Introduction

That we cannot live alone, at peace; that our own well-being is dependent on the well-being of other nations – far away. We have learned to be citizens of the world, members of the human community. We have learned the simple truth of Emerson that ‘the only way to have a friend is to be one’.

Franklin D. Roosevelt, 20 January 1945

All life-forms depend on the availability of water. Water is a unique resource which cannot be produced artificially. Although the total amount of water resources on the planet is enormous and remains constant in a closed hydrological cycle, only 2.5 per cent of all water resources are fresh water resources. Of the fresh water resources, 68.7 per cent is trapped in glaciers, 30.1 per cent is in the form of groundwater, 0.8 per cent is trapped in permafrost, and 0.4 per cent is surface and atmospheric water. In total, less than 1 per cent of all the fresh water available on the planet is relatively easily accessible for human consumption and to meet agricultural and industrial demands. Additionally, the remaining percentage of the relatively easily accessible fresh water resources is unequally divided over the planet. Fresh water is already a scarce resource for many people in many regions of the world. According to the latest update of the ‘WHO/UNICEF Joint Monitoring Programme (JMP) for Water

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2 See ibid.


Supply and Sanitation’, an estimated 663 million people still use poor-quality drinking water sources. Economic development accompanied by increasing energy needs as well as population growth are boosting competition over the world’s available fresh water resources. Additionally, climate change and global warming could severely restrict access to fresh water in many countries and regions of the world. Fifteen of the hottest years globally were recorded since 2001, the warmest year of all being 2015. All factors combined, it is clear that more sustainable and efficient use of the available fresh water resources will become crucial in future (global) water management.

The fact that, around five years ago, water (supply) crises suddenly appeared in the World Economic Forum (WEF) top five of ‘Global Risks in Terms of Likelihood’, is undoubtedly to be understood as a pressing

global wake up-call. Water (supply) crises ranked number two both in 2012 and 2013, number three in 2014, number one in 2015 and, most recently, number three in 2016 after ‘failure of climate-change mitigation and adaptation’ and ‘weapons of mass destruction’. The reason for this constant and prominent appearing in the WEF’s ‘Global Risk Landscape’ mainly lies in the potential negative impact of climate change on global food security. One must thereby realise that agricultural irrigation presently already accounts for approximately 70 per cent of global fresh water consumption. One must also realise that agriculture has to compete increasingly with cities and other industries over the availability of fresh water resources. Additionally, global demand for agricultural products is expected to increase by approximately 60 per cent by the year 2030. It is thus not difficult to imagine that any additional negative impacts caused by climate change on the availability of fresh water resources, can have devastating impacts in many – already pressured – countries and regions around the globe.

New adaptive strategies in water management are emerging, such as (international) trade in bulk fresh water, drip-irrigation and ‘(international) virtual water trade’. Since trade in bulk fresh water and virtual water trade are primarily emerging on the global level, it is only a small step to think that the World Trade Organization (WTO), being the global trade regulatory institute, could play a pivotal role in regulating these newly emerging fields. Additionally, since the entry into force of the 1995 Agreement on Agriculture, the WTO disposes over a powerful regulatory framework applicable to the worldwide subsidisation of irrigation. As three of the most prominent (and controversial) topics of global water management in the context of climate change, trade in bulk fresh water and virtual water trade are significant needs.

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water, irrigation subsidies, and virtual water trade are three major topics to be discussed under the framework of this book.

I THE QUEST FOR SUSTAINABILITY: ON HOW TO (EQUITABLY) SHARE THE WORLD’S FRESH WATER RESOURCES

A. Trade in Bulk Fresh Water

Effective trade in bulk fresh water (i.e., fresh water in large quantities) still occurs only sporadically. For example, during the dry summer of 2008, two emergency situations hit the headlines of the international press: the city of Barcelona had to be supplied with fresh water tanker shipments by the ‘Société des Eaux de Marseille’ providing water taken from the River Rhone in Marseille, and Greece was asked to supply the city of Limassol in Cyprus with fresh water tanker shipments. Such incidents could become more frequent as a result of climate change and global warming. In the meantime, however, examples of failed trade in

12 Unless it is explicitly mentioned otherwise the notion of ‘trade in bulk fresh water’ refers to trade in bulk fresh water in an international context.
13 Unless it is explicitly mentioned otherwise the notion of ‘virtual water trade’ refers to virtual water trade in an international context.
bulk fresh water are still more abundant. For example, in the context of industrial fresh water supply, at the beginning of the new millennium, the Bolivian government formally authorised bulk fresh water transfers by pipeline from Bolivian aquifers directly to mining companies in Chile. In response to quarrels and protests, the decree was put out of force. In the meantime, additionally having to face failures, protest and quarrels in the context of enhanced privatisation of water supply services, Bolivia has become a leading nation in the promotion of the human right to water, which has been anchored in the Bolivian constitution since 2009, following its approval by the Bolivian citizens in a nation-wide referendum.

Also, during the first years of the new millennium, Turkey and the State of Israel were in negotiations concerning regular tanker shipment deliveries of bulk fresh water from the Manavgat River in Turkey to Israel. A contract between Turkey and the State of Israel was signed in March 2004, but shortly thereafter the project was abandoned due to rising oil prices and the resultant increase in transportation costs. Moreover, the Israeli government decided to change its strategy in favour of the creation of a certain number of desalination plants. Also, the Kingdom of Saudi Arabia, a country which would most likely have the means to finance massive imports of bulk fresh water in order to secure fresh water to meet the needs of its population and (oil) industry, currently still prefers to increase its investments in desalination plants and technology. The neighbouring Hashemite Kingdom of Jordan is

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19 See ibid.
20 See ICSID, Case No. ARB/03/2, Aguas del Tunari SA v. The Republic of Bolivia, 3 October 3, 2005.
22 See articles 16.1 and 20 of the Bolivian Constitution.
25 See Asharq Al-Awsat, ‘Saudi-Arabia: The Desalination Nation’, 2 July 2013 by Abeed Al-Suhaimy, available at http://www.aawsat.net/2013/07/article55308131 (last accessed on 31 August 2016). This is despite of the fact
among the most water-poor countries in the world. Due to rapid population growth and agricultural and industrial development, in combination with the effects of climate change and global warming, new ways to overcome fresh water shortages are urgently required. Together with the State of Israel and the Palestinian Authorities, The Hashemite Kingdom of Jordan has plans for a 10 billion dollars mega project for the construction of a canal annex pipeline which would allow the transfer of desalinated water from the Red Sea to the Dead Sea. Due to the high costs of the project in combination with the unpredictability of the peace negotiations between the State of Israel and the Palestinian Authorities, however, the project is not likely to be realised in the immediate future. In the meantime the country is heavily reliant on agricultural imports, and thus on virtual water imports, which is criticised among international observers. For example, Yorke, came to the conclusion that the water that desalination plants are highly energy-intensive; see Reuters, ‘Saudi Arabia’s Water Needs Eating Into Oil Wealth’, 9 September 2011 by Reem Shamsedine and Barbara Lewis, available at http://www.reuters.com/article/2011/09/09/us-saudi-water-idUSTRE7885ZX20110909 (last accessed on 31 August 2016).


Introduction

crisis in the Hashemite Kingdom of Jordan could best be overcome by efficient political reforms and regional cooperation.\(^{30}\)

The Central Plains and the Southwest of the United States, as well as the South of China, notoriously suffer from long-standing droughts.\(^{31}\) Canada on the other hand, with approximately 9 per cent of its territory covered by fresh water, is the world’s number one water-fortress by holding approximately 20 per cent of global fresh water resources. During the 1990s, several companies thought to have found a lucrative market opportunity and planned on starting bulk fresh water exports from the Canadian lakes to the United States and Asia. For example, in 1998, the Canadian (Ontarian) ‘Nova Group of Sault Ste.’ obtained a licence to start exporting bulk fresh water from Lake Superior.\(^{32}\) Under pressure of public protest, however, the licence was quickly withdrawn.\(^{33}\) The most notorious case, the planned bulk fresh water imports of Canadian bulk fresh water by the United States’ company ‘Sun Belt Inc.’,\(^{34}\) directly led to a Canadian general export ban on bulk fresh water and to the

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\(^{33}\) See *ibid*.

\(^{34}\) See also Part I, Introduction, at p.25, footnote 100.
integration of a clause in the 1994 North American Free Trade Agreement (NAFTA), stating that NAFTA could not create any right for a Member State over the fresh water resources of another Member State.\textsuperscript{35} Maude Barlow and Tony Clarke, the leading personalities of Canadian civil society opposed to bulk fresh water exports, won the alternate Nobel prize in 2005.\textsuperscript{36} Since then, the situation in Canada has not changed. Droughts in the United States, in China and elsewhere in the world, however, have got worse. Most recently, in an attempt to find a solution to the fresh water supply problems in the drought stricken Southwest of the United States, plans are being made to import bulk fresh water from Alaska.\textsuperscript{37} Also, plans are being made to drag icebergs to water-scarce countries in Africa.\textsuperscript{38}

Countries are very reluctant to abandon even a small part of their sovereignty over their natural resources. Understandably, this holds even


more true for the case of fresh water, which undoubtedly is a very unique resource. However, with predicted water crises in mind, the search for (global) answers will also intensify. Bulk fresh water exports from water-rich countries to water-poor countries is an option to be taken seriously, not only in emergency situations, but also on a more permanent basis. In this context, the question poses as to whether or not the WTO, which offers a legal international trade framework, could effectively deal with future (international) trade in bulk fresh water.39 The WTO has constantly been, and still is, severely criticised for merely dealing with international trade issues as such, not taking into account ‘non-trade’ concerns such as the protection of the environment, labour rights and human rights. One must thereby, however, realise that – legally speaking – the WTO is already well equipped to take such non-trade concerns into account. WTO case law, however, needs to follow. In fact this should rather be: WTO case law needs to show the way. Apart from current geo-political considerations, there is no specific reason why the WTO should not fully consider environmental and human rights concerns, including the right to water and the right to food.

B. Irrigation Subsidies

Ongoing long-standing droughts, as occur in the Central Plains and the Southwest of the United States, in the South of China, in the Aral Sea region, and in vast parts of India, are also the result of the over-use and depletion of groundwater resources for irrigation. The global population is predicted to increase from approximately 7 billion people at present to approximately 9 billion people in the year 2050.40 Agricultural production should therefore increase by 60 per cent by 2050.41 While this

39 In its 2010 World Trade Report, the WTO conceded that: ‘WTO rules were not specifically drafted to regulate natural resources trade and may not always respond adequately to the specific features of this sector’; see WTO, World Trade Report 2010 – Trade in Natural Resources (Geneva: WTO, 2010), at 203, available at http://www.wto.org/english/res_e/publications_e/wtr10_e.htm (last accessed on 31 August 2016). See also Melanie Berger (2013), supra footnote 17.


should be done in an environmentally friendly (sustainable) way, prices should be kept affordably low.\textsuperscript{42} In most developed countries irrigation for agriculture is heavily subsidised,\textsuperscript{43} often in combination with subsidies for fertilisers and chemical treatment. Most major emerging economies, such as China, Brazil and India, are increasing their investments in agricultural irrigation. In least-developed countries, on the other hand, irrigation infrastructure is still largely insufficient, especially in Africa.\textsuperscript{44} Precise data on public funding for irrigation are not available, incomplete, or inaccessible in many countries,\textsuperscript{45} including in the European Union (EU) and the United States.\textsuperscript{46} The World Bank estimates the total


\textsuperscript{46} See e.g., Jacques Berthelot, \textit{The King is Naked: the Impossible US Promise to Slash its Agricultural Supports} (Solidarité, 7 November 2005), at 18–26, available at http://www.iatp.org/files/451_2_77425.pdf (last accessed on 31 August 2016).
yearly government support for agricultural irrigation at 30 to 35 billion dollars.47 A large part of the funding goes to so-called capital infrastructure such as canals, dams and pipelines, and its operation and maintenance. The rest goes to basic on-farm equipment for drilling wells and pumping up the water, and also increasingly to investment in water-saving technologies, such as drip-irrigation. The total global spending on agricultural subsidies is estimated at 258.6 billion dollars in Organization for Economic Development and Cooperation (OECD) countries alone.48 The influence of the powerful landowners and agribusiness groups on policy-makers thereby is enormous.49 Concerning the United States, for example, an early, but ground-breaking, study revealed that the biggest 5 per cent of the United States’ farmers received more than 50 per cent of all irrigation subsidies, while the smallest 60 per cent of the United States’ farmers only received 11 per cent of all irrigation subsidies.50 This unbalanced distribution occurs despite the fact that – from the outset – irrigation subsidies were meant to contribute to the survival of smallholder farming, as well as farmers in a financially weak position.51 In the meantime, this situation has not changed substantially.52 A more recent study concerning Mexico reveals the same phenomenon there; the biggest

51 See ibid, at 18.
20 per cent of the farmers received more than 70 per cent of all irrigation subsidies.\textsuperscript{53} In France, a 2005 policy brief revealed that the top 2,500 farms received more money than the 180,000 smallest ones collectively.\textsuperscript{54}

Against this backdrop, it has to be remembered that approximately 500 million people are presently (still) making a living as smallholders,\textsuperscript{55} the large majority of them in developing\textsuperscript{56} and least-developed\textsuperscript{57} countries.\textsuperscript{58}

\footnotesize{(Washington DC/New York: The World Bank and Palgrave Macmillan, 2006); Jacques Berthelot (7 November 2005), \textit{supra} footnote 46, at 18–26.}


\footnotesize{\textsuperscript{55} With regard to the identification of smallholders, the FAO finds that: ‘[t]he definition of smallholders differs between countries and between agro-ecological zones. In favourable areas with high population densities they often cultivate less than one ha of land, whereas they may cultivate 10 ha or more in semi-arid areas, or manage 10 head of livestock’; see John Dixon, Aysen Tanyeri-Abur and Horst Wattenbach, \textit{‘Framework for Analyzing Impacts of Globalization on Smallholders’ in John Dixon, Kiyoshi Taniguchi, Horst Wattenbach and Aysen Tanyeri-Abur, Smallholders, Globalization and Policy Analysis} (2004), published by FAO at http://www.fao.org/docrep/007/y5784e/y5784e00.htm (last accessed on 31 August 2016).}

\footnotesize{\textsuperscript{56} It is not clear which countries are to be considered as developing countries since the United Nations, the International Monetary Fund and the World Bank issue different lists based on different definitions. WTO Members can freely decide for themselves whether they want to be considered as a developing country or a developed country (bringing along certain legal implication under the WTO framework), but their chosen status can be challenged by the other WTO Members; see WTO, \textit{Who are the Developing Countries in the WTO?}, available at http://www.wto.org/english/tratop_e/devel_e/d1who_e.htm (last accessed on 31 August 2016).}

\footnotesize{\textsuperscript{57} Concerning the ‘least-developed countries’ the WTO decided to follow the United Nations’ list, see WTO, \textit{Who are the Developing Countries in the WTO?}, available at http://www.wto.org/english/tratop_e/whatis_e/tif_e/org7_e.htm (last accessed on 31 August 2016). For the official United Nations’ list of least-developed countries, see UNCTAD, \textit{List of Least Developed Countries}, available at http://unctad.org/en/pages/aldc/Least%20Developed%20Countries/UN-list-of-Least-Developed-Countries.aspx (last accessed on 31 August 2016).}

\footnotesize{\textsuperscript{58} See Olivier de Schutter, United Nations Special Rapporteur on the Right to Food, \textit{The World Trade Organization and the Post-Global Food Crisis Agenda – Putting Food Security First in the International Trade System}, Activity Report,}
This number quadruples to approximately 2 billion people if smallholders’ families are included. Smallholders still produce close to 80 per cent of all the food in Asia and sub-Saharan Africa. Moreover, they have the potential to substantially increase food production and to do so in a more sustainable way than non-smallholders. With less trade-distorting domestic support in the developed countries as well as in the emerging economies directed to agribusinesses, smallholders could also make a better living, or simply survive. On-farm investment in irrigation could thereby be crucial, especially on the African continent, where irrigated agricultural land accounts for only 6 per cent of all agricultural land. Moreover, in a global study, Lobell, Cassman and Field come to

61 Against this backdrop it should be kept in mind that the African States committed themselves in the 2003 Maputo Declaration to increase their budget allocated to agriculture and rural development to 10 per cent of their available financial resources; see African Union, Assembly of the African Union, Second ordinary Session, 10–12 July 2003, Maputo, Mozambique, Declaration on Agriculture and Food Security in Africa, Assembly/AU/Decl.7 (II), at 1, available at http://www.nepad.org/nepad/knowledge/doc/1787/maputo-declaration (last accessed on 31 August 2016). The 2003 Maputo Declaration on Agriculture and Food Security in Africa inter alia also mentions that Parties are: ’[c]onvinced of the need to address the root causes of agricultural crises in Africa, aggravated in particular by inadequate funding, the lack of adequate water control and management, poor rural infrastructure and neglect of agricultural research’; see ibid, at 1. See also FAO, More Effective Sustainable Investments in Water for Poverty Reduction, available at http://www.fao.org/in-action/water-for-poverty-in-africa/en/ (last accessed on 31 August 2016).
the conclusion that rain-fed agriculture only produces around 50 per cent on average of its (perfect) yield potential, while irrigated agriculture could reach up to 80 per cent on average of its (perfect) yield potential.63 In addition, the use of more efficient water-saving technology, especially in water-stressed areas, will be an important factor in the struggle for global food self-sufficiency.64 Another important factor lies in the fact that, in under-developed rural areas with insufficient access to fresh water resources, in 77 per cent of the cases, it is woman and girls who are responsible for the fetching of the water.65 Improved access could reduce their time spent on collecting fresh water (far) away from their villages, while also agricultural productivity could increase significantly.66


In the context of the WTO, irrigation subsidies are mainly notified under Annex 2 of the Agreement on Agriculture (AA), the so-called ‘Green Box’.\(^{67}\) The Green Box allows for the notification of domestic support which has ‘no, or at most minimal, trade-distorting effects or effects on production’,\(^{68}\) which is consequently exempt from reduction commitments and ‘non-actionable’. Certain irrigation subsidies in developing and least-developed countries could, however, also find shelter under the second paragraph of article 6 AA, the so-called ‘Development Box’, where special and differential treatment for developing and least-developed countries is expressed to some extent.\(^{69}\) Highly problematic in this context is the fact that also domestic support, which is suspected to have more than minimal trade-distorting effects, increasingly tends to find shelter under the Green Box.\(^{70}\) This is especially the case with regard to domestic support in developed countries, but more recently, also with regard to domestic support in emerging economies.\(^{71}\) The main

\(^{67}\) See Part II, Chapter 4.I, at 118 ff.

\(^{68}\) The ‘fundamental’ Green Box requirement mentioned in the first paragraph of Annex 2 AA.

\(^{69}\) See Part II, Chapter 4.I, at 118 ff.


\(^{71}\) Concerning the notifications on agricultural domestic support of the BRICS countries, see below at 150–72.
cause for the present ill-functioning of the Green Box might lie in the fact that there is no definition nor guidelines as to what exactly is meant by the notion of domestic support having ‘no, or at most minimal, trade-distorting effects or effects on production’. Additionally, a major omission in the AA’s domestic support framework lies in the fact that WTO Members can freely choose to notify their domestic support under a certain category. Apart from what is eventually decided in a dispute settlement, there are no sanctions for notifying in the wrong category, and a control mechanism with only limited powers is put in place. These two issues combined lead to a situation where domestic support, including irrigation subsidies, is – at best – notified partially. Moreover, if notifications occur, mostly they are not detailed enough and lag behind for years. Under Part II of this book, the main question addressed is how the WTO’s Agreement on Agriculture could contribute to a more

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73 See Part II, Chapter 4.II.B, at 138 ff.
74 The Committee on Agriculture; see article 18 AA.
76 See e.g., Jacques Berthelot (7 November 2005), *supra* footnote 46. For the latest update on WTO Members’ compliance with domestic support notifications see WTO, WTO Committee on Agriculture, *Compliance with Notification Obligations, Note by the Secretariat*, G/AG/GEN/86/Rev.17, 11 March 2014, available at https://docs.wto.org/ (last accessed on 31 August 2016).
sustainable use of irrigation subsidies, taking into account the needs of smallholders in developing and least-developed countries, as well as the predicted effects of climate change and global warming.

C. Virtual Water Trade

As an alternative to the purchasing of ‘real’ (bulk) fresh water, the costly desalination of sea- or groundwater, or the further depletion of aquifers, a country or region could also choose to alleviate its fresh water shortages by increasing imports of water-intensive agricultural (and industrial) products instead of producing them domestically. In this way, the water needed to produce these goods is virtually imported and thus saved from being used at home. Initially inspired by Israeli concerns not to over-export water-intensive agricultural products in view of emerging local water scarcity, Anthony J. Allan started developing the ‘virtual water’ concept\(^78\) in the early 1990s.\(^79\) The total amount of water needed to


\(^78\) The concept of ‘virtual water’ can be defined as: ‘the amount of water that is embedded in food or other products needed for its production’; see Global Development Research Center (GDRC), *The Concepts of Water Footprint and Virtual Water*, available at http://www.gdrc.org/uem/footprints/water-footprint.html (last accessed on 31 August 2016). The difference between the ‘water footprint’ of a product and the ‘virtual water content’ of a product can be explained as follows: ‘The water footprint is a term that refers to the water used to make a product. In this context we can also speak about the “virtual water content” of a product instead of its “water footprint”. The water footprint concept, however, has a wider application. We can for example speak about the water footprint of a consumer by looking at the water footprints of the goods and services consumed or about the water footprint of a producer (business, manufacturer, service provider) by looking at the water footprint of the goods and services produced by the producer. Furthermore, the water footprint concept does not simply refer to a water volume only, like in the case of the term “virtual water content” of a product. The water footprint is a multidimensional indicator, not only referring to a water volume used, but also making explicit where the water footprint is located, what source of water is used, and when the water is used. The additional information is crucial in order to assess the impacts of the water footprint of a product’; see Water Footprint Network, *Frequently Asked Questions, What is the Difference Between Water Footprint and Virtual Water?* available at http://waterfootprint.org/en/water-footprint/frequently-asked-questions/#CP1 (last accessed on 31 August 2016).

produce commodities (agricultural or industrial) throughout their production process was initially referred to as ‘embedded’ or ‘exogenous’ water. This was rapidly developed into the flashier, but also criticised,\textsuperscript{80} ‘virtual water’ concept. At present, trade in products with reference to their virtual water content is generally known as ‘virtual water trade’; this expression will also be used throughout this book. Inspired by the work of Allan, Arjen Y. Hoekstra introduced the ‘water footprint’ concept in the early 2000s\textsuperscript{81} and started to develop a scientific method for measuring the total amount of water being used in the production process of a particular good (the water footprint of a product).\textsuperscript{82} A famous example is

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the estimated water footprint of a cup of coffee, which consists of 140 litres on average. Hoekstra’s research brought to the attention of the general public that the amount of water needed in the production process of a particular product can vary considerably, depending on the production method used and the location of production. The production of 1 ton of wheat, for example, requires 690m³ of fresh water in China, 1,654m³ in India and as much as 2,375m³ in Russia. The production of 1 kilogram of beef requires 11,681m³ in the Netherlands, 16,482m³ in India and as much as 21,018m³ in Russia. In 2003, Malin Falkenmark introduced another crucial factor to the debate by specifying three different types of virtual water: a green component (rainwater), a blue component (surface and groundwater), and a grey component (used or polluted water). These three components have a different impact on water scarcity since surface and groundwater have higher opportunity costs than rainwater and polluted water. In 2004, Dennis Wichelns analysed the comparative advantage of fresh water availability in the context of virtual water trade. Simultaneously, the concept of ‘global water savings through international trade (of agricultural products)’

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84 See Arjen Y. Hoekstra and Ashok K. Chapagain (2008), supra footnote 82, at 14.
85 See ibid.
emerged, proclaiming that a certain amount of fresh water resources could be saved through virtual water trade if more water-intensive agricultural products were produced in water-rich countries and consequently imported by water-poor countries.\(^8^8\) The concept, however, also has critics.\(^8^9\) Two issues will be analysed in the context of the WTO and virtual water trade, namely: water-footprint processes and production methods (PPMs), and water-footprint labelling. The first topic concerns the question whether it could be beneficial for the environment, i.e. stressed fresh water supplies, if the production process of a certain good monitors the amount of fresh water which is used. One could thus compare the amount of fresh water used for the same product produced in various locations. The monitoring of the water footprint of products could be used for taxation purposes, be it locally, regionally (EU) or globally (WTO). An alternative would be to introduce the labelling of the water footprint of products, and let consumers decide.

II SCOPE, STRUCTURE AND METHODOLOGY

Part I of this book deals with the legal treatment of trade in bulk fresh water under the General Agreement on Tariffs and Trade (GATT). Although trade in bulk fresh water is only slowly emerging, this could


change under the influence of future climate change and global warming. Presently, nothing (formally) precludes bulk fresh water from falling under the scope of the GATT, even if it is still in its natural state. It is thereby to be recognised that trade in bulk fresh water could help alleviate shortages of fresh water and contribute to the realisation of the human right to water on the international level. However, over-exploitation of fresh water resources caused by international trade could severely damage the environment and could also have negative consequences for the realisation of the human right to water on the local and regional levels. WTO dispute settlement should therefore be able to adequately respond to such challenges. It is argued that a formal and binding exclusion of bulk fresh water from the scope of the GATT is not only unlikely to happen; it would also not stop trade in bulk fresh water from occurring. Nor would such exclusion stop potential damage to the environment and/or to the human right to water on the local and the regional level. The only practical result would be that the potential of the GATT, to take into account environmental, social and human rights concerns, would simply be ignored. It is concluded that the WTO should prepare fully to take into account environmental, social and human rights concerns, in particular the human right to water. The methodology used to come to this conclusion is empirical, analytical-synthetic and conceptual.

Part II of this book deals with the legal treatment of irrigation subsidies under the AA. The issue of trade in ‘real’ (bulk) fresh water was not on the agenda of the latest round of multilateral trade negotiations. Nor was the issue of access to fresh water and sanitation as a human right. Nevertheless, the WTO has already specified in the past that its activities are ‘relevant’ to the United Nations Millennium Development Goals, thus including former Millennium Development Goal (MDG) 7, target C and the following Sustainable Development Goal (SDG) 6 concerning water.

Throughout this book, unless it is explicitly mentioned otherwise, with the notion of ‘irrigation subsidies’ reference is made to agricultural irrigation subsidies in the field of agriculture.

Implicitly, however, the issue of trade in virtual water has been on the agenda of the Doha Round negotiations since the issue of agricultural subsidies, including irrigation subsidies, was discussed and negotiated. The outcome was to give more leeway for the ‘non-trade concerns’ of developing and developed countries alike, under Annex 2 AA, (the Green Box), a non-actionable category of agricultural subsidies theoretically not, or only minimally, trade-distorting. Under the Green Box, however, subsidies related to non-trade concerns are exempt from reductions for all WTO Members, including the already developed economies. They are thus likely to distort trade on a much bigger scale. The second paragraph of article 6.2 AA (the Development Box) on the other hand, where some room for special and differential treatment for developing countries was already available, has been left unchanged. It is argued that, *inter alia* for the well-being of the 2.6 billion smallholders and their families, it would be preferable if the non-trade concerns of the developing and least-developed countries could find additional shelter under the second paragraph of article 6 AA. It is concluded that the present rules concerning the Green Box should not only be further clarified but also strictly implemented, while domestic support concerning adaptation to climate change and global warming in developing countries – particularly in the field of irrigation – which is more than minimally trade-distorting, should find shelter under a fine-tuned Development Box. The methodology used to come to this conclusion is empirical, analytical-synthetic and conceptual.

Part III of this book deals with the issue of water-footprint PPMs, including water-footprint labelling schemes. Measuring and monitoring the exact amount of fresh water used to produce a certain good (the water footprint of a good), becomes increasingly important under the pressure of population growth, industrial and agricultural development, and the predicted effects of climate change and global warming. Two of the most water-stressed countries in the world (with fast growing populations), the


93 E.g., rural development, food security, poverty alleviation and the fight against the consequences of climate change and global warming.
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Hashemite Kingdom of Jordan and the State of Israel already import 86 per cent and 81.5 per cent, respectively, of their total water-needs through international virtual water trade. Differences in the water footprint of a certain good, depending on the climate or on the production method are regulated, to some extent, under the WTO. PPMs, both product-related (altering the product to some extent), and non-product-related (not altering the product as such), are implicitly regulated under the GATT and the Agreement on Technical Barriers to Trade (TBT Agreement), with dispute settlement playing a prominent role. In this context, the question remains whether non-product-related PPMs are acceptable as a criterion to distinguish between otherwise ‘like’ products.

Taking into account the amount of water used to produce certain, otherwise similar, or like, products, results in a technical distinction (a non-product-related PPM) which could be particularly interesting for environmental purposes. Considering the water scarcity already existing in many regions of the world, in combination with the predicted future effects of climate change and global warming, the idea of penalising

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94 The per capita availability of fresh water in the Hashemite Kingdom of Jordan lies around 150 to 160 m³/year/capita (whereas the water-poverty threshold is set at 500 m³/year/capita); see Hashemite Kingdom of Jordan, Ministry of Water & Irrigation (2015), supra footnote 26. See also Hashemite Kingdom of Jordan (2009), supra footnote 26. For a critical and comprehensive study on the politics of water management in the Hashemite Kingdom of Jordan see: Valerie Yorke (2013), supra footnote 27.

95 The per capita availability of fresh water in the State of Israel is 261 m³/year/capita; see Israel/Palestine Center for Research and Information, Water Imports – An Alternative Solution to Water Scarcity in Israel, Palestine and Jordan?, IPCRI Fact Sheet #2 (Jerusalem: IPCRI, 2010), Annex 2 at 6 (Data in 2007 from AQUASTAT, FAO of the UN), available at http://issuu.com/ipcri/docs/waterimports (last accessed on 31 August 2016).

96 For the Hashemite Kingdom of Jordan see Joep F. Schyns, Arwa Hamadeh, Arjen Y. Hoekstra, Mesfin M. Mekonnen and Marlou Schyns (2015), supra footnote 27, at 5705. For the State of Israel see Raphael Astrow, Mapping Israel’s Virtual Water Trade, Carnegie Mellon University, Dietrich College Honor Theses, Dietrich College of Humanities and Social Sciences, at 2, available at http://repository.cmu.edu/cgi/viewcontent.cgi?article=1228&content=hsshhonors (last accessed on 31 August 2016). About a decade earlier the percentages were 74 per cent (Jordan) and 73 per cent (Israel) respectively; see Diana Hummel, Thomas Kluge, Stefan Liehr and M. Hachelaf, Virtual Water Trade, Documentation of an International Expert Workshop, 3–4 July 2006 (Frankfurt/Main: Institute for Social-Ecological Research (ISOE), 2006), at 15, available at http://waterfootprint.org/media/downloads/Workshop-Frankfurt-Jul06-report.pdf (last accessed on 31 August 2016).
water-intensive production while rewarding less water-intensive production under a global international trade law framework such as the WTO, sounds attractive. Would water-footprint PPMs, being non-product-related PPMs, presently stand the test of dispute settlement review? It is argued that, considering the state of the art under WTO dispute settlement, non-product-related PPMs already have a chance of being accepted under the GATT, and are even more likely to be acceptable under the TBT Agreement. The specific case of water-footprint PPMs, however, is more complex. The water-footprint concept has several downsides, such as the high cost of establishment of a workable technical assessment framework, which could present a new and unacceptable trade barrier for many developing and least-developed countries. Additionally, it is difficult to compare the amount of water used in water-poor locations with the amount of water used in more water-rich locations in terms of opportunity costs. The type of water used thereby plays an important role. For example, the use of rainwater will normally be more sustainable than the use of river or aquifer water, and the use of renewable aquifer water will normally be more sustainable than the use of non-renewable aquifer water. Products produced in water-rich regions, however, will generally have an advantage and products produced in water-poor locations will generally risk being penalised, creating a de facto problem of discrimination on the basis of origin. Inter alia, for these reasons it is concluded that water-footprint labelling could offer a ‘softer’ and thus more acceptable alternative than the mandatory introduction of water-footprint PPMs in the WTO. The methodology used to come to this conclusion is empirical, comparative, analytical-synthetic and conceptual.

97 See e.g., Erik Gawel and Kristina Bernsen (2013), supra footnote 89.