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Article

Integrated Assessment of Novel Urban Water Infrastructures in Frankfurt am Main and Hamburg, Germany

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Table S1. Methods of data collection regarding assessment criteria and indicators as well as achievement degrees of compared options.

		Indicator		Α			В			С			D			E		
Category	Criterion		Method of Data Collection	Reference Option	Novel Option 1	Novel Option 2	Reference Option	Novel Option 1	Novel Option 2	Reference Option	Novel Option 1	Novel Option 2	Reference Option	Novel Option 1	Novel Option 2	Reference Option	Novel Option 1	Novel Option 2
Technology				4	2	2	4	3	2	4	2	2	4	2	3	4	2	3
Integrability	Impact on existing infrastructure and buildings	Need for adaptation of existing water/building infrastructure [low, medium, high]	Expert appraisal	2	0	0	2	0	0	2	0	0	2	0	0	2	0	0
	Synergetic potential	Synergies with other infrastructures and concerning renewable energy (waste heat, cooling buildings, biogas etc.) [high, medium, low]	Expert appraisal	0	0.5	1	0	1	1	0	0	0	0	0	1	0	1	1
Adaptability	Flexibility	Degree of flexibility regarding changes in climate, demography, law, usage patterns etc. [high, medium, low]	Expert appraisal	0	0.5	1	0	1	1	0	0	0	0	0	1	0	1	1
Operation reliability/	Process stability	Impact of extreme events (heavy rainfall, wastewater reduction, power failure,	Expert appraisal	1	0.5	0	1	1	0	1	1	1	1	1	1	1	0	1

Robustness		vandalism etc.) [low, medium, high]																
		Effects of failure of individual system components (resilience) [low, medium, high]	Expert appraisal	1	0.5	0	1	0	0	1	1	1	1	1	0	1	0	0
Ecology				4.4	8	9.6	2	9	6.4	4.6	6	5.1	6.6	6.6	8.9	4.6	8.4	8.4
Resource protection	Local ecosystem functions	Contribution to the production, preservation and strengthening of blue and green infrastructure [high, medium, low]	Expert appraisal	0	1	1	0	2	2	0	0	0.5	0	0	0.5	0	1	1
	Water protection (surface waters)	Reduction of inputs of nutrients (N, P) and ecotoxicological substances [high, medium, low]	Expert appraisal	0.7	1.5	1.8	0	1	0.7	0.3	0.5	0.3	1.3	1.3	1.7	1.3	1.7	1.7
	Soil and groundwater protection	Reduction of inputs of ecotoxicological substances [high, medium, low]	Expert appraisal	0.7	1.5	1.8	0	1	0.7	0.3	0.5	0.3	1.3	1.3	1.7	1.3	1.7	1.7
	Energy and climate protection	Emission of Greenhouse gases (CO2 equivalents) [t/a]	Material flow analysis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resource use	Resource balance	Drinking water demand [m ³ /a]	Material flow analysis	0	1	1	0	1	1	1	1	1	1	1	2	0	1	1
		Electricity demand [MWh/a]	Material flow analysis	2	1	1	1	1	0	2	1	1	2	0	1	1	0	1
		Heat recovery [MWh/a]	Material flow analysis	0	1	2	0	2	1	0	2	1	0	2	1	0	2	1
Economy				4	4	3	4	3	4	4	5	5	4	7	3	4	5	4
Utilities, investors	Costs	Annual costs [€/a]	Cost estimation	2	1	0	2	0	1	2	0	1	2	1	0	2	1	1
	Revenues	Potential revenues from products of novel water infrastructure systems [€/a]	Cost estimation	0	1	1	0	1	1	0	2	1	0	2	1	0	2	1
	Long-term competitiveness, innovation leadership	Effects on image and know-how [high, medium, low]	Expert appraisal	0	0	1	0	1	1	0	1	1	0	1	1	0	1	1
	Ability of system change (flexibility)	Duration of depreciations [low, medium, high]	Expert appraisal	0	1	1	0	1	1	0	1	1	0	2	1	0	1	1
Investors, residents	Economic viability	Impact on specific costs (rent, rent including heating) [low, medium, high]	Expert appraisal	2	1	0	2	0	0	2	1	1	2	1	0	2	0	0
Society				4	3	2	4	3	3	4	5	3	4	5	2	4	2	2
Exclusion	Socio-economic, cultural barriers	Risk of exclusion [low, medium, high]	Expert appraisal	2	1	0	2	1	1	2	2	1	2	2	0	2	0	0

Usability, practicality	Ease of handling	Ease of use for operators and residents [high, medium, low]	Expert appraisal	2	1	0	2	1	1	2	2	1	2	2	0	2	0	0
Environmental awareness	Awareness raising regarding resource use (water, energy)	Sensitization potential (residents, operator, investor, politics) [high, medium, low]	Expert appraisal	0	1	2	0	1	1	0	1	1	0	1	2	0	2	2



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