ECONOMIC EFFECTS OF WATER-RELATED TOURISM AROUND THE VLTAVA RIVER CASCADE

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Abstract
The Vltava River cascade with its series of dams and reservoirs has been traditionally an area of intense and diverse open-space recreation linked to water ecosystems. This study examines the effects of water-related tourism in this pilot area on the economy.
Using the Leontief input-output model based on the symmetric input-output table (SIOT) and data on yearly expenditure of recreationists, type I and II multipliers are derived for gross value added as indicator of economic effect. The results show that 1 CZK of tourists´ expenditure is associated with creation of about 0.41 to 0.53 CZK of regional gross value added (this also represents a proxy for the effect on regional gross domestic product). More than a half of the total effect of recreationists´ expenditure on the regional economy is realized through visitor purchases from economic sectors of accommodation and food service activities.

Key words: water-based recreation, tourism impacts, input-output analysis, gross value added, tourism expenditure

Introduction

Knowledge on the economic effects of nature-based tourism on the economy is vital, as the unpriced benefits of nature tend to have no voice in decision-making about the optimal use of natural resources. This is well acknowledged in research on environmental valuation and also newly emerging ecosystem accounting standards that relate environment to national accounts (UNSC, 2021). While some of the uses associated with natural resources, mostly extractive ones (lumbering, fishing etc.) are directly visible on the market and it is straightforward how they affect the economy, the effects of non-extractive uses such as providing recreation opportunities by nature remain largely hidden within the system of national accounts.
The total national impact of tourism on GDP is estimated annualy through the Satellite Tourism Account, but these numbers capture merely direct impacts of all types of tourism on the whole national economy. To link the economic impacts of recreation to a specific nature-based area and distinguish the share of the total effect driven by the nature-based area itself among all other recreational uses of the area (such as health and wellness tourism, historical tourism or congress tourism), a much more detailed economic analysis is needed, while more complex data necessary to accomplish such a task are often scarce or non-existing. Also, the impact of nature-based tourism in a particular area embraces a significantly larger portion of the total economic performance of the region than the direct impacts show (these encompass only the first round of supply-chain impacts of the goods and services demanded by visitors during their trips). The practice preferred for economic impact analyses is to focus on the total effect of visitors´ demand for the products of the economy which includes direct impacts and indirect effects of the demand (second- and further rounds of impacts on particular industries in the economy), and possibly also induced effects (realized through consumption of households employed in the stream of industries that is enabled by the visitor expenses).
This contribution investigates how such a task can be accomplished, using a Leontief input-output model for the regional economy following the best available practice (Spenceley et al., 2021). The approach is tested in a pilot area of the Vltava River cascade, an important recreation area in the Czech Republic characterized by a unique series of large water dams and reservoirs. Traditionally, the area has been very popular mainly with Czech visitors for diverse open-space recreation activities linked to water. The visitation pressure on this area has increased throughout last 20 years and is not expected to relent even in the future. This long-term trend is in sharp contrast with expected future risks related to climate change which might pose a challenge for maintaining the current level of qualities related to the water-based activities (such as maintaining recreation-supportive water levels and water quality) also in the following decades, considering the potentially shifting societal demand on other preferred uses of the water such as the flood protection function of the cascade.

Data

The work presented here builds on the methodology described in Kaprová (2020) and stems from a wide range of data:

- original on-site survey on visitor spending patterns in the pilot area (N=460), quota-sampled both for recreation areas around the Vltava river and recreation activities;
- data of visitation patterns based on mobile positioning data and other data sources;
- data describing the economy: both regional (NUTS3; Fischer et al., 2018; Sixta and Vltavská, 2016) and national symmetric input-output tables (SIOT produced by Czech Statistical Office);
- data describing the distribution of economic activities within the regions etc.

Only recreationists declaring that a water-based recreation activity was the motive for their actual trip (N=456) were further retained in the sample for the analysis of visitor expenditure. The main categories of spending include accommodation, board and transport (altogether, these form 77% of the expenditure of the average visitor). Further categories of expenditure included entrance and parking fees, costs of recreation equipment and retail purchases (including ingredients for cooking, souvenirs and gifts).

Results and Discussion

Using the Leontief input-output model (Miller and Blair, 2009; Mahajan et al., 2018), an open model and a model closed for households were built. This enables to address the full range of economic effects:

- direct - effects of first-round purchases in the supply-chain, in economic sectors that directly meet the visitors´ demand of goods and services (i.e. accommodation, meals at restaurants etc.);
- indirect – all subsequent supply-chain impacts, i.e. effects of all other rounds of additional purchases of economic inputs needed to meet the demand of the first-round supplier (suppliers to accommodation, restaurants, their suppliers etc.);
- induced – effects on economy through increased income of employees in sectors affected directly or indirectly by the visitor expenditure and subsequent changes of the consumption of employees through increased purchases of economic inputs;

and to derive type I and type II multipliers of economic effects.

We focus primarily on gross value added (GVA) as economic indicator, i.e. the value of gross output adjusted for intermediate consumption. Compared to gross output as another frequently used economic indicator, it does not overestimate the economic effect, as the value of all inputs to production are accounted for only once in the process of GVA calculation. In economic impact analyses, gross value added is also used as a proxy for gross domestic product (GDP), as GDP equals GVA plus (usually not very dominant) net taxes.

Figure 1 disentangles the storyline how the expenditure transforms into the effect on the regional economy. Out of 1 CZK of the gross (unadjusted) tourists´ expenditure at the pilot area, ca 20% is actually related to demand for products of the economy outside the region (produced in the rest of the Czech Republic or abroad) that were imported to the region, and thus the effects of these purchases leak out of the regional economy. Further 11% of the gross tourists´ expenditure are leakages related to direct taxes which also do not further translate into the regional GVA effect.

The gross expenditure adjusted for the leakages is used to calculate the economic impacts. The direct effect on GVA (25% of the gross expenditure) accounts for less than half of the total effect. The indirect effect adds another 17% to the total effect of visitors´ recreation-related expenditures. Induced effects account for further 11% of GVA formation. Following the usual practice (Miller and Blair 2009), we assume no leakages to savings. This type of leakage is relevant only for induced effects – i.e. by assumption, all income of households generated by visitor expenditure is used for consumption.

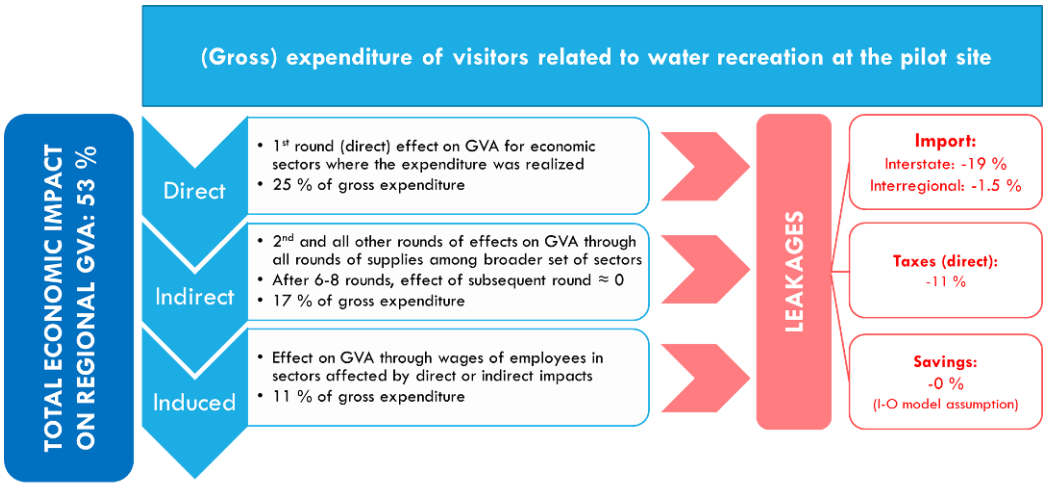

Fig. 1: Scheme of the economic impact of tourism expenditure related to water recreation at the pilot site of Vltava cascade on the regional gross value added (type II multiplier accounting for direct, indirect an induced effects)

Conclusion

The study enables to translate the effect of availability of the Vltava water ecosystems for recreation into economic terms, which is important in case the water-related recreation opportunities would be affected by climate change, droughts or floods and subsequent water management – and recreationists will have to substitute their trips with another recreational site outside the pilot area.

Using the type I and type II multipliers calculated respectively as the lower and upper bound of the true effect (Emonts-Holley et al., 2021), 1 CZK of tourists´ expenditure is assumed to be associated with creation of about 0.41 to 0.53 CZK of gross value added in the region (this also represents a rough proxy for the effect on regional gross domestic product) in the same year. These numbers represent weighted averages of multipliers across all expenditure categories and related economic sectors (weights=expenditure across categories and sectors). More than a half of the total effect of recreationists´ expenditure on the regional economy is realized through visitor purchases from economic sectors of accommodation and food service activities.

The I-O models are linear by definition, so the results are easily transferable to economic impact analysis. E.g. to accommodate a 100 CZK increase in tourists´ expenditure, creation of 41 to 53 CZK of gross added value is needed; also the loss of tourists and related expenditure is associated with a negative effect on regional GVA of the same magnitude. However, it has to be stressed out that the effects of large changes in recreation demand should be analyzed with extreme caution, and most preferably using a different modelling framework such as dynamic computable equilibrium models (CGE) if available, as the I-O model is rather restrictive in its assumptions (see e.g. Miller and Blair 2009; Emonts-Holey et al. 2021).

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Souhrn
Vltavská kaskáda s řadou přehrad a nádrží je tradičně oblastí intenzivní a rozmanité rekreace ve volné krajině spojené s vodními ekosystémy. Tato studie zkoumá dopady cestovního ruchu spojeného s vodou v této pilotní oblasti na regionální ekonomiku.
Pomocí Leontiefova input-output modelu založeného na nejpodrobnější symetrické input-output tabulce (SIOT) a na místě shromážděných údajů o ročních výdajích rekreantů jsou odvozeny multiplikátory typu I a II pro hrubou přidanou hodnotu jako ukazatel ekonomického efektu. Výsledky ukazují, že 1 Kč výdajů turistů je spojena s vytvořením přibližně 0,41 až 0,53 Kč regionální hrubé přidané hodnoty (to představuje také hrubý ukazatel efektu na regionální hrubý domácí produkt).
Modely vstupů a výstupů jsou z definice lineární, takže výsledky jsou snadno přenositelné do analýzy ekonomických dopadů. Dopady velkých změn v poptávce po rekreaci by však měly být analyzovány s maximální opatrností, pokud jde o předpoklady I-O modelu.

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