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Water Footprints

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Abstract: Towns are energy demand hotspots with local and national water resources implications. Through the widespread cross-border exchange of goods and services, water flows "virtually" in and out of the towns. Water supply initiatives and urban design decisions that impact residential, commercial, and industrial growth affect all physical and virtual surface water. This "teleconnection" type of water is progressively acknowledged as an important element of water strategy making. The position of trading & digital water flow is rarely addressed as an alternative to expand the "actual" water sources supply of a region, with a focus on monotonous extension of safe water supply technology. To determine the ability and importance of getting into account digital flows throughout urban development and policy and to evaluate digital water flows, we compare current methods. In the study of urban water footprints, we also identify and address goals for future research.

Keywords: Water footprint, Virtual water, Urban metabolism, Water scarcity

1. INTRODUCTION:

Cities are the centre of global economic powers across vast network of trade with their connections to distant as well as neighbouring locations. Cities are the accommodation to over half of the country's population worldwide and are forced to support almost half by 2050. While rise in urbanization has resulted in enhanced socio-economic opportunities and better social services, it also creates additional pressure on water management and ecosystem that they sustain[1]. This is further exacerbated by the deterioration of the ecosystem that may result from ageing and/or insufficient urban water infrastructure[2]. As a result, it is becoming evident that cities contribute greatly to achieve sustainability goals due to their capability to resolve and have effect on global problems related to biological diversities loss as well as energy resources associated with climate change[2]–[4].

In order to track the progress and evaluate the resilience of pathways towards urban development objectives, it is increasingly necessary to define and measure versatile metrics and common rules for communities, both in terms of their particular circumstances and comparable outcomes. Therefore, the use of city metrics to trace and describe states may help to reflect the relations (networks) between cities and world economy. A number of metrics of conservation are introduced and implemented. The footprint community is a collection of accessible and artificial indicators which relate our consumer patterns and production requirements to the assets of Earth[5]–[7].

This estimates the volume of water utilised in manufacturing of nearly all the raw material and their products. The water footprint also is an indication of how much water is being used up countries or on a global level constituting the basin of a river or from ground sources.

The units using which water foot print is quantified in cubical metres of volume per zone utilised, per hectare agricultural are, in terms of currency. This is used to know how our freshwater is getting utilised and how are they being polluted. The results obtained are affected by the source from which water is being taken and its time of collection. Generally being used up from a source where water sources are already less the aftermath is going to be serious and it will be requiring a suitable action against it.

It has three classes in it: green, blue and grey. Together, they make a bigger depiction of water acquisition in form of the moisture content of soil,the rains or the underground water, and the volume of fresh water needed for absorption of materials leading to pollution.

1. Blue water footprint:

The *blue water footprint* contains tonnes of water which is generally collected from underground sources or is being vaporized, or has been used up for manufacturing of a product or transferred between two water bodies[6]. Practices in agriculture such as irrigation of fields, water consumption for industrial uses each possess this category of footprint.

2. Green water footprint:

This is the volume of water being precipitated, or being stocked up in the roots present deep in the soil which is eliminated out by evaporation from the root area or incorporated by the plants [8], The main concern for agriculture as well as horticulture.

3. Grey water footprint:

This is the quantity of water that is utilised for treatment of materials leading to pollution such as water discharges from industries, spilled water from the man made ponds and waste water from domestic and municipality.

Fig.1: Types of water footprints

4. Factors Affecting Water Footprint:

The factors that affect the water foot print are:

i) The amount of water consumed depends upon the national income of the country.
ii) Water consumption pattern in manufacturing of food materials such as meat.
iii) High consumption of industrial raw materials.
iv) Agricultural practices undertaken which require huge volumes of water.

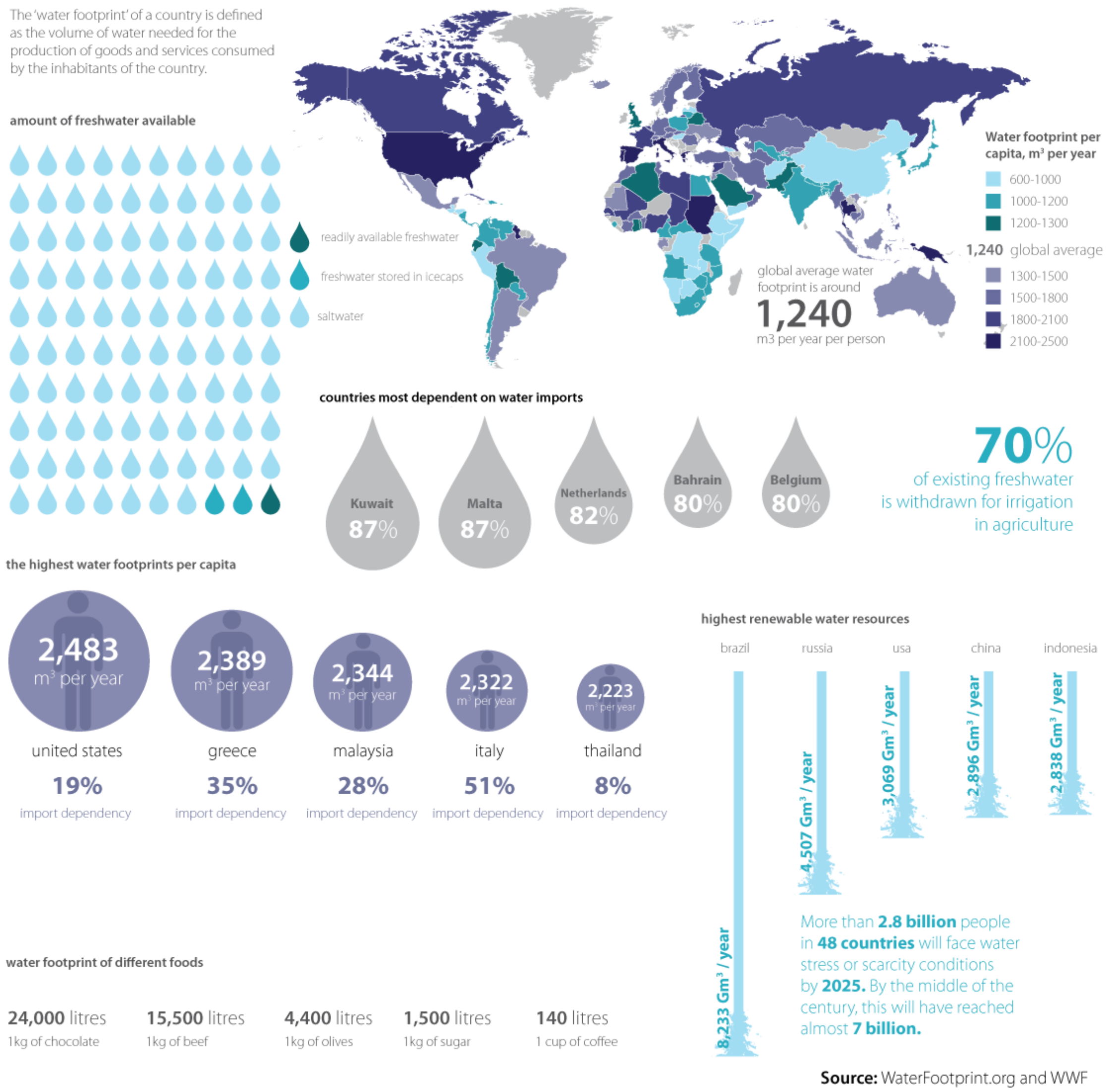

Fig. 2: Water foot prints

5. Method of Analysis:

The water footprint can only be viewed via a prism of water used during processing, which involves physical flow within an area and indirect flows via the inputs utilized in production, or it may be interpreted from consumption perspective which integrates the water collected by a country. The WF measures water consumption instead of water withdrawals, for which a large percentage are recovered as just a stream flow and refill. Methods appointed for water footprint research can usually be divided into "bottom-up (product level approaches)" and "top-down (sector level approaches)"[9]. Three key methodologies are adopted to analyze water footprint:

i) "Water Footprint Assessment (WFA)" which seems to be utilized at commodity level;

ii) "Environmentally Extended Input-Output (EEIO)" which uses commercial IO tables, takes into account service-level data; and

iii) "Life Cycle Assessment (LCA)" which depends heavily on optimization and datasets to estimate aviation.

6. *Assessment of Water Footprint*:

The "Water Footprint Network (WFN)" developed this tool, providing the widely used database. This tool can theoretically be used to evaluate the consumptive utilization of groundwater assets on any level and on economic sector. Global hydrological models are mainly utilized in WFA system in order to estimate WFs of the material. The main models incorporated mainly include "CROPWAT", "Global Crop Water Model (GCWM)" and "H08". Two different methods were introduced on a supranational scale to evaluate transfer of virtual water. This extension delivered opportunities for gaining insight in context of scaling and process riders behind transfer, to understand better dependence between various regions importance of different transition paths (network connections) and to recognize water savings. Networking and multi-networking approaches eventually provided a mathematical structure for integrated platform characterization and modelling.

7. Environmentally Extended Input –Output (EEIO):

EEIO analysis assesses interdependencies between the sectors by monitoring monetary flows across supply chain, which are then linked to coefficients of environmental consumption. This ensures, in the light of WF assessment, EEIO allows the quantity of virtual water determination, typically in bases of volume of water per dollar of resource value, which is redirected between two method endpoints in trade route. This requires the quantity of environmentally destructive water utilized in the IO sheets by particular sector[10]. The IO sheets quantify the valuation of the various sectors ' economic activities. It includes the quantity of consumptive groundwater utilized in IO scales by prominent sector. The IO scales measure the valuation of the various sectors ' economic activities.

8. Life Cycle Assessment:

LCA analyses industrial supply channels in order to compensate product's complete life, environmental impacts that are accumulated throughout its path. LCA is used to assess freshwater use through products and industries. LCA places great importance on the development, implementation and maintenance of a framework for comparative evaluation of the structural human and environmental effects correlated with product development. The "International Organization for Standardization (ISO)" defines these standards. As per standardization mechanism, support to inventory databases is also provided for their development. Some of important databases include “ecoinvent", "Qauntis" and GaBi.

LCA analysis aims to standardize the quantitative analysis of influences on water resources, like the distinction between the withdrawals and utilization and the effects of water depletion. Similar to LCA, WFA uses a global approach to assess effects and make suggestions for optimal sustainability. In metropolitan areas, wherein the desire to integrate and optimize data utilization is important, LCA's strong reliance on standardization stock data sets could consequence in an unacceptably standardized characterisation of water conservation under interpreted characterization.

2. CONCLUSION

The WF offers a brief framework covering both directly and indirectly water utilization. Because of dominant economic positions that communities play, the community scale represents significant future course of study for WF studies. Metropolitan areas are destinations for economic cooperation and have distinctive ability to create effective local choices with-reaching implications for un-local water assets through preparing and authorization. By utilization of constant approach to define water fluxes – real as well as virtual – for metropolitan, the WF provides opportunities for metrics and cross correlations.

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