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Water footprint based water allowance coefficient

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ABSTRACT

In our work, we tried to determine the asset value of water from natural resources. During the research we decided that a method based on allowance capitalization can be the most effective. Thus, the developed method is able to estimate water property value in a nationally uniformed system by utilizing final products. It has been decided that the determined method of Water Allowance Coefficient (WAC) is based on water footprint results of domestic wheat production. Water footprint was chosen because it is able to refer to water availability by also considering both direct and indirect usage of water. It covers absolute volume of our freshwater needs, which also can be determined as the availability potential of freshwater resources.

Methodological statement, because changes in AWVs (Adjusted Water Value) vary among regions, the distances of regional values would disappear by ranking. To eliminate this, the WAC values were directly used.

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1. Introduction

Water is classified among common goods, its place is among boundaries – fixed, its transportation and storage are complicated and costly (rather happens in the form of a product even at a national or regional level – for example grains, fruits, meat, etc.). In addition its substantive value is large (often not expressed in money), as it is related to life, beauty, wealth and health. People like the proximity of water. The economic consequence is that we should use it when and where it is available considering that it gravitates, leaks downward. There is always the threat of market failures in water supply as it has no homogeneous market because it is too expensive – pricing and water rate determination (can) cause extreme social conflicts and tensions. There is no other economic good that has such a complicated combination of characteristics like water [9].

We can agree with Professor Somlyódy [10] when he writes that water is a global phenomenon considering social and economic aspects, a unique resource which is not replaceable at many places of life. Water supply is determined by geographical differentiation or volatility of weather by climate change, while needs are based on human activities like agricultural and irrigation methods, customs, urbanization and overgrowth of megacities, or wealth and culture of middle class. Conflicts arising from these can be feed by virtual-water trade which can lead to a unified regulatory factor in product pricing.

Sustainable way out is "*intensified hydro-solidarity*, *international legislation and its effective usage*". Water dilemmas are joint forces of natural, economic and social sciences, that are handled in both horizontal (agricultural, industrial or household level) and vertical ways (micro-, macro- and global-stage), not exclusively as hydro-engineering problem. Keys are recycling and closing circulations, which also require optimal infrastructure and political background.

Present appointed target of this study is monetary valuation of the link between human economic activity and water. Evaluation of water as natural resource could raise numerous questions at theoretical level. We will not consider moral, ethical or philosophical views, in this study only an economic aspect and method and its needs will be discussed. Within a research project at Szent István University, Hungary [5], monetary valuation of water as an agricultural natural resource could take place by oriental calculations related to water price. This value is linked to the regional average irrigation rate on a hectare, which is finally corrected by the Water Allowance Coefficient (WAC). WAC is built on Water Footprint (WF) of domestic wheat production, because WF is the method, which is able to refer to water availability that also considers direct and indirect water use and it can explore the absolute amount of our fresh water need.

According to our main results, the value of agricultural water use on a hectare is 363,659 HUF (approx. 1200 EUR) in Hungary. Rainwater has the highest value from it, 170,920 HUF (approx. 550 EUR), which is almost half of the total AWV. The next is irrigation water, which is almost one-third of the total value. The lowest value is for dilute polluted water with 21%, 76,368 HUF (approx. 246 EUR). WAC based aggregated AWV in Hungary is over 1941.211 billion HUF (approx. 6.262 billion EUR). Value of rainwater (green water) is close to 912.5 billion HUF (approx. 2.943 billion EUR). Value of irrigation water (blue water) is over 621.18 billion HUF (approx. 2.003 billion EUR); the value of dilute polluted water (grey water) is more than 407.65 billion HUF (approx. 1.315 billion EUR).

2. Materials and methods

Water resource valuation as a national natural resource is hardly defined as it is difficult to estimate the value of all usage directions of surface, ground and waste water because of the lack of data and their borderless characteristics both in spatial and temporal dimensions. We decided to work out a model based on agricultural water usage direction, which is mainly irrigation. We have also decided to work with wheat production data as the national land valuation system (AK) is also working with it. That is why in our case water footprint of wheat is relevant.

Based on Water Footprint of domestic wheat production, Water Allowance Coefficient (WAC) has been developed as a correction factor, which can also be described as the availability potential of