

WHY?

When Ziad, the founder of Mrüna, was appointed as a Sustainability Consultant at the Dubai Expo2020 project in 2018, the site was a barren desert, and his role was to achieve the CEEQUAL Sustainability Certification Credential for the project's Infrastructure. During his time there he witnessed firsthand the amount of time, energy, and resources required to build a sewer network.

Traditional Wastewater Utilities consist of two essential components. A centralized plant, attended by a small army of skilled operators, and a vast sewer network. Astonishingly, 80% of the construction cost is for the sewer network: including pumping stations, concrete sewer lines, precast manholes, and an army of engineers to get it accomplished.

It begged the question, "Why are we spending a fortune to send precious water many kilometers away to a treatment plant, to then only bring it back in a tanker truck to irrigate the landscaping?" Perhaps this strategy made sense in water rich England at the turn of the 20th century, but why do we continue to pursue the same strategy throughout the world?

In Lebanon, the country's largest river is overflowing with sewage, poisoning the environment and the people who eat the crops it irrigates. Donors pay a fortune to vacuum wastewater from Informal Settlements which have overwhelmed nearby treatment stations. To add insult to injury, most of the vacuum trucks dump their cargo in the river to save fuel, knowing full well the treatment stations are at over capacity anyway.

NGOs, Governments, and Real Estate Developers continue to invest billions of dollars a year on outdated technologies and strategies. Consequently, international donors have funded treatment plants which have never seen a day of operation since their ribbon cutting ceremony. Simply because carving a sanitation network up the splendid mountains of Lebanon will cost many times more than the treatment plant itself: never mind the operating budget.

In Lebanon, a one size fits all centralized sanitation strategy is worse than unsustainable greenwashing: it puts people lives and a nation's precious resources at risk. Mrüna is a loose transliteration of the Arabic word for Resilience. And our mission to develop and implement a solution which will rapidly restore our environment and our dignity.

Disruption of Wastewater Sector Techno-Economic Dependencies

In recent years business and society as a whole have experienced a fundamental shift, fueled by technology, toward a more decentralized organizational structure. Take for example smart power grids that feed electricity back into the network and our newly minted Zoom enabled home offices.

Unfortunately, it appears this shift has skipped the wastewater sector almost entirely. A sector which continues to rely on a model that is not much different than the cities of ancient Rome. Basically, build a conduit to send the "waste" out, as rapidly and as far away, as possible into the nearest water body.

The industry clearly needs a revolution not a sustainability certification to greenwash the obsolete techno-economic path dependencies of a traditional sector. Other startups and established design firms are innovating new methods to exploit new technologies, however some of these innovations are simply innovating more efficient ways to conduct business as usual.

What the World needs is a comprehensive solution which will rapidly transform how wastewater is managed in peri-urban regions. Internationally, a key to scalability will be attracting blended financing arrangements adapted to local needs and circumstances, with an emphasis on financing that also generates social and environmental benefit. Investing in local capacities, skills and competencies institutional arrangements based on sharing costs and risks among users, investors, and establishments thus facilitating the process.

BiomWeb offers a platform to implement a paradigm shift that addresses the design, construction, and operational requirements needed to implement a decentralized and resilient sanitation infrastructure strategy. Our solution promotes a formidable alliance among nature, IoT, and SMEs' that will disrupt centralized sanitation utilities in the same way solar and smart-grids have done to energy utilities.

Centerpiece of a decentralized, scalable, and resilient infrastructure network.

Biomweb is a decentralized nature-based wastewater treatment system that is here to transform wastewater treatment. The solution is simple and elegant: it treats wastewater onsite with a series of water tanks that imitate aquatic habitats found in nature. It also does not require added chemicals, desludging, or vast infrastructure investment. BiomWeb looks like a bouquet and reuses the treated wastewater for irrigation. Green thumbs rejoice!

Complemented by the power of the Internet of Things, owners can monitor and control the system remotely with a smartphone. And our smart windmill makes it very energy efficient. A suite of tools will empower our partner SMEs to charge customers based on usage, and rapidly replace vacuum trucks with BiomWeb.

- Sensors: Will allow us to remotely monitor via a web application the following: volumes of water, TDS, water temperature, and electrical power consumption.
- Web Application: Will store data transmitted from the sensors and allow clients to monitor their wastewater treatment services. Additionally, it will set the stage to connect a network of customers, and service providers who have adopted the above set of technologies, to locally and collectively manage water surplus among each other depending on demand.
- Intelligent Dosing Retention time of wastewater is a key parameter for successful treatment. Most wastewater volumes are generated during the daytime. We can maximize the efficiency by algorithmically rationing the dosing of wastewater from our holding tank to our system over an entire 24-hour period.
- Smart Windmill: Pressure alternates aeration between an electric pump and renewable wind energy based on the presence of local wind speeds. Further reducing energy consumption.

Enlist the Private Sector

It's clear that future demands for water cannot be met unless wastewater management is revolutionized. Water and sanitation have historically been financed by the public sector; however, public sources of finance alone will not be sufficient to achieve SDG 6.

The international development community has put the private sector at center stage as a source for additional investments in sustainable development. However, private finance for the water sector has not reached an adequate scale.

BiomWeb offer a solution which enlists the support of the private sector to pick up where the public sector has dropped off. Our solution achieves both a technology innovation and a business model innovation that aims to decentralize wastewater treatment in the same way Solar City decentralized power generation.

Rather than sell the system at a steep upfront capital cost, which is prohibitively expensive to most potential customers, the objective of our project is to bill clients against WWT as a service provider (€/m³). These would result in small-scale facilities dispersed throughout a country and allow for independent, locally-maintained facilities that are effectively scalable via a network of partnerships and SME sales channels.

Our go-to-market strategy

Combining low maintenance ecosystem technology and approaches with IoT technology allows for a centralized management of a decentralized system, and offers the basis for scaling our business and establishing partnerships with local public, private and NGO partners who can readily exploit our technology and business model to offer services to prospective customers.

We expect to generate revenues via three different channels. Direct sales, sales via our partners, lease agreements, and blended financing and public private partnerships. In addition to specialized technical studies and consulting fees, for developing municipal sanitation master plans, which will offer us access to key stakeholders and present them the information needed to make knowledgeable decisions.

Challenge	Our Solution
<p>Monitoring</p> <p>regulators and utilities need to centrally and securely monitor a decentralized sanitation network.</p>	<p>Our solution consists of two components. The “BiomPod” Nature based Wastewater Treatment (WWT) system, an IoT infrastructure “BiomNet” which allows for a centralized management of a decentralized network of scalable sanitation infrastructure within a “BiomWeb”.</p> <p>Will store data transmitted from the sensors and allow clients to monitor their wastewater treatment services. Additionally, it will set the stage to connect a network of customers, and service providers who have adopted the above set of technologies, to locally and collectively manage water surplus among each other depending on demand.</p>
<p>Operation and Maintenance</p> <p>specialist process engineers, added chemicals, and periodic desludging are expensive.</p>	<p>BiomPod is compact, odorless, and most impressively, requires no desludging. The lack of sludge is immensely significant because conventional wastewater treatment systems, even other natural wastewater solutions, produce sludge as a byproduct. This sludge is another form of waste that needs to be disposed. Our solution does not require wastewater expertise.</p>
<p>Capital Cost & ROI</p> <p>Onsite systems require a high capital investment and long term ROI that is not practical to most customers.</p>	<p>Our business model innovation is a pay-per-use system to overcome sticker shock of centralized WWTP. It requires Internet-enabled water-metering that allows remote management of these physically decentralized WWTPs. A utility can then centrally manage these systems and bill customers. Think Solar City for wastewater treatment.</p>

Infrastructure Cybersecurity

In the long term we believe our organization will have a strong focus on scalable software solutions in the micro water utilities sector.

Increasing the interconnectedness and digitization of water systems will increase operational efficiencies and help rapidly meet demand. It also, however, increases concerns about cybersecurity. Cyber threats are now recognized as core risks to safely functioning societies, economic stability, and business continuity.

As our IoT infrastructure matures, our core offering will also include industrial Cyber Security solutions which are a critical component of delivering a resilient urban infrastructure in today’s world.

Additionally, once our online platform and sensors have matured, Mrüna may also transition to valorize our online asset management platform internationally to vendors who want to adopt our IoT and online applications to their solutions.

Our vision is to establish a distribution and communication technology that will allow us to more effectively harness the natural process exploited by the BiomWeb system