

# Accounting for Water Use and its Economic Value in Scotch Whisky Industry

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## Introduction : Whisky Industry

Whisky is an iconic product and is the most valuable export of Scotland after oil and gas. Water use accounting of whisky production is significant due to its dependency on the availability and quality of Scottish water resources as a water intensive manufacturing industry. This study focus on the single malt Scotch whisky industry, classified as whisky made of malting-barley at a single distillery, in its analyses of water use. Scotch whisky which accounts for £3.95 billion exports is a high-end product with a growing market share (SWA, 2014).

## Methods (1): Water Footprinting (WF)

- WF is an indicator of human appropriation of freshwater resources in volumetric figures. WF consists of three water components (green water as precipitation and soil moisture, blue water as surface and groundwater and grey water for pollution assimilation).
- The bottom-up WF methodology described in the Water Footprint Assessment Manual (Hoekstra et al., 2011) was used to quantify the overall freshwater embedded in Scotch whisky.
- The indirect WF (along the supply chain) and the direct WF (manufacturing processes in distilleries and warehouses) were calculated considering the litres of pure alcohol produced in 2013 for single malt whisky

## Methods (2): Economic Valuation

- Marginal productivity approach, the common methodology for estimating the value of water used in manufacturing industries, is adopted to estimate the marginal value of water use in whisky distilling process.
- A Mixed (Cobb-Douglas/Leontief) production function below was estimated using Ordinary Least Squares (OLS) regression .

$$Y = F(c(L,K), I(\min(W,E,M)))$$

The sub function  $c(L,K)$  is a CD function and  $I(\min(W,E,M))$  is a Leontief production function.

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## Results

- The largest contribution to WF, at 72.17%, in the whisky supply chain comes from the green water component in spring barley production. Grey water from effluent assimilation makes the greatest contribution, with 52.75%, to the water footprint of production processes. (Fig. 1)

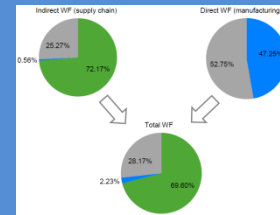


Fig. 1. Total WF of single malt Scotch whisky

- The marginal value of £5 per m<sup>3</sup> water use in single malt Scotch whisky production is relatively high compared to previous marginal value estimates of water use in the (unclassified) beverage industry ranging between £2.63 to £0.36 per m<sup>3</sup> in the literature (Wang and Lall, 2002; Kenneth et al., 2006; Ku and Yoo, 2012).
- These results highlight the reliance and thus accordingly high valuation of quality and availability of local freshwater resources by the Scotch whisky industry.

## Future

As well as contributing to current academic literature this particular PhD thesis aims to inform the Hydro Nation in

- valuation of water to the Scottish economy, society and the environment;
- economic regulation of water as a tool for climate change adaptation;
- multiple benefits of sustainable water resource management
- review of international best practices in water management and their possible implications for the Hydro Nation Policy.

