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Analyzing virtual water pollution transfer embodied in economic activities based on Gray Water Footprint: A case study

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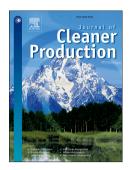
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#### ACCEPTED MANUSCRIPT

#### 1 Analyzing virtual water pollution transfer embodied in economic

### 2 activities based on Gray Water Footprint: A case study

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#### Abstract

Water pollution can be transferred either through natural water bodies or, indirectly, through economic activities. The former is a physical transfer, which has been extensively investigated and just used for controlling pollution of transboundary river basin. The latter is a virtual transfer, as shown by some studies, where it is demonstrated that the quantity of pollutants embodied in economic activities is much larger and worthy attention. However, understanding the mechanisms of virtual water pollution transfer through economic activities and relating them to domestic water resources remains a challenge. This study approaches this subject focusing on the use of the Gray Water Footprint (GWF) to account for the virtual water pollution. Based on natural background concentration, GWF is defined as the essential quantity of fresh water in order to assimilate the load of pollutants discharged into water. GWF reflects the impact of water pollution on the available quantity of water resources. GWF assessment has been tested quantifying and tracking Beijing's water pollutants emission flows embodied in economic activities. Based also on an Economic Input-Output Life Cycle assessment, we found that: 1) the material exchange between economic sectors cause the water pollution transferred virtually from down-stream industry to up-stream industry. For example, food and tobacco sector transfers 23.28×10<sup>7</sup> m<sup>3</sup> virtual water pollution to the agriculture sector. Consequently, the sectors which receive intermediate products

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