Roundtable on Financing Water

OECD-WWC-Netherlands Roundtable on Financing Water

Second meeting 13 September 2017, Tel Aviv

Session 1. Background paper

Prospects in Water-related Technological Innovation

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Contents

Tables

Figures

Introduction

1. Following the inaugural meeting of the OECD-WWC-Netherlands Roundtable on Financing Water (12 – 13 April 2017, Paris), a Roadmap for Future Work was developed. The Roadmap includes a number of themes to guide further analytical work under the Roundtable. This background paper contributes to the theme "Seizing opportunities generated by innovation" and will support discussions at the second meeting of the Roundtable (13 September 2017, Tel Aviv).

2. This paper describes the innovation landscape currently shaped by water start-up companies. Examples of both emerging technologies with the most potential to disrupt water and wastewater management as well as transformative business models are provided. Examples of opportunities to monetise these innovations are also provided. Finally, the challenges and conditions related to the increased adoption of innovative technologies are discussed.

Key messages

The focus of innovative activity in the water sector is predominantly driven by digitalisation, industrial wastewater treatment, as well as desalination and resource recovery. This focus has created new opportunities for monetising the services of water and wastewater utilities.

Start-up companies are transforming traditional business models into innovative models (e.g.. "Data as a Service" smart pre-paid water) that can accelerate the scale up of technologies, shorten payback periods for investments, and reduce CAPEX and OPEX for the end-users.

Shifting from an "infrastructure-based" business model to an alternative model based on the combination of "infrastructure and innovative technologies' could reduce the overall level of investment needed and make infrastructure investment more attractive for financiers.

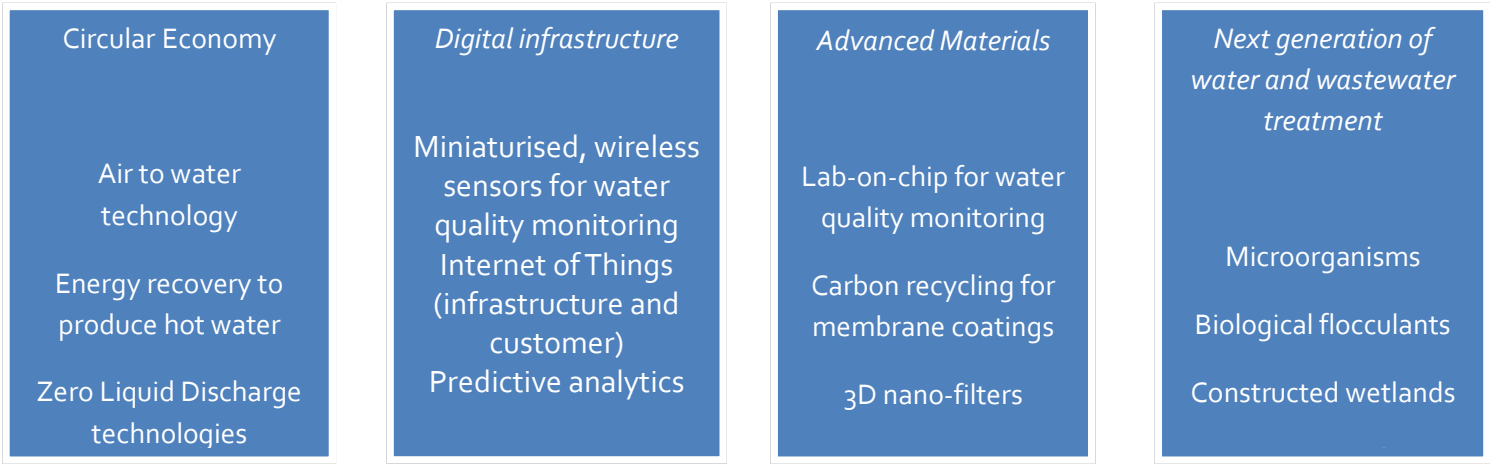
Regulatory gaps and misdirected policies hinder the uptake of innovative technologies.

3. This paper provides select examples of the main innovation trends in water and wastewater, driven by the activity of start-up companies. Innovative technologies are meant to create new value propositions for the market, in addition to responding to demand. This section also provides examples of disruptive start-ups' and utilities' business models and suggests an alternative model for managing infrastructure, taking into account the emergence of disruptive water-related innovation. Part II also briefly discusses the challenges and conditions needed to increase the uptake of innovative technologies and business models.[1]

Select examples of main innovation trends in water and wastewater management

4. At present, the water innovation agenda is very much driven by the introduction of digital solutions. The market also benefits from disruptive technologies in industrial wastewater and in desalination. In desalination, innovative technologies have been addressing longstanding issues that have hampered the development of this alternative resource. New technologies are aimed at reducing energy consumption (by 20 to 35%), reducing capital costs (by 20 to 30%), improving process reliability and flexibility, and greatly reducing the emission of brine by raising recovery (up to 98%). Figure 1 provides a non-exhaustive list of innovative technologies currently becoming available or that will soon be available on the market.

Figure 1. Examples of innovative water and wastewater technologies



Source: Author

Innovative disruptions focussing on both technologies and business models

Start-ups' alternative business models can provide incentives for increasing the market uptake of water-related innovation

5. There are numerous examples of water-related start-ups developing both innovative technologies, but also adapting their business model in order to accelerate the commercialisation of technologies. For example, Amoéba's business model is based on selling the technology through distribution channels[2]. Amoéba has already established distribution contracts with 15 partners. This approach aims to accelerate the uptake of the technology on the market, and allow for a return on the invested funds within 5 years instead of the 10 – 15

[1] Examples of international stakeholders active in the dissemination of water-related innovation are provided in the Annex.

[2] This is relatively unusual in the water sector. It is only since recently that start-ups and large companies partner for selling purposes.

years, usually cited for water investments (Merienne, 2017). Additional examples are discussed below. The common characteristics of these examples are: low or no upfront CAPEX, OPEX savings and short payback periods for clients.

Example 1 – "Data as a service": using remote sensing technology/spectral satellite imagery to detect leaks

6. Utilis commercialises an innovative algorithm-based solution for detecting leaks in urban drinking water networks. Utilising a novel remote sensing technology, UTILIS is able to scan and capture an entire pipeline network at once, thus providing information on potentially hundreds of leaks within a 6-week period. Usually, due to the size of the network and lack of manpower, most utilities cannot cover the entire network in one year when using traditional leak detection, leaving many areas un-surveyed for up to five years. By contrast, Utilis can supply a leak report for the entire network two to six times per year. Utilis reports that repeated scans paired with the reporting efficiency, can realise a reduction in water loss of up to 95%. There are no upfront CAPEX for the utilities. The business model is based on supplying "data as a service". The cost is around USD 160/mile/year, which can be largely offset by the avoided costs on addressing non-revenue water due to water losses (Perets, 2017).

Example 2 – The Water – Energy Purchase Agreement: a financing platform for wastewater treatment and resource recovery as a service with no upfront costs for the client

7. Cambrian Innovation has put in place the Water-Energy Purchase Agreement (WEPA), a financing model that borrows from the principles of the power purchase agreements that many corporate renewable energy buyers are using to invest in solar and wind power resources. It launched a USD 30 million fund in late 2015. Under the WEPA, Cambrian will construct, install, own, and operate the wastewater technology. Cambrian finances the project and takes on the ownership risk and operates the system on behalf of the industry, without industrial end-users paying for the upfront CAPEX. Cambrian charges a pre-negotiated monthly fee for the service over the lifetime of the contract and provides clean energy and clean water back to the facility at a discount rate. If the system does not perform up to contracted service levels, the monthly charge is waived (Aviles, C. et al., 2017).

Example 3 – Smart pre-paid water: providing access to water in urban areas in Africa, Latin America and South Asia

8. CityTaps has developed a smart pre-paid water meter that makes it possible for consumers, who do not currently have access to potable water, to pre-pay for water services at home with a mobile phone. The technology notifies customers when their pre-paid credit is running low and closes access automatically when the credit is spent. Customers can come back online quickly after topping up their account. Utility OPEX savings have been estimated between 10% and 20% due to the full automation of the metering and payment processes. The technology eliminates bill distribution and recovery, while keeping costs stable for customers. The technology also reduces the upfront costs for utilities and addresses the issue of non-revenue water as the technology collects data on customers' consumption and behaviour. The meter also displays data analytics. A pilot is currently running in Niger. CityTaps' business model is based on recovering a share of the utility's tariff (CityTaps, 2017).

Innovative technologies that transform utilities' business models and provide additional revenue streams

9. The emergence of innovative technologies can also generate new monetisation opportunities. Historically, the role of water utilities has been to protect the environment and

public health, as well as providing water services. Many utilities are now becoming "water resource recovery facilities", producing valuable products by recovering nutrients in the form of phosphorus, or producing fertilisers. This new approach diversifies the revenue stream of the utility, which is no longer solely based on volumes of water sold but also on services or resource recovered (see Box 1).

Box 1. Innovative technologies have enabled wastewater treatment plants to diversify revenue streams

Ostara Nutrient Technologies Inc. commercialises nutrient management technologies to recover phosphorus from liquid wastewater streams, while helping wastewater treatment plants meet strict phosphorus limits, and reducing sludge volumes and disposal costs. The technologies transform recovered nutrients into fertilisers ready to be sold on the market. Ostara guarantees the sale of every tonne of fertiliser produced. This ensures a stable revenue streams to the wastewater treatment plant (Ostara Nutrient Technologies Inc., 2017).

10. As well as contributing to the improvement and optimisation of asset management, innovative digital solutions can also create new opportunities for water utilities, through data monetisation. Innovative solutions are available to allow utilities connect consumers' data to better anticipate consumers' needs, fine-tune water and wastewater service offers and financial incentives, and dynamically adjust tariffs to build a different relationship with consumers, which are conducive to improving trust with consumers and additional revenue streams for the utilities.

Combining infrastructure and asset management through innovation

11. One possible innovative model to improve the risk-return profile of water infrastructure investments is to evolve from a solely infrastructure-based model to a model that combines infrastructure and innovative technologies and services. Under this model, existing infrastructure could either be retrofitted with or replaced by innovative technologies or nature-based approaches. Such alternatives to conventional infrastructure have the potential to reduce the CAPEX and OPEX of infrastructure projects and shorten the payback period for investors (see Box 2 and Box 3).

Box 2. Innovative desalination technologies can considerably reduce energy costs for freshwater production

Decentralised solar-based drinking water production technologies are coming onto the market. Existing desalination plants could be retrofitted to produce 1/3 of the drinking water currently produced with solar energy. The innovation lies in optimising energy performance, whilst guaranteeing the membrane lifespan. Using innovative solar-based technology has the potential to result in significant energy cost savings compared to the use of conventional technology. The payback period is about 4 to 5 years (Mascara-NT, 2017).

Box 3. Green infrastructure as an alternative to additional tertiary treatment in wastewater treatment plants

Constructed wetlands can be considered as a cost-effective alternative to tertiary wastewater treatment. For instance, CAPEX can be 20% higher if activated carbon is added for tertiary treatment, compared with a constructed wetland. Green infrastructure can bring additional benefits in terms of ecosystems services (e.g. provision of habitats, regulation of peak flows, recreation). OPEX has to include the maintenance of the infrastructure, and sustainability over time needs to be ensured (Suez, 2016). Adoption of green infrastructure will very much depend on the local conditions, the pollutants to be treated, the available land and the expected treatment performance.

Challenges to overcome to increase the uptake of innovative technologies and business models

12. In addition to the challenges identified in Part I, there are other challenges that need to be overcome to accelerate the uptake of disruptive technologies and the implementation transformative business models.

13. Regulation has been strong driver in many countries to improving drinking water quality and access to wastewater treatment. However, the application of different standards in different jurisdictions, for example for water quality treatment, can slow the rate of the diffusion of technologies designed for specific country contexts. Also, the implementation of available technologies may be slowed if the regulatory environment is not conducive to their application (Box 4). Box 5 provides an example of a US programme to help water-related innovation reach the municipal markets.

Box 4. Innovative sensors for monitoring industrial water and environmental resources quality

Historically, regulations for monitoring water quality have required laboratory testing. New developments have led to the emergence of innovative technologies that can be complementary to lab testing or provide a less costly alternative. "Real-time" sensors can monitor water quality, on-site, within less than 1 minute, at trace level so as to comply with current standards. These sensors are readily available on the market. The next generation of sensors will be miniaturised, wireless, in-situ sensors that can monitor water quality on an on-going basis, so as to anticipate defaults in compliance. However, where the regulatory environment does not allow for in-situ monitoring (rather than laboratory testing), market penetration may be slow, in particular in municipal markets.

Box 5. Supporting the procurement process on US municipal markets

DEPLOYMASS was launched by the Massachusetts Clean Energy Center (MassCEC) in 2014 in response to the barriers and challenges facing both public entities and innovative cleantech and water innovation companies. Through the programme, MassCEC works with companies to identify customers, navigate procurement barriers and provide technical and financial assistance in connecting their technologies with public entities. MassCEC is committed to providing one or more of the following forms of support: a) act as a liaison and connector between the company and one or multiple potential customers that are well-suited to procure the selected company's product or technology; b) act as a connector with state partners and procurement agencies; c) provide a grant to buy down the cost of the awardee's product, contingent upon a public entity's agreement to purchase the applicant's product; and d) varying technical assistance as needed by the company (Massachusetts Clean Energy Center, 2017).

Conclusion

Disruptions are currently occurring in water-related technologies and in business models, thereby creating opportunities for addressing long-standing issues, such as the slow adoption of technologies by the market, the typically long payback periods, or the huge upfront CAPEX and high OPEX. Several examples of innovative technologies and business models are provided in the preceding discussion. The challenge is now how to build on these examples, replicate and expand them in order to further foster water-related innovation.

Regulation is one of the key areas to address to increase the uptake of water-related innovation. Two conditions are required to ensure that regulation is an "enabler": regulation needs to be made more flexible so that innovative technologies are taken into account in water management options, and public supporting measures for better implementation of regulatory provisions are required.

Questions for discussion

- How can current frameworks for infrastructure investment and asset management be gradually developed so as to also consider approaches that combine infrastructure and innovative technologies to further contribute to water security and sustainable growth?

- How can governments and regulatory authorities make improve the flexibility of regulation to ensure that it does not create inadvertent barriers to innovation?

Annex 1 – Stakeholders' mapping: select examples of public organisations active in water-related innovation

14. A brief review of the parties involved in the water-related innovation ecosystem shows that there are a significant number of stakeholders involved, in particular in terms of clusters, incubators, and accelerators. These mainly cover e.g. research, demonstration, and access to public and private funding. This brief overview confirms the analysis in Part I, as these organisations have been instrumental in facilitating access to these different stages.

Table 1. Select examples of public organisations active in water-related innovation

	Cluster	Incubator	Accelerator	Innovation hub	Market Accelerator
EUROPE					
WATER SUPPLY AND SANITATION TECHNOLOGY PLATFORM (BRUSSELS)	√				
CLEANTECH FINLAND					
WETSUS CLUSTER (NL)	√	√		√	
COMPETITIVENESS WATER CLUSTERS (FRANCE)	√				
PORTO INNOVATION HUB (PORTGUAL)				√	
US					
IMAGINE H2O			√		
NEWIN (New England Water Innovation Network)	√				
MASSACHUSSETS CLEAN ENERGY CENTER				√	
CANADA					
WATERTAP ONTARIO	√		√		
SUSTAINABLE DEVELOPMENT TECHNOLOGY CANADA				√	
SINGAPORE					
ECONOMIC DEVELOPMENT BOARD					√
SPRING		√			
CHINA					
ASEM WATER	√				
ISRAEL					
HUTCHINSON KINROT		√			
AFRICA					
ICEADDIS		√			

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