CHIEF BUSINESS OFFICER - WFI GROUP

DR ARI VELTMAN

“The role of decentralized systems is expected to increase significantly, in line with the global need to think strategically about sourcing water”

Decentralized options for water and wastewater treatment are increasingly being contemplated as solutions to drought and water pollution, with a promising future in the circular economy. CRISTINA NOVO PÉREZ

With cutting-edge technologies for the water and wastewater treatment sector, Water From Innovation (WFI) Group helps customers meet environmental and regulatory compliance requirements at the same time as they improve operational efficiency and reduce costs. To learn more about the benefits and opportunities of decentralized approaches to wastewater treatment, we spoke to Dr Ari Veltman, Chief Business Officer at WFI Group. In this interview he discusses the role of decentralized solutions in water ecosystem planning: how they contribute to sourcing water for non-potable purposes to move towards a circular economy model.

Please tell us briefly about your career path and your current role at WFI Group.
My background took me over various roles, geographies and industries. As an economist, I started my path in the Financial Advisor to the Chief of Staff unit, planning and managing budgets. After completing my M.Sc. in business, I moved to Japan to complete a Ph.D. in Tokyo Institute of Technology. This was followed by business development work, and then 8 years in international offices of Google (Ireland, Japan, Singapore), leading various business teams.

In the last few years before joining WFI Group, I was helping technology-based startups and companies in various fields as a business mentor.

As the Chief Business Officer in WFI Group, my responsibilities include the overall business strategy and business activities. WFI Group comprises of several technology business units, including biological wastewater treatment, inorganic pollutant removal from water, and high recovery RO.

"With a decentralized approach, treatment facilities and execution will be spread and done at local points – closer to the source"

We'd like to discuss the role of decentralized systems. Maybe we should start with a definition of what is meant by decentralized systems, specifically for wastewater collection and treatment?
There is a wide range of what can be considered “decentralized”. To consider what is “decentralized”, a good starting point is to consider what is a “centralized” approach.

A centralized system-design approach suggests making an effort to consolidate water and wastewater treatment in one place. It includes centralized system-planning as well as centralizing the facilities and execution. This will usually be taken at a national level, a state or county level, and can also include a metropolitan district.

With a decentralized approach, some or all of the treatment facilities and execution will be spread and done at local points – closer to the source (be it water or wastewater), to be used (or dispersed) locally.

There are of course cases where the strategic planning is national or centralized, and as part of the planning, some of the treatment facilities will be decentralized. The approach and technology will depend on the specific needs and strategic decisions for each such location. This can apply to smaller or rural communities, to specific neighbourhoods, to detached facilities such as resorts, RV camps, remote malls, or oil & gas facilities, and can be also considered at the individual building or household level.

The scope and role of decentralized systems depends on a holistic approach, taking into account circular economy opportunities, economic, operational and strategic considerations (such as water economy resilience).

Can you comment on the role of decentralized approaches in the water industry, and specifically for wastewater treatment?
Planned and leveraged correctly, decentralized solutions can be a crucial component in planning for circular economy through reuse, as well as provide a significant strengthening to water resilience at both the local and the national levels.

The role of decentralized systems is expected to increase significantly, in line with the global need to think strategically

When there is an opportunity to utilize treated wastewater locally, the economic benefits of treating the wastewater locally can be huge and turn what was traditionally a huge economic burden to a strategic asset, possibly even an economic net-positive opportunity, when taking into account the value of water. Transporting wastewater for hundreds of miles to be treated and then sending them hundreds of miles back to be used makes little sense in this respect.

We are talking here mainly about non-potable decentralized use cases, mainly for irrigation and agriculture, possibly some industrial applications as well, but this is mainly a question of the available technology at this point, and local potable decentralized reuse may also become relevant in the near future.

about sourcing water. We (society) need to learn how to maximize and optimize strategically water sources and usages.

An obvious example is the use of local wells for sourcing water for either potable or non-potable use. Think of an extreme centralized approach in which one sends the water from a local well hundreds of miles to be treated for use, then have the treated water transported hundreds of miles back to be used. This is theoretically possible, but the cost of building and maintaining such a system will be huge and unproportional to the possibility of building a small facility to conduct the treatment locally.

Consider that a centralized source of water exists and is distributed to various communities. Even in such a case, when looking into considerations of resilience, a locally treated separate source can provide water security and backup, and an ability to operate independently whenever the central distribution system or source may be compromised.

Now let's look at wastewater. We have to first recognize that "wastewater" is an important source of water. Society might need to go through some adaptation of thinking, but when treated properly, wastewater can be a huge source for the overall water economy, both at a national level, and locally.

> **Planned and leveraged correctly, decentralized solutions can be a crucial component in planning for circular economy through reuse**

In Israel, about 90% of the municipal wastewater is being reclaimed and reused. This is actualized both in central wastewater treatment plants, and through local facilities designed to provide the irrigation for nearby agriculture or parks.

If we look at the considerations we discussed earlier, for the extreme example of treating remote wells centrally, these considerations of course apply to the case of reused wastewater as well.

What are some of the possible concerns around a decentralized system approach, and how do you address those?

The potential benefits, and indeed the need to treat wastewater locally are clear. There are a number of possible concerns when considering a decentralized solution, both for the local community itself, and for the central planner or regulator. The good news is that there have been significant advances and innovation in this space, and there is a new generation of technologies to address these concerns.

> **The economic benefits of treating the wastewater locally can be huge and turn what was traditionally a huge economic burden to a strategic asset**

The concerns mainly revolve around the question of possible improper operations, maintenance and general negligence which can lead to non-compliance of the resulting effluent, and ultimately risks to public health.

A known challenge for smaller communities is to find highly trained and experienced operational staff, as well as a difficulty to economically justify a meaningful full-time workforce dedicated to operating water or wastewater treatment facilities. It is typical in small communities to have operational staff responsible for a wide range of duties for the communities, taking care of a wastewater treatment facility can be one of which.

For such a small community – the benefit of a local independent resource and economic benefits can be offset by the concern of not being able to operate sophisticated systems in an ongoing stable manner. For the regulator, there is of course a concern related to the above, that due to general negligence, lack of abilities or lack of funding, improper treatment will lead to deterioration of a system and the possible usage of non-compliant effluent.

> **"There are a number of possible concerns when considering a decentralized solution, but a new generation of technologies addresses them"**

Alternatively, very simple solutions exist and have been deployed historically, but they are not suitable for the modern expectations from treated effluent, for reuse purposes or otherwise. Such solutions can include septic tanks or lagoons.

All of these concerns are legitimate concerns, and have been a barrier for the implementation of more advanced decentralized solutions for some time. The available technologies play a big part in these decisions, and as mentioned – technology that addresses these concerns already exists.

In order to address the concerns mentioned above, what we need is a solution that provides the high-quality effluent that can be reused for irrigation and agriculture in a stable reliant way, and can be operated with minimal operational overhead, without the need for a sophisticated operational team.

Solutions exist today that minimise the need for operational attention, allow for remote monitoring and adjustments, include only basic equipment, and are highly cost-effective. This, while providing great consistent results. As an example, I'll give a short explanation of the TAYA technology for biological wastewater treatment, developed by Triple-T, which was designed to address these issues.


Yiftah WWTP, Israel

The TAYA patented design is very simple, based on a divided basin filled with biomass attached to gravel media. The wastewater moves between these two chambers. The concept is similar to a fill-and-drain mechanism, but the specific design and algorithm result in accurate sludge control (that only needs to be removed after several years of operation) and effective removal of Nitrogen (Ammonium as well as total Nitrogen values). It only requires minimal operational attention 1 or 2 times a week, the only electro-mechanical equipment are two simple pumps, and the operational costs are very low. Everything is also connected to a remote monitoring and control system.


Visiting the R&D labs of ToxSorb

This solution allows a small community to generate high quality effluent from its wastewater locally, without being concerned with sophisticated operational needs and with minimal supervision time on a day-to-day basis, and has been already approved by a number of regulatory bodies, including in the United States.

Another option for any system is to consider contracting external support – contracting a company to provide the ongoing operations of the facility (whether for a simple-to-operate system such as the TAYA, or something more complicated). This should be taken into consideration in the planning phase, so that costing of the service provider can be built into the OPEX planning.

What are some barriers preventing more widespread use of these systems, and what are your expectations for the future?
Key barriers are those that concern adaptation of new technologies. There are a lot of existing dispositions about what "decentralized systems" can do and what they are, there is lack of familiarity with new available technologies, and of course there can be lack of trust and a general preference to continue with what is familiar – even when this means higher cost or unhealthy/ non-compliant effluent.

These issues are even more prominent for smaller communities, that do not have the ability to employ dedicated staff or actively stay up to date with new available technologies and will also be more difficult for technology providers to reach out to and educate.

"The TAYA solution allows a small community to generate high quality effluent from its wastewater, without sophisticated operational needs"

> There is lack of familiarity and trust on new available technologies, and to top that, there is of course the financial barrier

To top that, there is of course the financial barrier. Even if a technology makes sense economically, even if over a 10-year period there is a net economic benefit, the immediate funds required for financing the project might not be available.

My expectations are that along with efforts made by providers of innovative technology, we will see the regulator and central authorities take an increasingly active role in identifying new relevant technologies and streamlining the efforts to validate and adopt them as relevant.

Having a process to pilot and approve a new technology is helpful, but not enough. While the purpose and logic of this is clear, this creates *de facto* another barrier, another hassle, time and cost that can deter both communities and technology providers from proceeding, while these technologies are required to solve concerns identified by the regulator or the central planning organization.

> "I expect to see the regulator and central authorities take an increasingly active role in identifying and validating new technologies"

A more active role can mean a proactive identification of candidate innovations, and a sponsored process to pilot these technologies in advance, then proactively matching them to relevant communities.

Such processes can also help with cutting a lot of red tape and funding. There are numerous paths to fund infrastructure projects, so funds generally exist, but we know that the path to match those funds with the projects in need is not always an easy one. With the proactive involvement suggested above, some of these funds can be directed to the processes of identifying, piloting and approving new technologies as well as easing significantly the process of approving financing support to projects that were proactively identified by these organizations.

Could you share some real-world examples of successful projects or applications where decentralized systems have proven to be particularly effective in addressing wastewater treatment challenges?

I'll mention a couple of examples of projects where the effectiveness of such systems is a real game changer. The Yiftah Wastewater Treatment Plant (WWTP) serves several small communities and military outposts, all situated on a small plateau in northern Israel. Their wastewater used to be treated locally in septic tanks and then moved into a nearby lagoon with the assistance of gravity. Even though the lagoon was located near several crops requiring water, the quality of the previously treated wastewater was too low to make it suitable for irrigation.

To achieve higher-quality effluent without incurring a significant increase in operational costs, the existing facilities were leveraged as a primary treatment, adding highly efficient secondary treatment based on the TAYA aerobic-anoxic technology. The facility treats about 210 thousand gallons (800 cubic metres) daily. Additional sustainability and significant cost savings were achieved, as the rock extracted locally from the mountain was directly used by the TAYA as the biomass carrier

Yiftah WWTP, Israel.

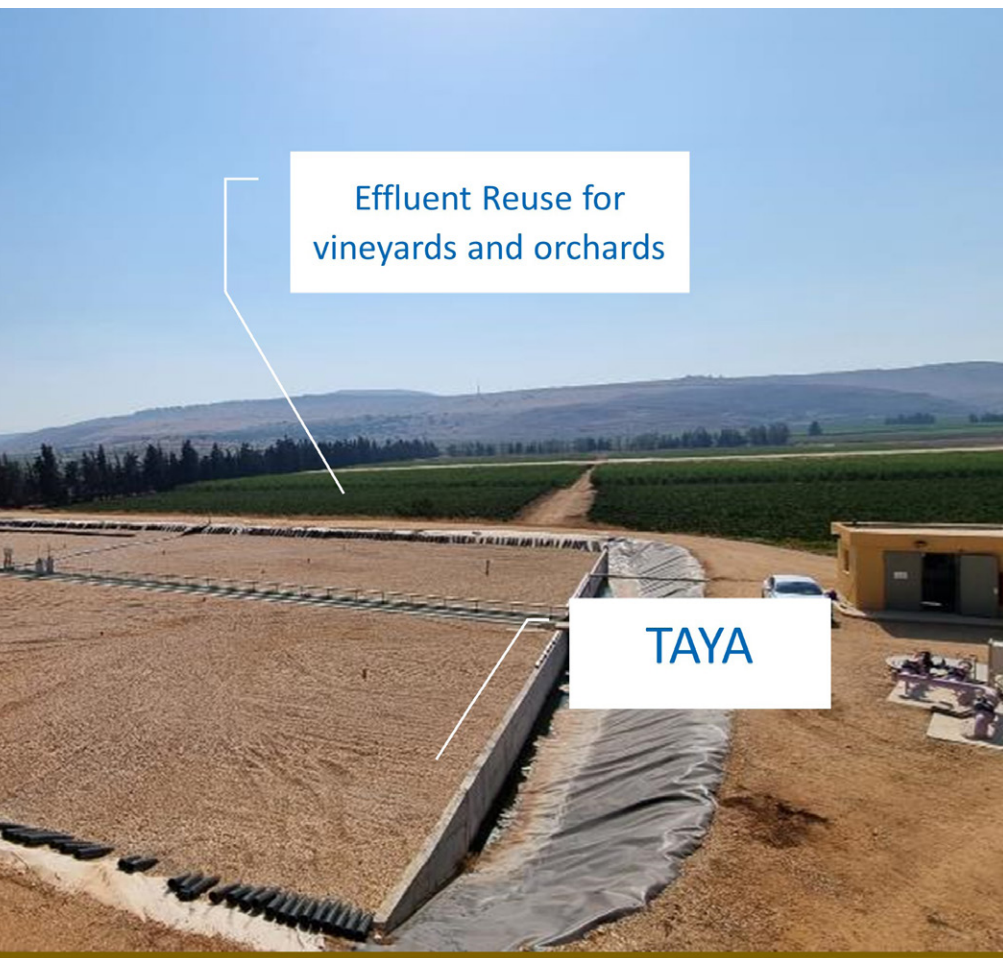
for the biological treatment process. Currently, the effluent is used to irrigate the nearby orchards and vineyards.

Han-Hashayarot is a detached eco-tourism lodging and camping site in the Negev desert on the ancient Nabatean "perfume road". They required a sustainable yet affordable solution without any odour, noise, or visual impacts or the need for highly skilled or dedicated personnel. The TAYA technology was implemented to allow an odour-less solution for treating their wastewater locally. With minimal electro-mechanical equipment, this solution creates no interruptive noise, and merges well into the overall landscape. The local TAYA-based plant in Han-Hashayarot requires minimal attention from their general operations staff, and very little electricity, without any need to deal with sludge. The facility treats 16,000 gallons (60 cubic meters) daily. The effluent from the TAYA is used to irrigate a nearby Bedouin olive plantation, and the facility itself is used by Han-Hashayarot to showcase sustainable circular-economy solutions.

Can you expand a bit on the role of decentralized considerations at the national planning level by the regulator?
When planning the overall water economy and resilience for the future, one has to consider all possible resources and usages and optimize across them. For one thing, not all water resources are equal. Potable water is, by definition, a more limited (and costly to obtain) resource than non-potable water. One planning consideration then, is to maximize matching potable water sources to potable use.

To this point, when you look at decentralized wastewater treatment that can provide a source for non-potable water suitable for irrigation, it will make sense to use that locally for those purposes instead of using potable water resources.

To provide some more sense for this kind of wider thinking, I can give an example of how national thinking and planning is translated into incentivization of a decentralized private solution. This example is different from the wastewater examples already given, providing another angle of the national/decentralized symbiosis. It involves a private entity, the central governmental body and the technology provider.



"Green Village" is an educational youth village in the centre of Israel. Local supply of drinking water is easily available in this location. The Green Village has a well on its premises connected to a regional aquifer, and has an incentive to achieve water independence and save costs. The aquifer underneath happens to be polluted with Nitrate, Perchlorate and EDB. The national water authority has an interest to treat this pollution and limit the spread of the pollutant.

The national water authority in this case defined an incentive-scheme in the form of available per-pollutant quantity-based compensation. ToxSorb (a research-based company specializing in solutions for inorganic water treatment) was chosen to provide a combined solution based on adsorbent technology and desalination (RO). The facility treats 70,000 gallons (265 cubic metres) daily.

The benefit of this project nationally, is the containment of a pollutant source of an important aquifer, upstream. The Green Village gains resilience and independence, while turning what is normally the cost for providing drinking water into a source of income.