4262	0.1274	15.8428	0.0051	3.0403	1.9581	0.5164
1999	Oceania	0.1086	0.0829	15.0996	0.0141	2.4344	1.2312	1.1563
Total	Oceania	0.8083	0.4026	83.2610	0.0743	9.4698	9.3081	2.6870
1995	FSU	0.0000	0.0000	0.1686	2.2567	3.6448	0.6938	0.0026
1996	FSU	0.0000	0.0605	0.5679	3.7433	6.4979	0.5752	0.4862
1997	FSU	0.0084	0.1986	0.5140	3.1474	4.8750	0.7675	0.1581
1998	FSU	0.0000	0.0587	4.2047	2.8446	8.8628	0.6726	0.2491
1999	FSU	0.0001	0.0081	2.5405	1.0728	5.3805	0.3649	0.0684
Total	FSU	0.0084	0.3259	7.9956	13.0635	29.2610	3.0740	0.9644
1995	Southern Africa	0.0659	0.0774	1.1837	0.0846	0.0013	0.0635	0.1302
1996	Southern Africa	0.0148	0.4304	1.8448	0.1097	0.0181	0.0506	0.5077
1997	Southern Africa	0.0187	0.0987	1.2787	0.1043	0.0237	0.1691	0.4175
1998	Southern Africa	0.1619	0.0191	0.6378	0.0777	0.2207	0.0474	0.3441
1999	Southern Africa	0.4690	0.0507	0.4311	0.1200	0.1049	0.0844	0.3402
Total	Southern Africa	0.7302	0.6763	5.3761	0.4963	0.3687	0.4150	1.7397
1995	South America	0.3406	0.5553	4.6692	1.0516	2.5608	1.4886	2.0551
1996	South America	0.1454	1.8655	16.1354	1.6227	2.0701	3.0895	2.6493
1997	South America	0.2371	1.7136	11.0835	2.2029	6.2214	6.3842	3.4523
1998	South America	0.4825	1.9114	16.3524	1.5771	5.9081	5.2614	2.5408
1999	South America	0.4284	1.1105	14.0544	1.3799	3.5032	2.4084	2.6677
Total	South America	1.6341	7.1563	62.2949	7.8342	20.2636	18.6321	13.3652
1995	South-east Asia	0.2849	0.4551	19.1315	0.4550	5.0358	2.4177	2.1945
1996	South-east Asia	0.3131	0.5623	135.8150	0.3038	4.7795	4.8298	2.5216
1997	South-east Asia	0.3588	0.0492	29.3716	0.8805	4.4413	7.0455	2.8520
1998	South-east Asia	0.4478	0.9822	32.0168	0.4792	5.8334	7.5120	2.7838
1999	South-east Asia	0.4075	0.0892	10.2948	0.4391	5.6713	9.7584	2.6162
Total	South-east Asia	1.8121	2.1381	226.6296	2.5578	25.7613	31.5634	12.9680
1995	Western Europe	0.1380	0.4339	3.1199	2.6850	3.0802	6.0055	0.4943
1996	Western Europe	0.1505	0.3463	1.3676	5.2138	4.4753	2.9264	0.4402
1997	Western Europe	1.3653	0.4891	47.1093	4.5064	3.4981	4.8419	1.0670
1998	Western Europe	0.1932	0.4562	6.6849	3.3835	3.1953	5.6990	1.7203
1999	Western Europe	0.1574	0.5373	1.2506	3.1859	5.9554	5.9736	1.3596
Total	Western Europe	2.0044	2.2629	59.5323	18.9746	20.2044	25.4465	5.0814

Appendix VII. Gross virtual water trade between and within regions (Gm^3)

Year	Importer / Exporter	Oceania	FSU	Southern Africa	South America	South-east Asia	Western Europe
1995	Central Africa	0.0016	0.0000	0.2974	0.0000	0.0135	0.2956
1996	Central Africa	0.0032	0.0000	0.2296	0.0000	0.0035	0.3720
1997	Central Africa	0.0037	0.0004	0.0689	0.0000	0.0052	0.4330
1998	Central Africa	0.0039	0.0030	0.0110	0.0006	0.0203	0.3726
1999	Central Africa	0.0028	0.0095	0.0372	0.0019	0.0031	0.5153
Total	Central Africa	0.0152	0.0128	0.6440	0.0024	0.0456	1.9884
1995	Central America	0.0021	0.0705	0.1234	0.5349	0.0227	3.3923
1996	Central America	0.0012	0.7957	0.0135	0.4109	0.0020	3.2256
1997	Central America	0.0016	0.6464	0.0038	0.4511	0.0662	3.0797
1998	Central America	0.0012	1.4570	0.0252	0.8466	0.1215	2.1573
1999	Central America	0.0008	1.3183	0.0000	0.2027	0.1966	2.4711
Total	Central America	0.0068	4.2878	0.1660	2.4461	0.4090	14.3330
1995	Central & South Asia	0.0828	0.6171	2.0879	0.2170	16.4929	2.3568
1996	Central & South Asia	0.0968	2.7256	1.7244	0.4307	12.9263	4.8867
1997	Central & South Asia	0.0857	2.4983	1.9615	0.0725	8.6227	5.0332
1998	Central & South Asia	0.0671	2.7169	2.8054	0.1390	22.0534	3.7352
1999	Central & South Asia	0.0705	1.3252	0.8581	0.0133	4.7938	1.7571
Total	Central & South Asia	0.4030	9.8831	9.4374	0.8725	64.8891	17.7689
1995	Eastern Europe	0.0128	1.2859	0.0097	0.0045	0.2588	8.0978
1996	Eastern Europe	0.0243	1.0543	0.0436	0.0180	0.0936	6.5557
1997	Eastern Europe	0.0550	0.7011	0.0047	0.0184	0.0984	6.6503
1998	Eastern Europe	0.0384	0.7832	0.0334	0.0310	0.0356	6.4511
1999	Eastern Europe	0.0830	1.4087	0.0270	0.0087	0.0671	9.6622
Total	Eastern Europe	0.2134	5.2331	0.1184	0.0807	0.5536	37.4171
1995	Middle East	0.1463	0.0583	0.0132	0.0841	1.8071	3.2920
1996	Middle East	0.1621	0.2322	0.0039	0.0303	0.1687	3.5465
1997	Middle East	0.1582	0.2314	0.0028	0.1068	0.0653	3.5249
1998	Middle East	0.1627	0.3683	0.0053	0.1177	0.2319	3.7930
1999	Middle East	0.1916	0.3229	0.0039	0.1395	0.3430	4.0939
Total	Middle East	0.8209	1.2131	0.0291	0.4784	2.7234	18.3654
1995	North Africa	0.0001	0.0045	0.2438	0.0007	0.0003	4.3878
1996	North Africa	0.0000	0.0852	0.0988	0.0003	0.0001	2.4037
1997	North Africa	0.0003	0.0362	0.0079	0.0013	0.0794	1.7243
1998	North Africa	0.0000	0.0845	0.0111	2.5338	0.0752	3.2199
1999	North Africa	0.0000	0.0078	0.0715	2.0780	0.0007	2.0517
Total	North Africa	0.0005	0.2182	0.4330	4.6141	0.1556	13.7874
1995	North America	1.1661	1.1577	2.9580	14.2710	15.5146	40.1633
1996	North America	0.6804	1.7920	2.2324	19.8020	18.5889	35.7772
1997	North America	0.9599	0.9510	1.4799	19.1690	19.2247	34.6834
1998	North America	0.5791	0.5480	1.7857	18.7479	16.0199	31.2913
1999	North America	0.6364	5.2041	1.3884	16.6849	13.4565	28.3520
Total	North America	4.0219	9.6527	9.8444	88.6748	82.8046	170.2672
1995	Oceania	0.5475	0.0002	0.0897	0.1887	5.3400	0.4606
1996	Oceania	0.6456	0.0233	1.1791	1.3382	8.1038	0.9863
1997	Oceania	0.4756	0.0126	0.4342	1.4269	7.5285	0.9140
1998	Oceania	0.3933	0.0182	0.4143	0.3051	7.5973	1.1343
1999	Oceania	0.7380	0.0025	0.7245	0.4021	2.9925	0.9212
Total	Oceania	2.7964	0.0568	2.8418	3.6611	31.5618	4.4077
1995	FSU	0.0000	0.5451	0.0000	0.0000	0.0000	2.5000
1996	FSU	0.0000	9.7397	0.0000	0.0007	0.0001	10.2587
1997	FSU	0.0128	11.8430	0.0000	0.0592	0.1445	9.3471
1998	FSU	0.0000	10.6950	0.0000	0.0000	0.1935	8.3268
1999	FSU	0.0000	15.8625	0.0000	0.0000	0.0642	4.5710
Total	FSU	0.0128	48.6822	0.0000	0.0599	0.4024	35.0022
1995	Southern Africa	0.0273	0.0000	0.3526	0.2259	0.4280	1.0714
1996	Southern Africa	0.0152	0.0297	0.4171	0.4718	0.3477	1.5414
1997	Southern Africa	0.0182	0.0575	0.6457	0.5718	0.1307	1.4755
1998	Southern Africa	0.0157	0.0426	0.6061	0.0209	0.2332	1.3904
1999	Southern Africa	0.0213	0.1274	0.7558	0.0160	0.0726	2.1788
Total	Southern Africa	0.0977	0.2573	2.7772	1.3063	1.2123	7.6575
1995	South America	0.0711	0.2946	1.0340	21.4816	3.5136	31.7385
1996	South America	0.0738	0.4403	0.3949	28.2697	2.1257	30.1766
1997	South America	0.0618	1.0428	0.3870	29.2891	4.5405	35.6362
1998	South America	0.0662	1.2015	0.3896	33.7365	3.3530	42.7230
1999	South America	0.0681	1.8700	0.5423	33.9501	2.9675	50.9358
Total	South America	0.3409	4.8491	2.7477	146.7270	16.5003	191.2102
1995	South-east Asia	0.3702	0.1799	3.0271	0.6281	15.9496	1.6990
1996	South-east Asia	0.4566	0.5666	1.7790	1.0685	17.5632	2.4310
1997	South-east Asia	0.6372	0.6638	1.8766	0.6033	14.3879	2.3415
1998	South-east Asia	0.5804	4.0351	2.3113	0.9429	26.4621	2.4427
1999	South-east Asia	0.5823	0.5305	2.8190	0.2086	12.8347	2.1644
Total	South-east Asia	2.6266	5.9759	11.8129	3.4514	87.1976	11.0786
1995	Western Europe	0.1166	0.5322	0.6521	0.5863	0.3013	45.9353
1996	Western Europe	0.0082	0.6934	0.3595	0.1325	0.2755	49.6688
1997	Western Europe	0.0113	0.7744	0.3661	0.2419	0.4019	51.1823
1998	Western Europe	0.0099	0.4420	0.3563	0.3617	0.5186	52.2922
1999	Western Europe	0.0064	1.4464	0.2997	0.2690	0.2778	51.3804
Total	Western Europe	0.1523	3.8883	2.0337	1.5914	1.7752	250.4589

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