Glossary

Virtual-water content – The virtual-water content of a product (a commodity, good or service) is the volume of freshwater used to produce the product, measured at the place where the product was actually produced (production-site definition). It refers to the sum of the water use in the various steps of the production chain. The virtual-water content of a product can also be defined as the volume of water that would have been required to produce the product at the place where the product is consumed (consumption-site definition). If not mentioned otherwise, we use in this book the production-site definition. The adjective 'virtual' refers to the fact that most of the water used to produce a product is not contained in the product. The real-water content of products is generally negligible if compared to the virtual-water content.

> *The three colors of a product's virtual-water content* – The virtual-water content of a product consists of three components, namely a green, blue and gray component. The 'green' virtual-water content of a product is the volume of rainwater that evaporated during the production process. This is mainly relevant for agricultural products, where it refers to the total rainwater evaporation from the field during the growing period of the crop (including both transpiration by the plants and other forms of evaporation). The 'blue' virtual-water content of a product is the volume of surface water or groundwater that evaporated as a result of the production of the product. In the case of crop production, the blue water content of a crop is defined as the sum of the evaporation of irrigation water from the field and the evaporation of water from irrigation canals and artificial storage reservoirs (although for practical reasons the latter component has been left out from our studies). In the cases of industrial production and domestic water supply, the blue water content of the product or service is equal to the part of the water withdrawn from ground or surface water that evaporates and thus does not return to the system where it came from. The 'gray' virtual-water content of a product is the volume of water that becomes polluted during its production. We have quantified this by calculating the volume of water required to dilute pollutants emitted to the natural water system during its production process to such an extent that the quality of the ambient water remains beyond agreed water quality standards. The distinction between green and blue water originates from Falkenmark (2003). It is relevant to know the ratio of green to blue water use, because the impacts on the hydrological cycle are different. Both the green and blue components in the total virtual-water content of a product refer to evaporation. The gray component in the total virtual-water content of a product refers to the volume of polluted water. Evaporated water and polluted water have in common that they are both 'lost', i.e. in first instance unavailable for other uses. We say 'in first instance' because evaporated water may come back as rainfall above land somewhere else and polluted water may become clean in the longer term, but these are considered here as secondary effects that will never take away the primary effects.

Virtual-water flow – The virtual-water flow between two nations or regions is the volume of virtual water that is being transferred from one place to another as a result of product trade.

Virtual-water export – The virtual-water export of a country or region is the volume of virtual water associated with the export of goods or services from the country or region. It is the total volume of water required to produce the products for export.

Virtual-water import – The virtual-water import of a country or region is the volume of virtual water associated with the import of goods or services into the country or region. It is the total volume of water used (in the export countries) to produce the products. Viewed from the perspective of the importing country, this water can be seen as an additional source of water that comes on top of the domestically available water resources.

Virtual-water balance – The virtual-water balance of a country over a certain time period is defined as the net import of virtual water over this period, which is equal to the gross import of virtual water minus the gross export. A positive virtual-water balance implies net inflow of virtual water to the country from other countries. A negative balance means net outflow of virtual water.

Water footprint – The water footprint of an individual or community is defined as the total volume of freshwater that is used to produce the foods and services consumed by the individual or community. A water footprint can be calculated for any well-defined group of consumers, including a family, business, village, city, province, state or nation. A water footprint is generally expressed in terms of the volume of water use per year.

Water footprint of an individual – Is defined as the total water used for the production of the goods and services consumed by the individual. It can be estimated by multiplying all goods and services consumed by their respective virtual-water content. A simple web-based water footprint calculator for assessing your individual water footprint is available at: www.waterfootprint.org.

Water footprint of a nation – Is defined as the total amount of water that is used to produce the goods and services consumed by the inhabitants of the nation. The national water footprint can be assessed in two ways. The bottom-up approach is to consider the sum of all goods and services consumed multiplied with their respective virtual-water content. In the top-down approach, applied in this book, the water footprint of a nation is calculated as the total use of domestic water resources plus the gross virtual-water import minus the gross virtual-water export.

Internal and external water footprint – The total water footprint of a country includes two components: the part of the footprint that falls inside the country (internal water footprint) and the part of the footprint that presses on other countries in the world (external water footprint). The distinction refers to the appropriation of domestic water resources versus the appropriation of foreign water resources.

Blue, green and gray components of the total water footprint – The total water footprint of an individual or community breaks down into three components: the blue, green and gray water footprint. The blue water footprint is the volume of freshwater that evaporated from the global blue water resources (surface water and ground water) to produce the goods and services consumed by

the individual or community. The green water footprint is the volume of water evaporated from the global green water resources (rainwater stored in the soil as soil moisture). The gray water footprint is the volume of polluted water that associates with the production of all goods and services for the individual or community. The latter has been calculated as the volume of water that is required to dilute pollutants to such an extent that the quality of the water remains below agreed water quality standards.

Water saving through trade – A nation can preserve its domestic water resources by importing a water-intensive product instead of producing it domestically. International trade can save water globally if a water-intensive commodity is traded from an area where it is produced with high water productivity (resulting in products with low virtual-water content) to an area with lower water productivity.

Water self-sufficiency vs. water dependency – The 'water self-sufficiency' of a nation is defined as the ratio of the internal water footprint to the total water footprint of a country or region. It denotes the national capability of supplying the water needed for the production of the domestic demand for goods and services. Self-sufficiency is 100% if all the water needed is available and indeed taken from within the own territory. Water self-sufficiency approaches zero if the demand for goods and services in a country is largely met with virtual-water imports. Countries with import of virtual water depend, de facto, on the water resources available in other parts of the world. The 'virtual-water import dependency' of a country or region is defined as the ratio of the external water footprint of the country or region to its total water footprint.