



Project no. 4CE439P3

URBAN_WFTP

**Introduction of Water Footprint (WFTP) Approach in Urban Area
to Monitor, Evaluate and Improve the Water Use**

**List of characterization factors
used in Water Footprint approach**

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Foreword

The present report was prepared within the context of the work package WP3 ('Water use and management baseline assessment according to Water Footprint approach and sharing of results among partners') of the URBAN_WFTP project (<http://www.urban-wftp.eu>).

Thanks are due to all partners of the URBAN_WFTP project for fruitful discussion and provision of city level data.

1. Purpose of this document

The general goal of this work was to identify all characterization factors which could help in adapting Water Footprint Approach to an urban.

2. Document scope

This document presents all parameters which were used during development of Water Footprint common approach for urban areas. When selecting the parameters it was assumed that no industrial or agricultural activities will be analyzed in details.

3. Parameters

The urban parameters that were considered for the first time when the water footprint approach was formulated were:

- Number of inhabitants
- Geographical location and meteorological conditions
- Surface cover
- Social conditions
- Irrigated area per dwelling unit
- Water needs
- Production of water
- Sewage water treatment
- Food consumption and type (virtual water)
- Virtual water in other products

For the sake of simplicity it was decided to separate the parameters which describe virtual water flow in the city from real water. It was also agreed that time dependent variables will be considered on an annual basis.

3.1 Virtual water

The parameters defining flow of virtual water in the city are summarised in Table 1.

Table 1: Parameters of virtual water flow

Notation	Unit	Name	Description
VWi	m ³ /year	Virtual Water imported	Total virtual Water imported to city
VWe,r	m ³ /year	Virtual Water imported and re-Exported	Virtual water that is just passed through in trading goods
VWe,d	m ³ /year	Virtual Water exported goods produced with domestic water	Virtual water that is generated with domestic water for exported goods
VWe	m ³ /year	Virtual Water exported	Total Virtual water that is exported
IWFcons	m ³ /year	Internal Water footprint consumed goods	Water footprint of consumed goods produced with domestic real water
EFWcons	m ³ /year	External Water footprint consumed goods	Water footprint of consumed goods produced with external real water
WFcons	m ³ /year	Water footprint consumed goods	Total Water footprint of consumed goods

3.2 Real water

The parameters describing flow of real water in the city are summarised in Table 2.

Table 2: Parameters of real water flow

Notation	Unit	Name	Description
PREC	mm/year	Annual Precipitation	Rainwater volumes per year per unit of surface
A	m ²	Total Area	Total surface managed by the municipality
Qprec	m ³ /year	Total annual precipitation	Total rainwater volumes in the city
Qgw	m ³ /year	Groundwater uptake	Volume of freshwater uptaken from fresh ground-water resources
Qsw	m ³ /year	Surface water	Volumes of freshwater uptaken from fresh

		uptake	surface-water resources
Qimp	m3/year	Imported water	Volume of fresh water imported from other basin (outside city boundary)
Qsuppl	m3/year	Annual water supply inflow	Total Volume of freshwater uptaken
QId	m3/s	Industry/farming demand	Volume of water withdrawn for Industry and farming use
QE	m3/year	Water use for Energy (heating)	Volume of water withdrawn for heating and cooling
QIe	m3/year	Industry/farming effluent	Volume of water discharged from industries and farms
Qinflow	m3/year	total water inflow	Total Volume of freshwater inflow
Aperm	m2	permeable area (Green)	Total permeable surface manager by the Municipality
Aimper	m2	impermeable area (Build-up)	Total impermeable surface manager by the Municipality
Yperm	-	Runoff coefficient	% of rainwater that becomes runoff from permeable surface
Yimper	-	Runoff coefficient	% of rainwater that becomes runoff from impermeable surface
Qrunoff	m3/year	Total runoff	Total Volume of freshwater runoff
Rtreat	-	Treated Runoff coefficient	% of total runoff that goes to treatment systems
Qrt	m3/year	Treated runoff	Total Volume of treated runoff
Qexp	m3/ year	Exported water	Volume of freshwater exported to another water basin or outside of the basin that the city uptake water from
Qoutflow	m3/year		Total volume of freshwater that leave the city
ETP	mm/year	Potential evapotranspiration	
Awater	m2	Area under surface waters	Total surface water area
Kperm	-	Evapotranspiration	% of rainwater that evapotranspirates from

		coefficients	permeable surface
Kimperm	-	Evaporation coefficients	% of rainwater that evaporates from impermeable surface
Kwater	-	Evaporation coefficients	% of rainwater that evaporates from surfacewater
Qetr	m3/year	Evaporated volume	Total volume of water evaporated from the city
Rloss	-	Runoff loss coefficient	% of runoff water going to surface water
Qrl	m3/year	Loss	Total volume of runoff going to surface water
I	-	Infiltration coefficient	% of rainwater infiltrating in the ground
Qinfil	-	Infiltration volume	Total volume of rainwater infiltrating in the ground
Tloss	-	Transport loss coefficient	% of freshwater uptaken infiltrating in the ground
Qtl	m3/year	Transport loss	Total volume of freshwater losses during transportation
Qdel	m3/year	Long term freshwater storage	Water does not return in the same period (e.g. it is withdrawn in a scarce period and returned in a wet period)
Qtreated	m3/year	Wastewater treated	Volume of water out of the wastewater treatment
QU	m3/year	Additional water use	
QEff	m3/year	Additional water discharge	Discharge from other uses such as Industries, Farms and energy
c(i)	mg/m3 or mg/l	Main Pollutant concentration	reference i-Pollutant (after treatment)
cmax(i)	mg/m3 or mg/l	legal concentration of i-pollutant	legal limit concentration of reference i-pollutant in the receiving water body
cnat(i)	mg/m3 or mg/l	natural concentration of i-pollutant	natural concentration of i-pollutant in the receiving water body

