BUSINESS MODEL INNOVATION

Outline

A business model can be defined as a simplified representation of the elements, and the interrelations between these elements, that an organization employs to create, deliver, capture, and exchange sustainable value for, and in collaboration with, a broad range of stakeholders.[1]

In the case of the water sector the range of stakeholders include governments, international organizations, service providers and their networks, watershed institutions, regulators, financial actors, civil society, science and academia, advisors and companies, such as technology providers like De Nora.[2] An organization and its business is at the center of a complex network of entities.

[1] https://www.repository.cam.ac.uk/bitstream/handle/1810/257296/Geissdoerfer_et_al-2016-Journal_of_Cleaner_Production-AM.pdf

[2] https://aquaforall.org/viawater/files/oecd_stakeholder_engagement_for_inclusive_water_governance.pdf

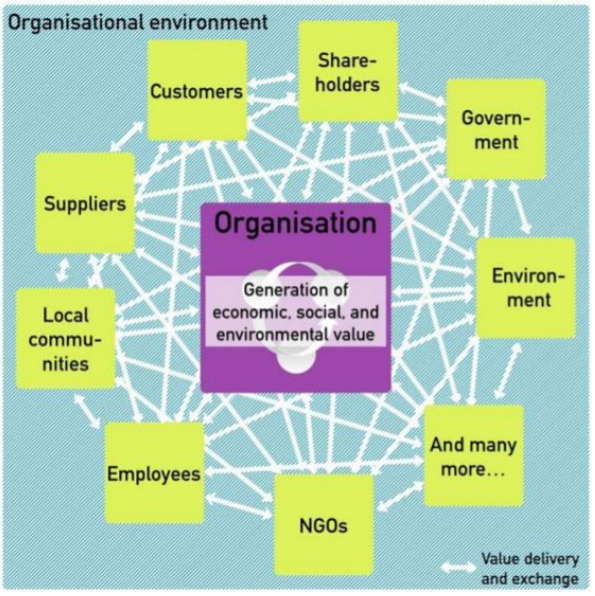

Figure 1 – The sustainable business model concept.

As showed in **Figure 1**, the term "business" does not imply that the business models are only useful for firms with a sole mission of achieving financial goals. In general, the ultimate scope of a business is the generation value, that can be *economical*, *social*, and/or *environmental*. This definition nicely connects with the underlying question of the **Internet of Water De Nora Challenge**: "how might we create value for the *customers*, i.e. those who makes a company generate revenues, the *community*, and the *environment* leveraging digital technologies within the water treatment industry?".

An answer to this question may be to innovate, enabled by digital technologies, the way De Nora delivers value to its broad range of stakeholders, i.e. doing **business model innovation**. This regards re-thinking the activities done within a brand new business model or changing some components of the existing one.

Various tools exist to assist in the design and visualizing a sustainable business model. One of the most popular is the **Business Model Canvas**, which summarizes the main components of a business model, as shown in **Figure 2**. Each frame contains a component and the questions to be answered to fill it in. Detailed workshops on how to use canvas like this are available online.[3]

[3] https://www.alexandercowan.com/workshop-business-model-canvas/

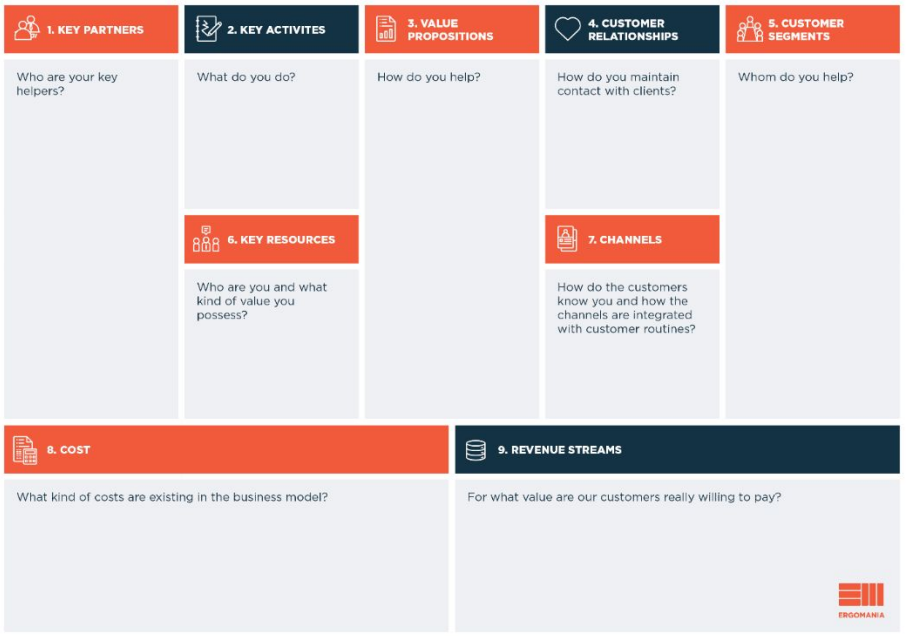

Figure 2 – A template business model canvas.[4]

In recent years, business model innovation and digital technologies have been often connected: it is not a case that the term "business model" emerged more and more during the internet boom. As a matter of fact, digital tools are often the enabling factor of novel ways of making business. A notable example is represented by Airbnb, whose business model canvas is shown in **Figure 3**: the web platform and the app are well-known, but the digital platform is only the enabling "brick" of a broader picture.

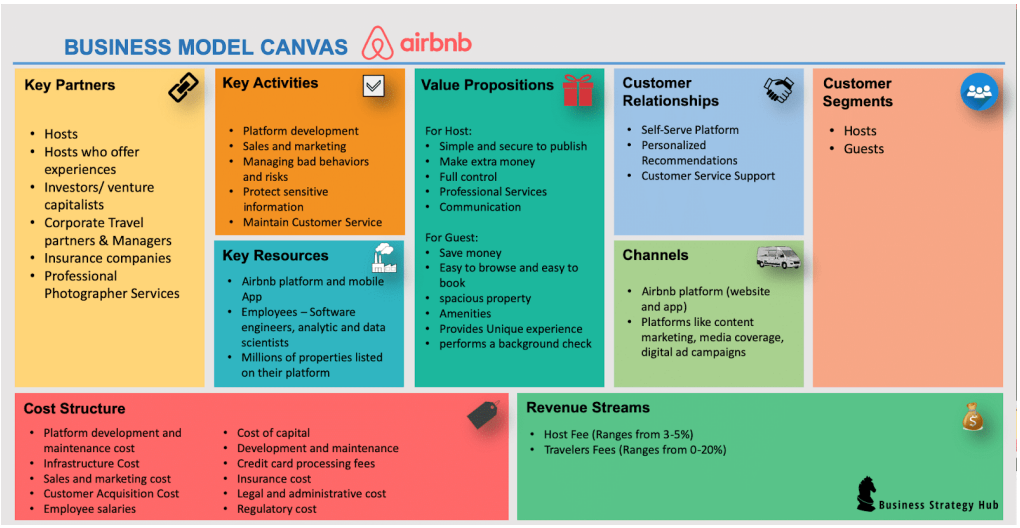

Figure 3 – Airbnb business model canvas.[5]

[4] https://ergomania.eu/business-model-canvas-complete-business-model-on-a-single-sheet-of-paper/
[5] https://bstrategyhub.com/airbnb-business-model-how-does-airbnb-make-money/

For brand new businesses, such as Airbnb, business model innovation means to design from scratch each frame of the canvas. Nonetheless, another way to practice business model innovation is by introducing incremental changes to a business model. This involves initiating purposeful changes to specific business model elements, followed by realigning the other business model components with the changes.[6]

The cornerstone of a business model is the value proposition: a promise of value to be delivered, communicated, and acknowledged to certain customer segments. In the water sector, it is common that novel regulations are an important driver for companies like De Nora to increase their value proposition: for instance, when an emerging contaminant in drinking water is regulated, such as PFAS, De Nora may increase its offering to "promise" the removal of the pollutant to customers, e.g. public water utilities, struggling with such restrictions.

This latter case does not necessarily involve digital technologies, which may instead enable novel services, such as advanced asset management, remote monitoring, decision-making systems, and remote assistance.[7] Among them, remote assistance is a nice example of recent increase of De Nora's value proposition: De Nora VIA™ service, an innovative way to connect De Nora technicians with on-site customers in real time using live video and inspections.[8] However, ideas related to the use of digital enablers for increasing the value proposition are the objective of Challenge 3 – Digitally-enhanced water treatment and Challenge 4 – Simplification of Design, Operations & Maintenance.

Within this challenge, the scope is to re-think or adapt De Nora's business model in order to meet the favor of current or new customer segment(s). Currently, De Nora's mainly follows the "product" business model:[9] a product or a standardized service is sold to customers and the value proposition is transactional, i.e. to provide something that customers will buy. De Nora sells equipment for water treatment to customers (e.g. water utilities and industries) or resellers with an upfront capital investment by them. Additional revenue streams come from selling spare parts and aftermarket services.

Selling products or services is the oldest and most common form of business model. This pathway requires:

- Identifying potential customers
- Identifying how to capture awareness and create demand
- Identifying mechanisms of monetization - that include unit price, freemium, razor-blade, discounts for quantity

The advantage is the scalability, greater volumes typically reduce costs and profitability is reached only when the firm achieves scale.[10] In De Nora's case, it is more convenient to sell medium-large equipment to treat significant volumes of water with costly equipment rather than selling many small-size treatment units. Thus, the current structure is mainly designed for customers with high purchasing power and large water volumes to be treated.

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[6] http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1337236&dswid=4571
[7] https://www.youtube.com/watch?v=8Oo8zaR252g&feature=youtu.be
[8] https://www.denora.com/products/brands/DE-NORA-VIA-Remote-Support-Service.html
[9] http://www.businessmodelzoo.com/business-models/
[10] http://www.businessmodelzoo.com/business-models/

The exploration of novel digitally enabled ways to do business may allow to reach new customers segments, hence improving water availability and quality to them. The most impactful directions are subscription-based business models (i.e. “solutions” models) and tailored profit models for the large market of developing countries.

Subscription-based business models

In subscription-based business models, also known as “solution” models, the value proposition is relational instead of transactional. For instance, in B2B markets, users of airplane engines, machine tools or computers are provided services on a solutions basis such as “power by the hour”, “machine time as a service” and “software as a solution”. This pathway requires:

- Identifying potential customers
- Creating high level of trust with those customers, that allows identification of unmet needs
- Tailoring the product or service delivery to fulfil those needs in the context of the customer
- Charging mechanisms are almost always value based rather than cost based

The main risk of these models is the upfront investments in time, money, and relationship building needed to reach the level of trust that makes the model profitable.

In the case of water treatment, customers are basically challenged with ensuring the accurate water quality is met, based on the specific industry, application and operating parameters of the site (e.g. drinking water, irrigation, process water, etc.). Essentially, their end goal is to treat the water by way of chemical injection or filtration in order to reach the quality levels needed. They just want a solution for their problem, they do not necessarily need to buy a water treatment equipment.

Because of this, there is an opportunity to leverage **subscription-based business models** enabled by digital technologies: the customer subscribes to a “treatment-as-a-service” plan, where the charging mechanism may be constructed from the data, taken for instance by IoT devices in the field, asking no or reduced upfront capital investment.

This type of business model may be attractive either for current customer segments or may even attract new ones, which may have different requirements than traditional De Nora’s ones.

A notable example can be the agriculture market. In fact, while most of the markets for water treatment technologies have a consistent and constant flow of water that needs to be treated, the agriculture market, and especially the post-harvest segment, experiences substantial shifts in water treatment volumes on a seasonal basis. This variability in treatment volumes makes market entry (especially for disinfection) difficult since equipment must be sized to handle peak flows, which may only occur for a fraction of the year, making the return on investment relative to delivered chemicals very unattractive.[11] In other words, it is more convenient to buy chemicals for disinfection (e.g. calcium hypochlorite tablets)

[11] http://www.fao.org/land-water/world-water-day-2021/water-management/wastewater/en/

when the water treatment is needed than to buy a dedicated equipment for on-site generation.

Business models for developing countries

Today the water industry is designed for industrialized countries, where large drinking water and wastewater treatment networks serve millions of people. However, third-world countries or economically challenged regions still lack access to basic water and sanitation, a.k.a. WASH (Water, Sanitation, and Hygiene) global issue.[12] Specifically, 4.5 billion people do not have access to a toilet that is connected to a sewage system or vaults and approximately 90 percent of wastewater is untreated when discharged. Water pollution causes illness and accounts for 50 million deaths per year worldwide, especially in Africa and Asia.[13]

These people who subsist on few dollars a day are often referred to as the Base of the Pyramid (BoP): their incomes in current U.S. dollars are less than $3.35 a day in Brazil, $2.11 in China, $1.89 in Ghana, and $1.56 in India. Yet together they have substantial purchasing power: the BOP constitutes a $5 trillion global consumer market. Their aggregate purchasing power suggests significant opportunities for market-based approaches to better meet their needs, increase their productivity and incomes, and empower their entry into the formal economy.[14]

To better serve the BoP population, organizations need to move beyond offering basic sanitation products becausethey are priced at levels that are inaccessible to low-income, BoP segments, even with the benefit of financing. In addition, developing-country markets present economic, logistical, and regulatory obstacles that differ markedly from developed country markets.[15]

[12] https://www.unwater.org/water-facts/financing/

[13] https://www.innovationpolicyplatform.org/www.innovationpolicyplatform.org/system/files/5%20Wastewater%20Treatment_Apr6_0/index.pdf

[14] http://pdf.wri.org/n4b_executive_summary_graphics.pdf

[15] https://path.azureedge.net/media/documents/TS_safe_water_prelim_an.pdf

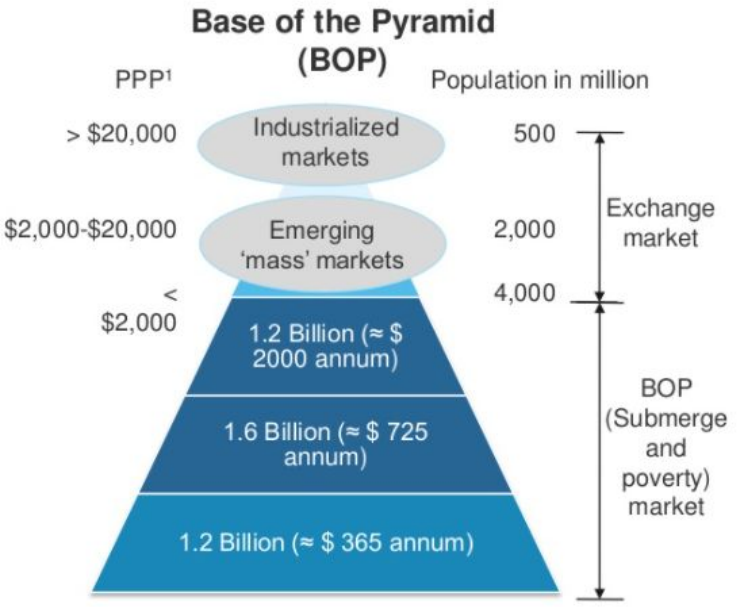

Figure 4 – Base of the pyramid. PPP = Purchasing power parity.[16]

Moreover, portable water treatment devices are not only costly to the end customers, but also to the manufacturer, due to downscaling of technology providers' products. For instance, De Nora developed portable sodium hypochlorite generators, which are small versions of a large electrolytic systems. These systems, as well as others, have been deployed for potable water infrastructure in low-income countries such as Myanmar, Puerto Rico and Haiti.[17] In all cases, while demonstrating the potential application of De Nora's systems to developing countries, the deployment has been conducted in collaboration with humanitarian organizations, pursuing social goals not economic ones. Current De Nora's distribution system is not suitable for the developing world and creating one could be extremely costly in terms of money and resources.

Novel business model, enabled by digital technologies, may help making low-income markets more attractive for water treatment companies. As a matter of fact, as shown by **Figure 5**, hybrid business models combining social and economic goals are emerging through external, social impact investors.[18] Such investors could purchase the household devices (e.g. container-based sanitation systems, CBS) or micro-treatment plants and rely on the expertise of economically-driven organizations to operate them. These social impact investors attempt to generate water revenues as well as to reduce costs. Setting up economic goals means that the organizations are more likely to cover their costs but, at the same time, they have to learn from profit-oriented firms how to organize professional marketing campaigns and build entrepreneurial capacity.

[16] https://www.slideshare.net/hgebauer/business-model-innovation-for-water-services
[17] https://www.linkedin.com/pulse/de-nora-relief-organizations-our-chlorine-generation-sawyer-jd/
[18] https://www.diva-portal.org/smash/get/diva2:1337236/FULLTEXT02.pdf

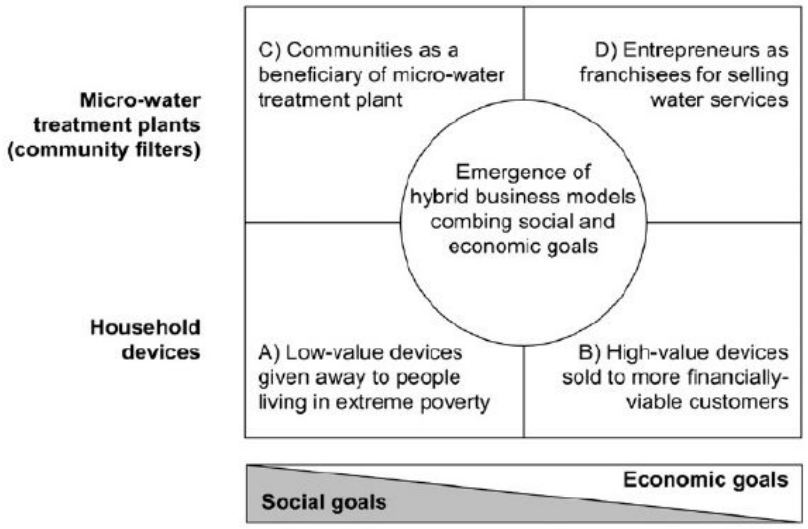

Figure 5 – Basic business models for water services.

Figure 6 – A container-based sanitation system and a micro water treatment plant.

Together with new business models, the role of digital tools can be crucial: collection of crowdsourced data, together with and supply chain innovations, can make the deployment of these water projects more attractive and economically viable.

In fact, it has been shown that digital innovation can overcome the obstacles that organizations face when scaling up the services they provide in developing countries. As an example, companies offering container-based sanitation (CBS) systems collect human excreta from hundreds of households on a weekly basis. At the start, when fewer toilets had to be serviced, this was typically managed with handwritten records and dispersed spreadsheets. More recently, many technological tools are employed to manage this process, including the Internet of things (IoT), mobile phones, and cloud databases. IoT solutions, such as QR codes and RFID tags, are primarily used to track the movement of human excreta from the collection point to the treatment center. Mobile phones, both “smartphones” and “function phones,” are integral to the data collection and management of these organizations. They allow IoT tagged objects to be scanned, customer data to be

efficiently entered, and for seamless customer service requests and reminders. In contexts where mobile payments are commonplace, they are also used for fee collection and payment reminders. Cloud-based customer relationship management tools provide a home for all the data that are generated and convenient means for sharing information.[19]

Insights, hands-on knowledge and tools to design an effective water, sanitation and waste management business model are available at **SSWM Toolbox**,[20] an extensive collection of knowledge around sustainable sanitation and water management.[21]

Also, a suggested reading is "Digital Solutions in the Water Sector" from GSM Associations, which shows with several examples business models that leverage mobile technology to deliver better and more affordable energy, water and sanitation services in emerging markets.[22]

Business models supporting water reuse

Water reuse generally refers to the process of using treated wastewater (reclaimed water) for beneficial purposes such as agricultural and landscape irrigation, industrial processes, non-potable urban applications (e.g., toilet flushing). This approach has significant environmental benefits that include mitigating water scarcity, and offering opportunities for revenue generation, especially if more resources than water are recovered, or if treatment can deliver water of potable quality.[23] A schematic representation of the value that can be extracted from wastewater is showed in **Figure 7**.

However, the main challenge of water reuse is to regain the extra cost induced by the resource recovery and reuse value proposition. In other words, if the reuse requires for example additional water treatment or water conveyance towards the beneficiary which are not straight away borne by the beneficiary, these costs should be recovered first. In fact, cost recovery from sale of treated wastewater for irrigation is very limited although it is the largest reuse sector. Especially in developing countries farmers seldom pay for fresh- or groundwater (except for pumping) while treated and piped water is usually significantly subsidized.

Another challenge is to recover as much as possible the normal operational and maintenance cost of the treatment process or even start making profit. This can be very ambitious but is not impossible as in the case of energy recovery or the reclamation of potable water. As a reference, depending on the final application, being irrigation or potable use, the reported price of reused water can vary from few cents to more than 1 US$/m3.

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[19] https://www.mdpi.com/2071-1050/10/3/752

[20] https://sswm.info/perspective/innovating-business-models

[21] https://sswm.info/

[22] https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2020/12/Scaling-Digital-Solutions-in-the-Water-Sector-Lessons-from-CityTaps-and-Wonderkid.pdf

[23] https://www.researchgate.net/publication/283667660_Business_Models_and_Economic_Approaches_Supporting_Water_Reuse

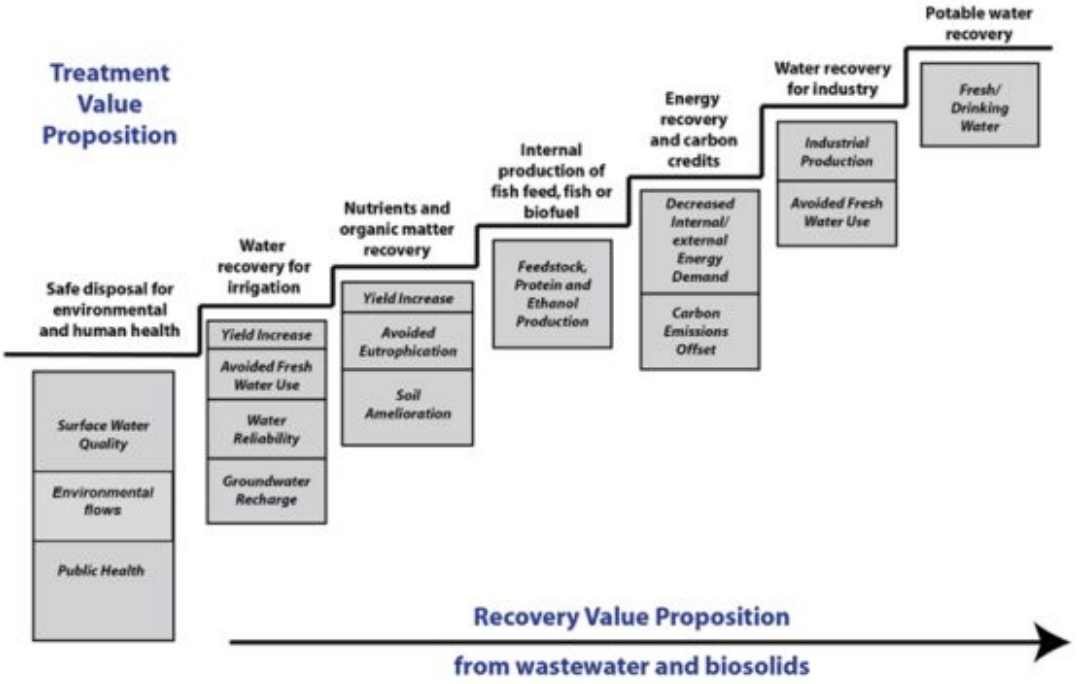

Figure 7 - Ladder of increasing value propositions related to wastewater treatment and water, nutrient and energy recovery

However, current water reuse applications are not yet based on digital solutions that connect providers of safe treated water (WWTPs) with end-users (e.g. farmers) and provide cross-sectoral coordination taking into account water quantity and quality requirements with obvious effects on the business case of water reuse. Examples of digitally enabled solutions have been designed for improving the water reuse business model, such as:

- an early warning system for safe reuse, based on multi-parameter sensors and machine learning, aiming to prevent bacterial and toxic contamination linked to the reuse of treated wastewater.[24]
- a web-based information system which gathers data related to sewer networks, drinking water networks and land use. Georeferenced data are available online and from mobile devices on a single platform. The integration of all this data will provide decision support for future applications of water reuse in metropolitan areas.[25]
- a match making web-based platform to manage demand for treated wastewater for agricultural irrigation. It is based on the assessment of irrigation needs using remotely sensed data as well as on the amount and quality of available reused water.[26]

[24] https://www.digital-water.city/solution/early-warning-system-for-safe-reuse-of-treated-wastewater-for-agricultural-irrigation/

[25] https://www.digital-water.city/solution/webgis-platform-for-improved-decision-making-in-water-reuse/

[26] https://www.digital-water.city/solution/match-making-tool-between-water-demand-for-irrigation-and-safe-water-availability/