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1 Project Logo

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3 Relevant Figures

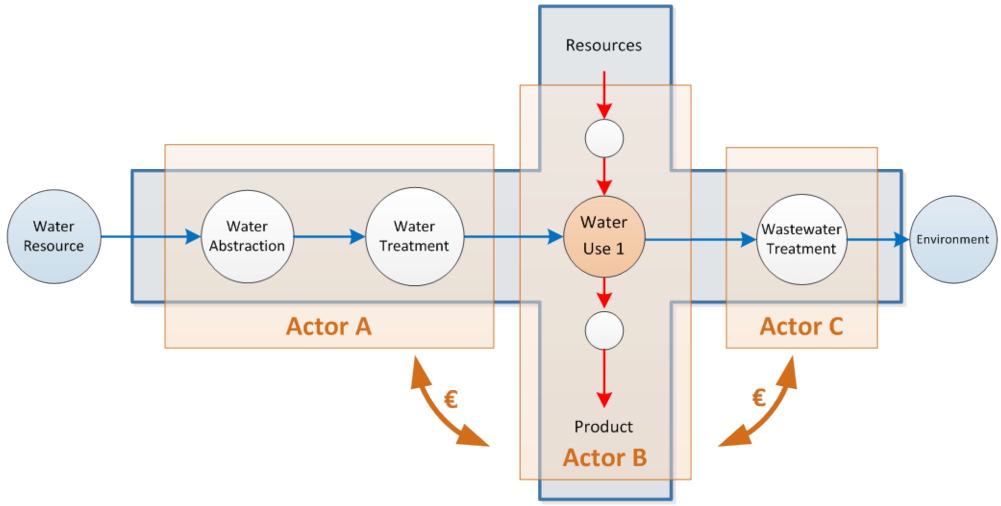

Figure 1. The meso-level water use system

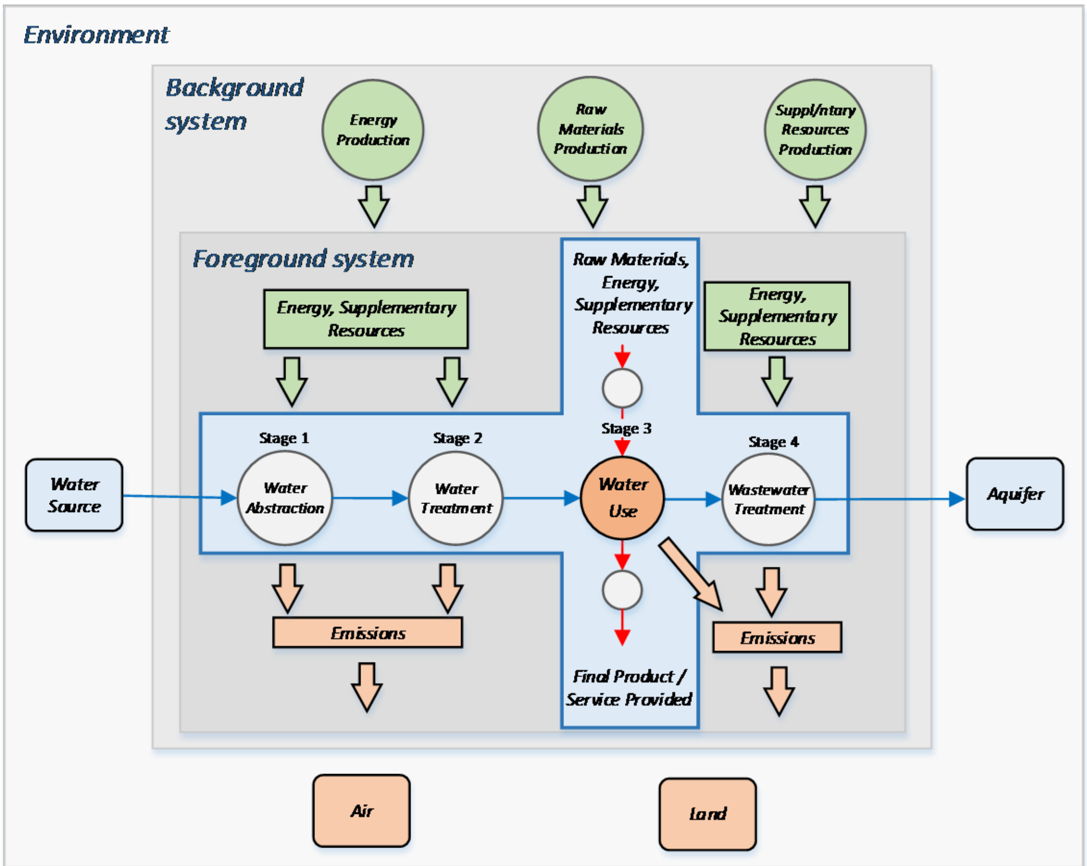

Figure 2. The generic meso-level water use system

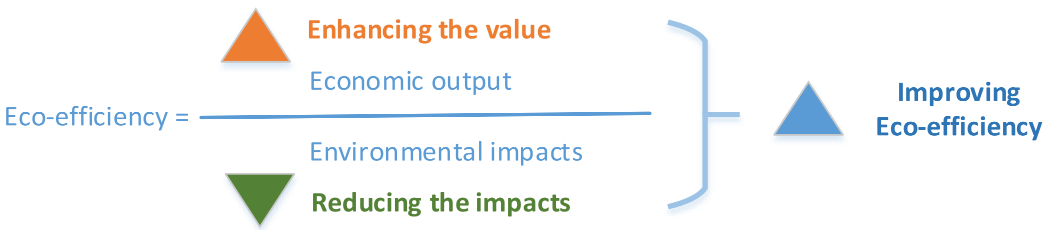

Figure 3. The eco-efficiency "equation"

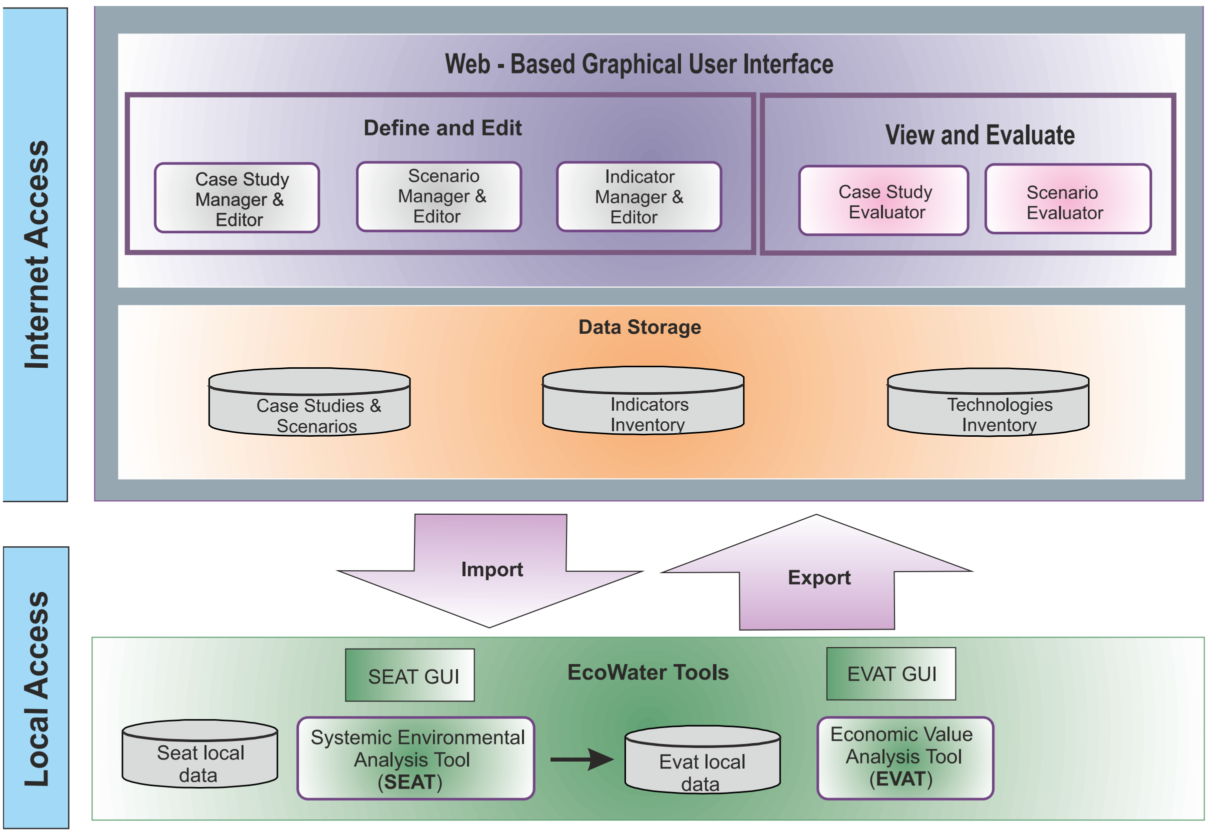

Figure 4. Architecture of the EcoWater Toolbox

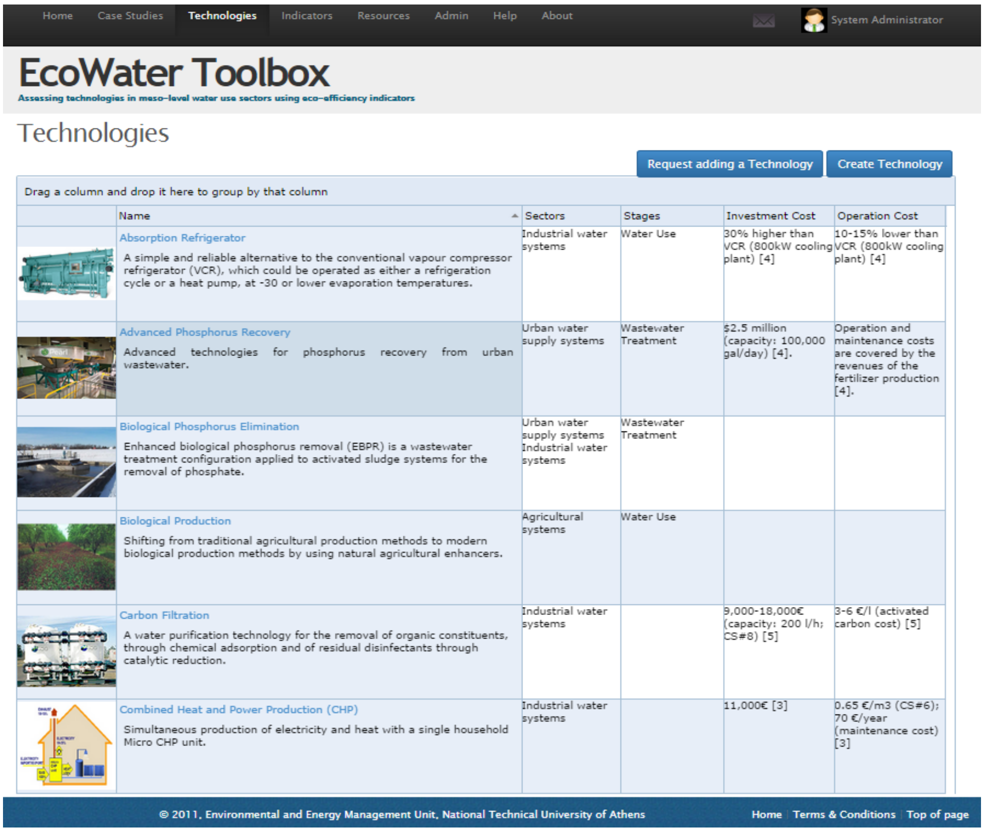

Figure 5. The Technology Inventory

4 Relevant Tables

Table 1. Generic stages in a meso-level water use system

No	Name	Description
1	Water Abstraction	Processes related to the abstraction of water from the environment and the distribution to the users
2	Water Treatment	Processes related the treatment of water according to the quality standards of the users
3	Water Use	Processes related to the production of goods or services
4	Wastewater Treatment	Processes related to the treatment of wastewater before disposing to the environment

Table 2. Material types in the meso-level water use system

Material Type	Description
Water	Water service related materials (fresh water, wastewater).
Resources	Various resources used in the processes of the water supply chain or in the production chain (energy, raw materials, chemicals, etc.)
Emissions	Emissions generated from the processes of both chains and released to the environment
Products/Services	The main outputs of the water use stage
By-products	Produced by the processes of both chains

Table 3. Midpoint impact categories

No	Impact Category	Unit of measure
1	Climate change	$tCO_{2,eq}$
2	Stratospheric ozone depletion	$kgCFC\text{-}11_{eq}$
3	Eutrophication	$kgPO_{4,eq}$ or $kgNO_{x,eq}$
4	Acidification	$kgSO_{2,eq}$
5	Human toxicity	$kg1,4DCB_{eq}$ or CTUh
6	Ecotoxicity 6a Aquatic 6b Terrestrial	$kg1,4DCB_{eq}$ or CTUe
7	Respiratory inorganics	$kgPM_{10,eq}$
8	Ionizing radiation	kBq $U\text{-}235_{air,eq}$
9	Photochemical ozone formation	$kgC_2H_{4,eq}$
10	Resource depletion 10a Minerals 10b Fossil fuels 10c Freshwater	 $kgSb_{eq}$ or $kgFe_{eq}$ MJ or TOE m^3

Table 4. Summary of baseline eco-efficiency assessment results

Indicators	Agricultural		Urban		Industrial			
	CS#1	CS#2	CS#3	CS#4	CS#5	CS#6	CS#7	CS#8
Climate Change (€/t$CO_{2,eq}$)	1081	186	94	373	1351	0.12	30.1	44000
Stratospheric Ozone Depletion (€/kgCFC-11_{eq})	NR*	NR	$>10^6$	$>10^6$	NR	NR	NR	$>10^6$
Eutrophication (€/kg$PO^{-3}_{4,eq}$)	109	15.4	41.7	4.9	1025	NR	0.99	42000
Acidification (€/kg$SO_{2,eq}$)	82.6	21.8	4.4	215	366	37.8	3.1	15000
Human Toxicity (€/kg1,$4DCB_{eq}$)	19.9	1.7	1.1	4.5	6.8	7.2	28.5	2000
Aquatic Ecotoxicity (€/kg1,$4DCB_{eq}$)	74.5	10.9	13.3	15.6	0.8	13325	737	1800
Terrestrial Ecotoxicity (€/kg1,$4DCB_{eq}$)	3866	106	513	6000	9.5	191	630	$>10^6$
Photochemical Ozone Formation (€/kg$C_2H_{4,eq}$)	8417	518	111	8822	6959	610	3271	$>10^6$
Respiratory Inorganics (€/kg$PM_{10,eq}$)	3007	143	22.5	1257	NR	31590	NR	NR
Minerals Depletion (€/kgFe_{eq})	7948	923	42.4	NR	NR	NR	NR	NR
Fossil Fuels Depletion (€/MJ)	4.9	0.007	0.01	0.03	NR	0.01	NR	NR
Freshwater Depletion (€/m^3)	7.0	0.6	1.1	31.6	122	13.5	203	17000

Table 5. Potential for improvement of the environmental performance

Case Study	Resource efficiency scenario		Pollution prevention scenario		Circular economy scenario	
	Water Use	Energy Use	Water Use	Energy Use	Water Use	Energy Use
CS1. Sinistra Ofanto (IT)	-6.3%	-5.9%	0%	-9%	-	-
CS2. Monte Novo (PT)	-8.7%	-8.3%	0%	-5%	-	-
CS3. Sofia (BG)	-9.0%	-8.0%	-9%	-14%	0%	-1%
CS4. Zurich (CH)	-13%	-6%	-1%	0%	-2%	0%
CS5. Textiles (IT)	-52%	-15%	0%	-0.8%	-	-
CS6. Amsterdam (NL)	-	-	-18%*	-11%	-30%*	+1%
CS7. Dairy (DK)	-47%	-	-133%	-	-316%	-
CS8. Automotive (SE)	-1.1%	-2.8%	-1.5%	+3.9%	-1.3%	+4.4%

* Case Study #6: In Water Use column the Thermal Pollution Reduction in the receiving water body is shown

Table 6. Net Economic Output change for the main involved actors

Case Study	Resource efficiency scenario			Pollution prevention scenario			Circular economy scenario		
	Water Utility	Water User	WW Utility	Water Utility	Water User	WW Utility	Water Utility	Water User	WW Utility
CS1. Sinistra Ofanto (IT)	0%	-3.1%*	N/A	0%	+1.2%	N/A	-	-	-
CS2. Monte Novo (PT)	+6%	-7.5%	N/A	0%	+11%	N/A	-	-	-
CS3. Sofia (BG)	-21%**	+13%	-21%	-20%	+10%	-20%	+9%	0%	+9%
CS4. Zurich (CH)	-1%	+19%	-17%	0%	-2%	-48%	0%	-3%	0%
CS5. Textiles (IT)	0%	+11%*	0%	0%	-6.8%	+6.7%	-	-	-
CS6. Amsterdam (NL)	-	-	-	0%	+11%	0%***	0%	+9%	-11%
CS7. Dairy (DK)	-55%	+10%	-42%	-26%	+10%	-6%	-75%	+10%	-41%
CS8. Automotive (SE)	0%	+0.3%	-57%	-12%	+0.3%	-57%	-12%	+0.2%	0%

* In CS#1 and CS#5 there is more than one water user. The worst economic performance is shown

** In Case Study #3, water utility and wastewater utility are managed by the same actor

*** In Case Study #6, the users of electricity and thermal energy are shown in the 3rd column instead of WW Utility

Tables 5 and 6 summarize the potential for improvement of the environmental performance and the distributional issues for all the case studies, based on the application of the three alternative technology scenarios.