Urban water management: Ways to a flexible future

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Topics: Wastewater | Water & Development | Society

How can water supply and wastewater disposal be provided flexibly and efficiently, especially in rapidly growing cities? A new research agenda formulates open questions from a technical, social and transformative perspective. It stresses the importance of transdisciplinary cooperation between research, policy and practice to promote innovation in the water sector.

In Switzerland, fresh drinking water springs from the tap whenever it is needed. After use, it flows through the sewage system into the central wastewater treatment plants, where it is cleaned and reintroduced into the water cycle. This system has proven itself over many decades. But growing cities, climate change, environmental protection and scarce resources pose new challenges for urban water management. Not only for Switzerland, but worldwide – especially in developing countries.

How must the system be designed so that it can be flexibly adapted to changing conditions? How can new requirements such as the recovery of water, nutrients and energy be taken into account? How can the innovative capacity of the institutions involved be reinforced? And how can the acceptance of new technologies be systematically promoted in the community?

New research agenda published

To find answers to these challenges, an international group of researchers led by Sabine Hoffmann, head of the Wings research programme at the Swiss Federal Institute of Aquatic Science and Technology (Eawag), has jointly developed an interdisciplinary research agenda for the future of urban water management. The agenda was recently published in the journal "Environmental Science & Technology". "The cooperation of different disciplines is key. Only if research, policy and practice work

together can sustainable and practicable solutions be developed for different cities and needs."

Particularly the development of new technologies is an important step. A slow shift from conventional centralised systems to decentralised alternatives can already be observed in some industrialised countries: water systems without grid connections for individual buildings or with small grids for a few buildings as well as hybrid systems that integrate local systems into a large grid. These alternatives are not only flexible, but can often recuperate valuable resources such as water, nutrients and energy in addition to local wastewater treatment. "It is important to systematically promote and make visible such niche developments, experimental spaces and pilot projects, because their market application has so far been limited to a few places in the world," says Sabine Hoffmann.

Cultural standards must also be considered

However, sustainable urban water management not only requires technological progress. Change processes are necessary on different levels. Laws, regulations and health standards must be reviewed and, if necessary, adapted. Urban planners, architects, sewage technicians and plumbers are called upon to reconsider their approach. Cultural norms need to be reconsidered, for example how to use a toilet properly. For instance, some toilets with no-mix technology require you to sit down to open the urine drain and collect urine separately. However, in many cultures sitting is not a common practice when using the toilet. Not to be neglected is the "yuck factor", which most cultures associate with the reuse of wastewater.

In order to drive global and local innovation in the water sector, future research work must take a transdisciplinary approach, examine socio-technical systems from an integrated perspective and evaluate experiences with "lighthouse projects" in different contexts. "Some of these lighthouses are already being built in cities like San Francisco, Bangalore and Hamburg," says Sabine Hoffmann. However, there is still too little exchange of experience and knowledge. "We therefore encourage international organisations, city networks, governments and financial donors to network more strategically to facilitate knowledge-sharing and mutual learning."

Cover picture: Max Maurer, Eawag

Original Publication

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tential of non-grid, small-grid, and hybrid solutions' (129 chars) journal => protected'Environmental Science and Technology' (36 chars) year => protected2020 (integer) volume => protected54 (integer) issue => protected'9' (1 chars) startpage => protected'5312' (4 chars) otherpage => protected'5322' (4 chars) categories => protected'urban water management; non-grid systems; small-grid systems; hybrid systems

; research agenda; transdisciplinary integration' (124 chars) description => protected'Recent developments in high- and middle-income countries have exhibited a sh
ift from conventional urban water systems to alternative solutions that are
more diverse in source separation, decentralization, and modularization. The
se solutions include non-grid, small-grid, and hybrid systems to address suc
h pressing global challenges as climate change, eutrophication, and rapid ur
banization. They close loops, recover valuable resources, and adapt quickly
to changing boundary conditions such as population size. Moving to such alte
rnative solutions requires both technical and social innovations to co-evolv
e over time into integrated socio-technical urban water systems. Current imp
lementations of alternative systems in high- and middle-income countries are
promising, but they also underline the need for research questions to be ad
dressed from technical, social, and transformative perspectives. Future rese
arch should apply a transdisciplinary research approach through socio-techni
cal "lighthouse" projects that apply alternative urban water systems at scal
e. Such research should leverage experience from lighthouse projects in a ra
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Hoffmann, S.; Feldmann, U.; Bach, P. M.; Binz, C.; Farrelly, M.; Frantzeskaki, N.; Hiessl, H.; Inauen, J.; Larsen, T. A.; Lienert, J.; Londong, J.; Lüthi, C.; Maurer, M.; Mitchell, C.; Morgenroth, E.; Nelson, K. L.; Scholten, L.; Truffer, B.; Udert, K. M. (2020) A research agenda for the future of urban water management: exploring the potential of non-grid, small-grid, and hybrid solutions, *Environmental Science and Technology*, 54(9), 5312-5322, doi:10.1021/acs.est.9b05222, Institutional Repository

Further Information

Wings Research Programme: The interdisciplinary and transdisciplinary research programme Wings investigates alternative water and wastewater socio-economic contexts (including Switzerland, USA, France, India and Kenya).

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