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Limitation of Water Footprint Sustainability Assessment: A Review

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Abstract
Water is nature resource that is essential for all life, for the functioning of ecosystems, and also for the human society. Sustainable use of water resource is important for sustainable development of human society. Water scarcity can lead to conflicts between different water users. Therefore, several sustainability assessment tools were developed in recent years. Water Footprint Sustainability Assessment, which is a part of Water Footprint Assessment methodology, is one of them. Each sustainability assessment tool has its own limitations. It is important to know these limitations because incorrect application of sustainability assessment can lead to erroneous or improper decisions. In this article, risks connected to the Water Footprint Sustainability Assessment are reviewed and discussed in several examples. Individual parts are focused on blue, green, and grey water sustainability assessment. The article contributes to the scientific debate on limits of Water Footprint Sustainability Assessment as the key element of everyday applications, identification of needs of future research and subsequent development of new or improved procedures of sustainability assessment in the framework of Water Footprint Assessment.

Keywords: volumetric water footprint; sustainability assessment; sustainable development; limitation of methodology

1. Introduction

The availability of natural resources on Earth is limited. In the last two decades, there is a noticeable worldwide increase in the extraction of raw materials (WU Viena, 2020). The safe and righteous use of natural resources within humanity's operating space and planetary borders (Rockström et al., 2009) is, therefore, one of the main limiting factors for future "sustainable" growth (O'Brien et al., 2014). Securing water resources for society is one of the limiting factors of sustainable development. Almost 2.3 billion people lack basic water services such as the access to harmless drinking water and solved wastewater disposal (UN Water, 2018). The United Nations has responded to these facts by defining Goal 6 in Sustainable Development Goals (SDGs). Defining SDGs presents a novel approach to global governance where goal-setting features is a key strategy (Biermann et al., 2017). Although there are some voices that SDGs prefer economic development to environmental issues (Eisenmenger et al., 2020).

Freshwater resources represent only 2.5% of all water on Earth (Shiklomanov, 1993). Growing population increases its demands on the safe water sources availability and food production. At the same time, agriculture and food production are one of the main consumers of freshwater on the planet (Hoekstra & Mekonnen, 2012). Global studies point out that water usage for food production is unsustainable (Mekonnen & Hoekstra,

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2020), and other studies suggest that significant water problems already exist in many parts of the world, and times of possible water crises or even wars for water may became a reality (e.g. Falkenmark et al., 2009). On the other hand, Biswas and Tortajada (2019) argue that thoughts concerning the possible future wars for water are misguided because the initial assumptions are often misunderstood, or misapplied by the tools used. The argumentation that water disputes are unlikely to be the primary cause of war is not unique in the scientific community. Nevertheless, even a potential threat of water scarcity may lead responsible authorities to make inadequate decisions.

As the correct application of any sustainability assessment tool is the basis for credible results, this article focuses on a critical analysis of water footprint applications in terms of assessing the sustainability of water resources use. The aim of this paper is not to point at the "imperfection" of the water footprint or to claim that the water footprint is not a suitable tool for an effective management of natural resources. The main aim of this paper is to point out that the water footprint include some unresolved methodological issues and if an author of a water footprint study and subsequently users of that study do not realize it, it could lead to incorrect conclusions concerning the water use sustainability and subsequently wrong decisions. The potential risk of incorrect conclusions does not concern only water footprints, but all tools of footprint families in general (Laurent & Owsianiak, 2017). Therefore, this paper discusses limitations of the water footprint assessment for assessing the sustainability of the water resources use; including several illustrative examples.

2. Water Footprint Introduction

The water footprint is a part of the Environmental footprint family (Vanham et al., 2019). The environmental footprints are used for the assessment of sustainability and its components from different perspectives (Čuček et al., 2012). Individual footprint methodologies are characterized by significant variations in methods, applications, and policy relevance (Fang et al., 2016). On the other side, individual footprints overlap, interact, and complement each other (Galli et al., 2012).

There are two fundamentally different approaches to determine the water footprint. The older approach (Hoekstra et al., 2011) is referred to as the "volumetric water footprint" or the "water footprint assessment" (Hoekstra et al., 2009). The volumetric water footprint focuses on the amount of freshwater consumed during the life cycle of a particular product, process, service, or organization and follows the concept of virtual water (Allan, 1997). The other approach, so-called "impact-orientated" or "impact approach", focuses on impacts assessment associated with the water use during the life cycle (Berger & Finkbeiner, 2013) and is based on principles of the Life Cycle Assessment (LCA). The impact-oriented water footprint is governed by the international ISO Standard (ISO, 2014). Both mentioned approaches share a general framework (Boulay et al., 2013) as:

1. setting objectives and scope,
2. accounting phase,
3. impact assessment phase, and
4. result interpretation phase.

However, each approach serves different objectives. As the impact water footprint is a product-oriented method and aims to achieve the product sustainability; the volumetric water footprint is a water management approach with a focus on the sustainability of water use (Ansorge, 2020b; Matuštík & Kočí, 2020). This paper deals with the application of the volumetric water footprint, which is composed of three parts - blue, green and grey water footprint. The blue and green water footprints are quantitative indicators expressing the volume of freshwater that is directly consumed during the life cycle of a product, process, service or organization. The blue water footprint is defined as the amount of fresh water taken and consumed from water resources (rivers, lakes, reservoirs and groundwater). The green water footprint represents the amount of precipitation and soil water consumed for the production of agricultural commodities. On the other hand, the grey water footprint represents an indirect freshwater consumption and thus serves as a qualitative indicator. The grey water footprint is defined as the amount of freshwater needed to dilute the pollution discharged into receiving water body to a level of environmentally harmless concentrations (Hoekstra et al., 2011). Based on the determination of the above-mentioned water footprint components, the sustainability of water use within the life cycle of the system is assessed.

3. Potential Risks in the Blue Water Footprint Sustainability Assessment

The blue water footprint represents water consumed from freshwater sources. Consumed means that consumed water does not return to these water sources. However, no water can be lost physically, as it is a part of the natural water cycle. Therefore, water consumed means water that is no longer available to other users in a particular river basin. The blue water footprint also does not include water withdrawn from the sea, brackish water, etc. From the water management point of view, this is a key element of the water balance, as it is the amount of water that human society uses to meet its needs and which cannot be used for other purposes in the particular river basin. To determine the blue water footprint, direct /or indirect consumption measurement methods or model calculations are used. However, each model is merely a schematic simplification of the reality, and therefore model calculations are usually the most common causes of possible inaccuracies in water footprint results.

Example 1 - Blue water footprint of crop production

Agriculture is the world's largest consumer of freshwater (Falkenmark & Rockström, 2006), therefore many water footprint studies deal with the water footprint of agricultural commodities. The blue water footprint of crop production is determined by calculation when the so-called effective precipitation is deducted from the total moisture demand of the crop; usually determined as crop evapotranspiration using the CropWat, AquaCrop, or similar models (Hoekstra et al., 2011). This procedure has been used in many global (e.g. Hoekstra & Mekonnen, 2012) and regional (e.g. Kashyap & Agarwal, 2021) water footprint studies. However, this methodological approach omits several facts that result from real agricultural practice in different parts of the world:

- If there is no possibility to irrigate (e.g. due to the lack of water resources or due to the technical unavailability), then irrespective of the calculation, the actual value of the blue water footprint is zero.
- In many parts of the world, farmers do not have tools for accurate dosing of irrigation

water, so they use other methods to determine the irrigation doses and irrigation scheduling.

- Different types of irrigation have different water-use efficiency, i.e. water requirements. Drip irrigation requires much less water than irrigation by sprinkles or flood irrigation; unlike some cases when the implementation of more effective irrigation techniques can lead to water consumption increase (Perry et al., 2017). The calculation of the blue water footprint of crop production does not take into account a method of irrigation; however, some models of crop water needs do (Kuschel-Otárola et al., 2020).
- Different types of crop management can affect the need of irrigation water and the water use efficiency, as well as the overall evapotranspiration from agricultural land, e.g. mulch cultivation, etc. (S. K. Biswas et al., 2015).
- Crop production is a business like any other and the farmer's aim is a profit. Especially, in case of high irrigation costs, it is economically more advantageous to reduce irrigation doses below the plants' physiological optimum and apply so-called deficit irrigation (Geerts & Raes, 2009). The deficit irrigation regimes save blue water resources at acceptable yield losses. Despite reduced yields – a farmer achieves higher economic productivity and water use efficiency (Cheng et al., 2021). Fernández et al. (2020) stated that the water footprint approach does not render better results than the water productivity approach for on-farm irrigation decision.
- Water used for irrigation which was not evapotranspirated by crops, could increase soil moisture or be evapotranspirated by other non-crop plants or be used after the harvest; and therefore did not return to water resources in the particular river basin.

The sustainability assessment of the blue water footprint lies in the comparison of calculated water footprint to available water resources. The available water resources of "blue water" could simply be imagined as the amount of water (e.g. river network outflow) reduced by the amount of water needed to maintain the function of the ecosystem (environmental water requirements). If the calculated water footprint of agricultural commodities exceeded the value of available water resources, it shall be declared unsustainable (Mekonnen & Hoekstra, 2020). However, "limitations" resulting from the above-mentioned practical examples turn up in cases when the real blue water footprint (i.e. the amount of water taken from water sources, which will not return to water sources in the river basin) may be higher or lower than the value calculated by a model.

- If for any reason, no irrigation water is applied (i.e. blue water footprint = 0) then this non-existent water use cannot be marked as unsustainable regardless of whether the calculation of the blue water footprint indicates the opposite. However, some situations may arise, where a common method of crop production is unsustainable or inefficient due to a lack of precipitation, a lack of water resources for irrigation, or insufficient condition of irrigation infrastructure in the area; however, it does not say anything about the sustainability of water use.
- Even in a case when irrigation is used, if the theoretically calculated value of the blue water footprint is used to assess sustainability and not the real value of water consumed - wrong conclusion about the sustainability/or unsustainability of water use can easily be drawn. It can be argued that water used for irrigation, which is not consumed by crops, remains in a river basin and can be used again in a same way as in a case of water loss through a seepage from reservoirs (P. H. Gleick, 1994). However, the case concerning

irrigation water is different, because part of the water remains in soil as soil moisture and not as a part of groundwater (usable by man). With regard to a capacity of the soil to retain water as soil moisture, a volume of irrigation water, which will increase a volume of soil water, can significantly exceed an amount of water transpired by the crop. Irrigation efficiency is thus a very significant factor that affects the overall sustainability of water resources management. A. Hoekstra (2019) addressed this problem in detail and proposed a method for determining green and blue water balance in soil.

Some authors (Fereres et al., 2017; Perry, 2014; Wichelns, 2015) point out that limitations of water footprint might lead to erroneous conclusions, which may affect negatively the assessment of crop water use and decisions by both policy makers and consumers in agriculture sector. Sun et al. (2021) also point out that the main limits of water footprint studies are the data gap and the availability of data, including the quality and accuracy of the data, and a series of assumptions when applying the model. This is mentioned for example in the study of mining industry (Islam & Murakami, 2020) or in study of hydroelectricity (Pfister et al., 2020; Scherer & Pfister, 2016).

Example 2 - Blue water footprint in hydropower industry

Water consumption in hydroelectric power plants is linked only to water losses from water reservoirs (with the exception of construction or demolition phase of a hydroelectric power plant and associated infrastructures - water reservoirs, electrical wiring, etc.). Currently, three methods of "water losses" calculation are used (Herath et al., 2011) and are variously combined in many studies of the hydropower water footprints, providing different results (Ansorge, 2020a; de Oliveira Bueno et al., 2020; Xie et al., 2019). The "gross consumption" method considering only the evaporation from the water reservoir is described in Water Footprint Assessment Manual (Hoekstra et al., 2011). The "net consumption" method, which is often used to calculate water losses during electricity generation in hydropower plants (Bakken et al., 2017), does not express an actual amount of water consumed, but a difference from the reference state. The "water balance" method considers a water reservoir as a closed system, where "system water losses" are caused by evaporation from the reservoir surface and "system water gains" represents precipitation. In the "water balance" method, the blue water footprint represents the difference between evaporation and precipitation. Following example from the field of hydropower points to several other risks while using the blue water footprint:

- Different sectors may have different approaches to the calculation of water consumption (which is not considered a mistake). However, if the same principles of calculating water consumption are not applied to all sectors in the same way, then results of individual sectors are incomparable and it cannot be stated whether a given "process" is more or less sustainable than the others.
- Different water footprint calculation methods (e.g. using the "water balance" method as mentioned above; in this water consumption calculation method, the evaporation is compensated by precipitation) can lead to negative water footprint values in areas where precipitation predominates over evaporation. Similar techniques, which involve any compensations in the phase of water footprint accounting, can be marked as "off-settings". The "off-settings" are inconsistent with the Water Footprint Assessment Manual, which does not recommend "off-settings" for studies focused on individual products, processes or organizations (Hoekstra et al., 2011). On the other hand, it could

be argued that if a reservoir did not exist, then due to perception and evapotranspiration from the earth's surface only a part of precipitation fallen on the earth's surface could reach a watercourse; whereas in a case of the existence of the reservoir, all precipitation falling on the reservoir becomes available as blue water.

- Reservoirs often do not serve only to one purpose. Therefore, water losses shall be allocated to individual benefits provided by a reservoir. However, this can be an ambiguous task, as the benefits do not have to be tied only to a water reservoir itself, e.g. users can benefit from balancing reservoir outflows many kilometres downstream (Bakken et al., 2016). In addition, the significance of individual reservoir purposes can be assessed from many different perspectives. At present, there is no consensus on how to allocate water consumption to different benefits provided by a reservoir, and different approaches to this problem are applied (Golabi & Radmanesh, 2020; Zhang et al., 2019). A study of the water footprint of hydroelectric power plants in the Ore Mountains in the Czech Republic (Ansorge, Vojtko, et al., 2020) showed that the water footprint calculation is very sensitive to a choice of the allocation method. The omission of some benefits provided by a reservoir or purpose allocation can lead to significant distortion in results of studies focused on a specific product or process.

- Study by Pfister et al. (2020) shows important differences between results based on regional and global datasets for the same hydro power stations in monthly step of water footprint assessment. The difference in annual step, on the other hand, was negligible. Monthly step of water footprint assessment is recommended by many authors to capture the seasonal phase shifts in water demand and water availability (e.g. Hoekstra et al., 2012; Wada et al., 2011). Several studies (e.g. Ansorge, Vojtko, et al., 2020; Vaca-Jiménez et al., 2020) shows high variability of water footprint in monthly step. Study by Vaca-Jiménez et al. (2020) shows also importance of variable and average open surface water area.

4. Potential Risks in the Green Water Footprint Sustainability Assessment

The green water footprint represents water in the soil (not groundwater) and rainwater consumed. The green water footprint is usually associated with agricultural and food production. Perry (2014) point out that the total water consumption by a crop (blue plus green water footprint) is computed as the maximum potential crop evapotranspiration, while the actual evapotranspiration is often much lower. The green water footprint is calculated as the lower of the actual potential crop evapotranspiration of the cultivated plants and the effective precipitation value. The green water footprint value is compared with "available green water sources" which are defined as the total evapotranspiration of rainwater from land minus the evapotranspiration from land reserved for natural vegetation, minus the evapotranspiration from land that cannot be productive (Hoekstra et al., 2011). Shu et al. (Shu et al., 2021) describe another approach to sustainability assessment based on the green water scarcity index and levels of water scarcity degree, originally proposed by Smakhtin et al. (2004). The Water Footprint Assessment Manual (Hoekstra et al., 2011) admits that the issue of green water footprint sustainability is still methodologically unresolved. In general, plants cannot consume more water than the amount of water available in the soil plus effective rainfalls. Thus, the consumption of green water cannot be unsustainable. The importance of determining the

green water footprint lies in a fact that during the absence of soil moisture and precipitation (i.e. absence of available green water) - there is a need to replace this deficiency with blue water sources (Hoekstra, 2016). Yet, a lack of green water sources is limiting for food production, wood production, and bioenergy (Schyns et al., 2019).
Another significant effect of the green water footprint is affecting the overall availability of "blue" water because the amount of run-offs and groundwater reserves is formed by a part of precipitation that does not evaporate from the area. In many countries around the world, a majority of land is cultivated and this pressure continues to grow along with the growth of human population. Changes in run-off characteristics of certain area due to human activities can significantly affect the availability of blue water sources.

5. Potential Risks in the Grey Water Footprint Sustainability Assessment

Compared to the green and blue water footprints, the grey water footprint refers to a pollution rate. It is defined as a volume of freshwater that is required to assimilate a load of pollutants onto the environmentally friendly level (at least the level of agreed water quality standards). The grey water footprint is calculated by dividing the pollutant load by the difference between the ambient water quality standard of the pollutant and its natural concentration in the receiving water body (Hoekstra et al., 2011). The grey water footprint is calculated for each pollutant separately and the highest value determines the result. This value is then compared with the amount of water in the recipient. However, this elegant approach encounters several application limitations:
- The principle of grey water footprint calculation is based on an assumption that water quality in a recipient is at the level of the natural background (theoretical assimilation capacity) and neglects the influence of other pollution sources in the river basin that reduce the actual assimilation capacity at the discharge point. This is a reasonable methodological status, because the influence of other pollution sources cannot be reflected in the indicator. It means, when e.g. 5 polluters discharge the same pollutant into the same water source in the same amount, then their grey water footprint is the same. On the other hand, if each of these polluters depletes the ¼ of assimilation capacity of the river basin, then in total, the capacity of the river basin had been exceeded (5 x ¼ = 5/4 > 1). When assessing the sustainability of the grey water footprint of a certain product, process or service, it could be concluded that the water use of the assessed system is sustainable, although the whole assimilation capacity of the recipient might have been depleted and thus further discharge is in fact unsustainable.
- The grey water footprint value depends both i) on the amount of discharged pollution and ii) especially on a value of the assimilation capacity. As studies have shown, the grey water footprint is sensitive to the value of the recipient's assimilation capacity, and the grey water footprint is thus often determined by substances that are not discharged in high concentrations but have low assimilation capacities (e.g. Ansorge, Stejskalová, et al., 2020a). The problem is that the grey water footprint value is often determined for "common" pollutants (e.g. Li et al., 2016). The number of monitored pollutants discharged into a recipient is usually limited to "common" pollutants of basic chemical analyses and data for the grey water footprint calculation concerning other pollutants are not even available. However, this may lead to an underestimation of the grey water footprint. For

instance in municipal wastewater, there are many residues of pharmaceuticals, which grey water footprint is significant in comparison with other pollutants (Martínez-Alcalá et al., 2018; Wöhler et al., 2020).

- The procedure for recipient assimilation capacity determination is not standardized and different authors use different values, such as environmental quality standards (De Girolamo et al., 2019) or drinking water limits (Mekonnen & Hoekstra, 2010). In addition, with knowledge of the harmfulness degree of individual pollutant, limits are gradually been either tightened or released (Mičaník et al., 2017). As the result, grey water footprint values taken from various studies are incomparable. The paradox of the grey water footprint is that the stricter the environmental standards are, the higher the grey water footprint is (Jamshidi, 2021). Therefore, the option of the assimilation capacity value significantly influences conclusions of the sustainability assessment (Berger & Finkbeiner, 2013). The use of global environmental standards does not take into account local conditions issues, as the assimilation capacity of each water body may be different (Hashemi Monfared et al., 2017). This may lead to incorrect conclusions on the sustainability of discharges into individual river basins and it is appropriate to consider a degree of uncertainty when making conclusions on sustainability (Ansorge, Stejskalová, et al., 2020c), as the uncertainties about the sustainability of water use (associated with the grey water footprint assessment) can be significant (D'Ambrosio et al., 2020). One of the possible ways to solve this problem is involving the uncertainty into the grey water footprint model (Wang et al., 2021).

Example 3 – Assessment of the wastewater treatment plant effect on the reduction of the water footprint

The grey water footprint is commonly used to assess the wastewater treatment plant (WWTP) effect on pollution reduction (e.g. Gómez-Llanos et al., 2018, 2020; Gu et al., 2016). In the Czech Republic, the analysis was performed on data set of registered wastewater discharges. For each WWTP, the grey water footprint value was determined, and identified the pollutant that determinates the grey water footprint at the inflow to the WWTP and at the outflow from the WWTP (Ansorge, Stejskalová, et al., 2020b). In several cases, differences between the grey water footprints of inflows vs. outflows, were negative, i.e. such WWTPs seemed to produce pollution. This situation appeared when the grey water footprint value at the inflow to the WWTP was caused by a different pollutant than in the outflow, and for one of these two pollutants (parameters), data was missing either at WWTP influent or effluent.

The above-mentioned example showed a general risk not only in water footprint studies:

- In datasets collected for other purposes, appropriate validation procedures must be done before using for water footprint calculation. These procedures verify that data provide relevant results.

Example 4 - water footprint calculation in a geographically delineated area

The above mentioned analysis concerning the grey water footprint of pollution discharged from WWTPs in the Czech Republic tempts to sum up the grey water footprints of pollution sources in a certain area, e.g. in a river basin. However, as mentioned earlier, the grey water footprint is determined for each pollutant separately and the highest value is taken for the result. This principle must also be followed when assessing the water footprint in geographically delineated areas. It is easy to prove that if we have two sources of pollution, one releasing pollutant A and the other pollutant B, then the volume of water needed to dilute the substance A can also be used to dilute the substance B. However, this only applies if the pollution from both sources is discharged into the same river basin. The sum of grey water footprints counted by individual sources is higher or equal to the sum of grey water footprints counted by individual pollutants and thus may overestimate the value of the grey water footprint.

The grey water footprint calculation method also does not consider self-purification processes in the water environment. That is right when determining the total grey water footprint value. However, the sustainability assessment is made for a certain (usually closure) profile. Self-purification processes are one of the important ecosystem services that aquatic ecosystems provide. The level of aquatic ecosystems‘ self-purification depends on many physical, chemical, and biological factors (Ostroumov, 2005) and is also the indicator of the aquatic ecosystem "health" (Zubaidah et al., 2019). Self-purification processes neglecting in the river network can lead to incorrect conclusions about the sustainability of water use in river basin or geographically delineated area. The inclusion of quality models of self-purification processes in the water footprint calculations, specifically sustainability assessments, has not yet been examined.

It follows that:

- The grey water footprint in a geographically delineated area is not equal to the sum of the grey water footprints of individual pollution sources, if the individual sources emit different pollutants.
- The grey water footprint assessment in a geographically delineated area shall be carried out in terms of pollutants, not sources.
- Different pollution sources emit different pollutants, and since the pollutant with the highest grey water footprint may not be discharged from all sources of pollution, pollution sources that do not emit the pollutant with the highest water footprint would remain "not included" in the water footprint assessment. Therefore, it is necessary to address the grey water footprint in a geographically delineated area iteratively.
- If the assessed geographically delineated area consists of several river basins (or water from the assessed area outflows via different profiles), the assessed area must be divided into sub-basins according to individual pro-files through which water outflows from the assessed areas.
- Exclusion the self-purification processes from the sustainability assessment can significantly affect evaluation results.

6. Discussion and Conclusions

Hoekstra (2017) recognized that water footprint needs to be put in context to get meaning and water considerations need to be embedded in broader reflections. Considering the complexity of the whole issue of sustainability assessment, the water footprint ,as other types of footprints (Galli et al., 2016), cannot assess the sustainability as a whole but can take the sustainability assessment from a different perspective. First, it is always important to thoroughly define objectives and the scope of a study, so data collected within the water footprint accounting make a relevant background for the sustainability assessment phase. Using the example of wastewater treatment plants' effect on the grey water footprint reduction, it was demonstrated that the choice of dataset,

including its processing, may influence the results.
It is also important to realize that the choice of a method for water footprint accounting (water use calculation, water body assimilation capacity determination) can significantly affect the results of the sustainability assessment. The example of crop production showed that the theoretical values determined on the basis of model calculations may not correspond to actual irrigation practice or real evapotranspiration and may lead to incorrect conclusions. The example of the hydropower plant shows that different understanding of the term “water consumption”, expressed by different methods of its quantification or allocation, can lead to even negative values of the water footprint, which may not be actually wrong, but may not be fully in accordance with the defined methodology.
The water availability and water needs vary during the year, therefor the impacts of water use vary with location and with time (Wichelns, 2017). The temporal and geographical scale play an important role in Water Footprint Sustainability Assessment as the example of the hydropower plant shows. The same conclusion can be stated for the green (Zhuo et al., 2016) and grey (Ansorge, Stejskalová, et al., 2020c) water footprint sustainability assessment.
Many studies report the total value of the water footprint, i.e., they sum up the quantitative (blue and green) and qualitative (grey) water footprint parts. However, they neglect that water needed for dilution the discharged pollution (grey water footprint) could further be used downstream as a source of blue water. So far, the water footprint assessment has completely neglected the issue of the water sources pollution degree, due to various types of water uses (of blue water sources withdrawn from water sources) even though this part is essential for the sustainability assessment, because in some areas the quality (pollution degree) may make it impossible to use it for intended purposes. When assessing the water use sustainability in geographically delineated areas, such as river basins, the influence of the self-purification processes in aquatic ecosystems is still being neglected, which mainly affects the sustainability assessment while using the tool of the grey water footprint.
The scientific debate on risks or limits of individual tools and methodologies for sustainability assessment is the key element of research and subsequent development of scientific procedures. At the same time, it serves users for a better understanding of principles and regularities of newly developed procedures and reduces a risk of incorrect conclusions. Therefore, the aim of this paper is to give an impulse for further methodological works, so that the water footprint serves better in assessing the sustainability of water management.

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