Sustainable criteria of water minimization

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Ukraine is one of Europe's countries with shortage of water resources. The average year availability of water resources is 1700 m^3 per person, for example, such indicator for France is 4570 m^3 per person, for Sweden it is 24000 m^3 per person. At that time, the daily water consumption on urban territory more than 350 litters per person and water leakage during the water transportation are more than 2 km^3 per year. Also, more than 10500 km^3 per year of wastewaters polluted surface water resources in Ukraine. At present time water quality in the all rivers are not corresponding with Ukrainian Water Sanitation Standards by such indicators as ammonium, oil products, phenol, nitrates, nitrites, copper, total-iron, zinc.

Today, households, office and resident building are the major consumers of water, accounting for about 75% of water resources to supply by municipal water company and correspond to 375 liters per capita per day. Such high level of water consumption in the city with water scarcity leads to different environmental problems.

One of the ways to predict the water crisis is based on the development of the precautionary measures to reduce level of water use of powerful water consumers. The implementation of such measures should be support by decision-making tools to include sustainable indicators and criteria.

Sustainable criteria are defined as the set of factors that may be used to assess the range of options, in this case to analyze the current situation of water use and proposed the minimization of water use to base on the sustainable development principles. The concept of Sustainable Water industry Asset Resource decision (SWARD) is developed in United Kingdom as the result of the semi-named project. The principle objectives of the concept are to facilitate the inclusion of sustainability in the decision-making processes for water services asset planning and to provide the means whereby the relative sustainability of each of the options under investigation can be compared. It proposed to use the primary and secondary criteria to classify by four groups: economic, environment, technical and social, according to the main principles of sustainable development concept.

Options for dealing with water minimization for Kharkiv City Municipality was generated with use of such approaches as human behaviour changes (A), water control implementation (B) and water saving technologies introduction (C). Also it is estimated the situation as doing nothing (D).

Criteria were generated by the results of future research of environmental, economical, technical and social factors of water minimization (table 1).

The sustainable criteria were developed for proposed options to estimate the real condition of water minimization management providing in the municipal economy of Kharkiv city.

Table 1 - Water minimization criteria

Primary criteria	Secondary criteria	Indicator
	Economic criteria	
Water service costs	Capital costs: investment Operational costs Maintenance costs Repair costs Municipal bill	total $ $/year $/year $/year $/year
Financial risk	Risk of capital investment	qualitative
	Environmental criteria	
Resource utilization	Water resource extraction Leakage rate Energy/fuel use for water services Energy/fuel use for heat production Material use Chemical use	cub.m/year cub.m/year kWh(t,cub.m)/ye kWh(t,cub.m)/ye t/year t(l)/year
Environmental impact	Impact on water: -water polluters discharge Impact on air: -CO2, SO2, NOx emission	 t/year t/year
	Social criteria	
Responsibility	Participation in change behavior	% of people to pay in time/catchment people
Family budget affordability	Volume of water bill	% of average family budget
Acceptability	Acceptability	Average acceptability (score)
	Technical criteria	
Adaptability	Costs of adding systems Costs of removal from the system	total $ total $
Reliability	Risk of failure	qualitative

The decision making system also will be developed to base on the criteria.