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LETTER FROM THE EDITOR



Food, energy, and water are at the core of sustainability efforts worldwide. They form the nexus of human survival — including economic development and environmental wellbeing.

Food production relies on both water and energy, and unsustainable agricultural practices can deplete both. Water availability affects crop yields and energy production such as hydropower and biofuels. And fossil fuel-based energy contributes to pollution, impacting water availability and food production. The three are inextricably linked.

In the **Food Energy Water** magazine we describe how their deeply interconnected relationship can be managed practically to ensure the long-term resilience of human civilisation.

The sustainability industry is riddled with examples of greenwashing and empty claims — in this issue we seek to present concrete examples of how sustainable means of production and renewal are being practised for real impact in the Global South.

These include circular economy models such as using waste for bioenergy, sourcing of water from the atmosphere, and food waste reduction. This holistic approach ensures that resources are efficiently used, equitably distributed, and preserved for future generations. We hope you find this issue an enjoyable, informative, and in the case of one article, perhaps even a slightly alarming read.

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HER EXCELLENCY CHARLOTTE LOBE

HIGH COMMISSIONER OF THE REPUBLIC OF SOUTH AFRICA IN SINGAPORE

04 South Africa's Vision: Balancing Sustainability and Growth

For South Africa, sustainability is not just about environmental conservation — it must balance economic growth, social development, and climate resilience. Her Excellency Charlotte Lobe, High Commissioner of the Republic of South Africa in Singapore, laid out the nation's sustainability vision, highlighting the need for self-sufficiency, inclusive growth, and collaboration.

“A sustainable ecosystem should be able to support life without outside help while meeting the needs of current and future populations,” Lobe said. “This does not mean isolating ourselves, but rather ensuring that we can sustain life, protect the environment, and foster partnerships.”

Addressing South Africa's Sustainability Challenges

South Africa's sustainability efforts are shaped by its socio-economic realities. The country faces what H. E. Lobe referred to as a “triple challenge” of poverty, unemployment, and inequality — factors that deeply influence its development strategy.

“We are conscious of where we come from and the current dynamics within our country,” she said. “Our approach to social equity takes into account the need to build a strong economy, a developmental state, and a workforce equipped for future industries.”

Guiding this strategy is the National Development Plan, which emphasises protecting South Africa's natural resources while ensuring economic stability. Deforestation, wetland degradation, and biodiversity loss — exacerbated by agriculture and economic activities — require ongoing attention. “We adopted a strategy that combines environmental protection, social equity, and economic efficiency with the country's values and vision,” she explained.



Her Excellency Charlotte Lobe

Energy Transition and Collaboration

While the transition to renewable energy was a priority, the country acknowledged the continued role of coal in its energy mix. “As we move toward renewable energy, we must also consider the realities of our economy. South Africa will still rely on coal to some extent, but we are committed to a just transition,” Lobe said. “This strategy ensures that South Africa can grow in a way that is fair and supports long-term development.”

H. E. Lobe also emphasised the importance of partnerships in advancing sustainability. “Our work must support not just government initiatives, but also communities, the private sector, and academia,” she said.

As South Africa navigates the complexities of sustainable development, its strategy reflects a pragmatic approach — one that acknowledges both the urgency of climate action and the socio-economic realities that shape it.

05 Decentralising Food, Energy and Water Solutions at Scale

Pradepto Biswas, founder of Plataforma, explains what the platform is working on.

Plataforma is a platform designed to create enterprise solutions by integrating food, energy, and water systems. These three essential, interconnected systems coexist to form the foundation of nature and sustain life. The objective of Plataforma is to cross-integrate these systems to ensure resource optimization, sustainability, and efficiency in their utilization.

A large number of organizations out there are involved in producing more food, generating more energy, and extracting more water. They also act in isolation: a food company might ignore water, just as a water company might ignore energy — and energy companies usually focus exclusively on energy production. But only by bringing all three verticals together can we avoid over-extraction or under-utilization of resources.

Unlike conventional systems that focus on consumption-led growth, Plataforma designs solutions based on sustainability and actual needs rather than excessive production and consumption. Plataforma's model harmonizes interaction among these three essential systems to optimize their efficiency and impact — it ensures that each system interacts with and supports the others.

Focus on Smallholders and Decentralization at Scale

Plataforma emphasizes smallholder solutions and small-scale, decentralized systems for food, energy, and water.

This approach helps prevent leakage and inefficiencies that typically occur in large-scale projects with extensive transmission lines for energy and pipelines for water. For instance, treating wastewater at its source enables immediate groundwater recharge, eliminating the need for long-distance transportation and minimizing losses.

The platform is built on two key pillars:

1. **Decentralization** — Addressing challenges at the point of origin ensures that solutions are implemented swiftly, reducing dependency on large-scale infrastructure projects that take years or decades to develop.

2. **Scaling Smallholder Impact** — Instead of targeting massive industrial setups, Plataforma focuses on empowering thousands of smallholders within a food group or energy system. By enabling rapid deployment of modular, small-scale solutions, Plataforma ensures real-time impact and avoids delays associated with large, centralized projects.

Plataforma prioritizes operations in the Global South — India, South America, and Africa — where food production is concentrated and where the largest populations in need reside. It is a solution for the Global South originating and operating in the Global South. Addressing sustainability challenges in these regions is essential to ensuring the well-being of the globe as a whole. Plataforma is already present across several locations in Asia, has just entered Africa, and plans to expand into South America within this decade.



Technology-Driven Solutions for Real-World Impact

Plataforma and the companies under its umbrella develop proprietary, in-house technologies that integrate food, energy, and water systems. The goal is to provide real-world, tangible benefits, such as:

1. **Smart Food Production** — Supporting the cultivation of nutritionally dense crops such as millets and coconuts, which enhance livelihoods and promote sustainable farming practices.
2. **Energy from Waste** — Using agricultural waste to generate compressed biogas and compressed natural gas, reducing reliance on fossil fuels while producing valuable byproducts like organic fertilizers.
3. **Water Accessibility** — Community-driven solutions that provide access to clean water at an affordable cost, allowing households to treat and recharge groundwater without waiting for government or large-scale corporate intervention.

Plataforma ensures that technology is an enabler, not just an investment. By developing farm-gate, pre-processing, and distribution technologies, it enhances the entire food value chain, ensuring efficiency from production to consumer access.

Unlike typical venture capital firms and holding companies that merely invest in businesses, Plataforma actively operates and directly manages its projects. It focuses on developing and deploying proprietary technologies that ensure operational efficiency in all invested businesses. The emphasis is on creating long-term, sustainable food, energy, and water systems that solve real-world problems with practical, hands-on solutions.

Regeneration

Plataforma believes in driving change from within. By actively managing its initiatives, it ensures that sustainability is achieved on the ground rather than being treated as an abstract investment goal. Plataforma's core philosophy revolves around regeneration rather than extraction.



Food Regeneration: Traditional, nutritionally dense crops such as millets and coconuts are promoted to improve food security without exhausting natural resources. Our approach ensures that production methods align with nature rather than disrupting it.

Energy Regeneration: Organic waste from farming is processed into biogas and fertilizer, creating a circular system that enhances both energy production and soil health.

Water Regeneration: Instead of continually depleting natural water sources, Plataforma treats wastewater and captures atmospheric humidity to create potable water at a nominal value of as little as two rupees (SG\$0.031) a litre.

The coconut tree exemplifies regenerative agriculture, historically thriving in about 110 countries globally. Over time, coconuts have lost their significance due to the advent of cheaper substitutes. However, cheap doesn't always mean better, nor does expensive always equate to quality. If coconut oils and coconut-based products, as well as millet-based products, make a comeback,

they can provide tremendous nutritional benefits. Our proprietary solution can process a fresh coconut and make it into a usable commodity, like virgin coconut oil, within 45 minutes of harvesting the coconut. Consuming these products leads to better health outcomes, regenerating both individuals, communities and our natural world.

By integrating these regenerative principles, Plataforma ensures that its systems contribute to long-term environmental sustainability while improving livelihoods.

Plataforma is not just a holding company or an investment firm; it is a hands-on operator that develops and manages technologies for food, energy, and water integration. By focusing on decentralized, scalable solutions in the Global South, Plataforma drives real-world impact while championing sustainability through regeneration. Its holistic approach ensures that communities have access to essential resources without over-extracting or depleting nature's gifts, creating a more balanced and resilient future.

08 Harnessing Water from the Air

Access to safe drinking water is a basic human right, yet 2.2 billion people still cannot access safely managed water services, according to data from UNICEF. Of this figure, 115 million people still collect drinking water directly from rivers, lakes, and other ground surface water sources.

Airowater, which manufactures electrical panels and communication equipment,



Containerized 3000L Airowater Machine for outdoor applications

saw this problem and decided to leverage technology to find a solution. Considering that many places in India experience water shortage, the company turned to an alternative source in nature— air.

Eliminating Risks

In developing countries, especially in rural areas, people often have to travel hours to fetch drinking water. Even then, water sourced from rivers or streams are not 100% free from contaminants. There is always a risk of acquiring waterborne diseases, such as diarrhea and cholera.

To remedy this, Airowater developed its atmospheric water generator technology, whereby machines harness moisture from the atmosphere via condensation to transform air to water. The condensed water is free from contaminants and can be used for drinking purposes.

Since condensation is a natural process occurring when the water evaporates from the sea, lakes, rivers and ponds and converts into water vapour, Airowater's technology does not harm the environment. There are trillion tonnes of vapour in the air, while there are 6 to 7 trillion gallons of water in the atmosphere at any given time. This is constantly made from the sun heating the oceans.

To eliminate suspended dust particles in the air, Airowater employs antistatic and form filtration. Other gaseous impurities do not have the same temperature as water for



Compact 25L Airowater machine for indoor applications

condensation, therefore, they are passed through as gases and not mixed with condensed water. Meanwhile, the process of ozonation destroys viruses and bacteria present in the air.

Since Airowater's water is made from air, no heavy metal or pesticide traces are present, compared to tap water, which is high risk for many contaminants. Air is passed through an antistatic air filter, while the water undergoes a series of purification and ozonation — rendering the finished product safe for human consumption.

Innovative Technique

Airowater carefully follows a detailed process that involves the use of various filters. Once the air is filtered through a patented filtering process, a condensation unit receives the humid airflow from the evaporator. The condensation unit then converts the water vapour into water, in a process called atmospheric condensation.

To ensure no contaminants make their way into the extracted water, Airowater leverages the following four-step filtration process:

1. **Advanced air filters** — In order to eliminate all the dust particles and anti-scalene from the air, the procedure focuses primarily on the micro dust form of filtration to perform the task successfully.

2. **Water dust filter** — In step two, a collection tank filter and tank input filter are used in order to eliminate the

various external particles from the air.

3. **Advanced water filters** — In step three, Airowater uses filters such as Membrane TCR, Sediment Filter RO, and Pre-Carbon Filters, which eliminate any unpleasant smell, odour, and colour from the retrieved water. These filters also remove the various physical impurities from the water up to 5 microns. They reduce odours and the taste of chlorine as well. Moreover, up to 90-95% of different salts and organic molecules get removed via these filters.

4. **Ozone generator** — The ozone generator oxidises and deodorises the water thoroughly, and is 3,741 times more powerful as a disinfectant than chlorine. This allows it to destroy all kinds of microorganisms in an instant.

As the world turns to sustainable measures to prevent depletion of the earth's natural resources, Airowater has turned to air to produce safe drinking water. Airowater does this through its atmospheric water generator units, which vary depending on the size of population who will use it. For example, its Dewpoint Smart, Dewpoint Smart+, and Dewpoint Prime are fit for households and small offices. Meanwhile, Dewpoint Super and Dewpoint Hyper can serve 50 to 150 people, and can be used during relief operations, and for deployment in remote areas/ inhospitable terrain.

For mass scale water generation, Airowater's Dewpoint Mega and Dewpoint Ultra can generate up to 500 litres and 1,000 litres of pure drinking water per day. These can be installed at schools, factories, as well as commercial and residential buildings.

10 Transforming an Industry in Crisis



Coconut farm in Bali, Indonesia

Coconut products are everywhere. From coconut water in post-yoga smoothies to coconut oil in plant-based meats, global demand has surged. Yet behind this boom, the coconut industry is on the edge.

Despite soaring demand, supply is stagnant. Many coconut trees, once producing hundreds of nuts annually, now yield only a fraction due to aging plantations and a broken economic model that discourages replanting. Meanwhile, a convoluted supply chain keeps farm-gate prices low, leaving farmers struggling.

This is where Coconut Knowledge Center (CKC) comes in. Co-founded by Haigan Murray, the organisation is tackling the industry's declining productivity by rethinking business models, promoting direct farmer-to-market relationships, and introducing innovative processing techniques.

In this interview, Murray lays out the urgent challenges facing the coconut industry — and what it will take to turn things around.

Innovating to Break the Commodity Trap

CKC's roots trace back to Coconut Pacific, an Australian business founded in the 1990s. One of its key figures, Dr Dan Etherington, developed a micro-level, village-based system that required no refrigeration or energy-intensive processing for extracting virgin coconut oil.

Murray saw its potential and, by the mid-2000s, helped distribute the technology across Southeast Asia and India. But technology alone couldn't fix deeper industry problems. By 2014, Murray and his team launched CKC, shifting their focus to systemic change.

According to Murray, the coconut industry had been stagnant for over 50 years. Major coconut-producing nations—including Indonesia, the Philippines, and India—were stuck in a commodity trap, where coconut oil was treated as just another raw material, leaving farmers with low margins and no incentive to replant.

"Until we unlock the replanting problem, we cannot say there is sustainability in coconut," he said. CKC is working to change this equation by linking farmers directly to value-added markets, improving efficiency, and finding ways to maximise every part of the coconut plant.

The DME System and Market Integration

CKC's first breakthrough was the Direct Micro Expelling (DME) system, a decentralised approach that let farmers process virgin coconut oil on-site without refrigeration or large-scale infrastructure.

"Most virgin coconut oil was extracted using the wet method, meaning you had to chill coconut milk to separate fat and water," Murray explained. "This method didn't require any of that, so farmers could process coconuts in their villages."

To showcase its potential, CKC set up a DME demonstration site in Bali—a strategic move that attracted interest from farmers, processors, and new industry entrants. The success of the model led to 20 factories being established across Indonesia, Timor-Leste, India, and the Philippines, proving that DME could scale.

But CKC didn't just stop at production—it also created direct market links to ensure farmers weren't stuck selling a bulk commodity. One example is Bali Balance, which provides a premium outlet for farmer-produced coconut oil. That model worked well, creating direct links between farmers and the market.

This market integration approach caught the attention of a new generation of coconut industry players, many of whom weren't tied to the traditional commodity model.

"People who hadn't been in coconut for more than 10 years were coming in with innovative approaches," Murray said. "They were working on climate change and sustainability platforms—anything other than treating coconut as a commodity. That's exactly what CKC champions."

An Industry in Decline?

One of the biggest challenges isn't just low prices or inefficient supply chains; it's the age of the trees. For decades, farmers haven't replanted, leading to chronic senility in the crop. Murray revealed that a highly productive tree would yield around 150 nuts per year. However, in Indonesia, the production is about 20 nuts per year, with some trees producing as few as 10 or 12 nuts.

As yields decline, farmers must source coconuts from increasingly large areas, making logistics more costly. The obvious solution—planting new trees—hasn't happened for nearly 50 years. The reason isn't just economic—it's psychological, according to Murray.



Haigan Murray, Co-founder, Coconut Knowledge Center

Even unproductive trees still yield something, and cutting them down means waiting years for a replacement crop to mature. Many farmers view replanting as too risky.

But the bigger issue is that coconut farming remains locked in a decades-old low-margin business model. "No matter what happens at the commodity end of the marketplace, nothing changes for the farmers," Murray observed. "The farm-gate price has remained below economic levels for three decades."

As a result, replanting initiatives have largely failed. International organisations have attempted to incentivise sustainability, but without real improvements in profitability, farmer participation remains low. In India, the Philippines, and Indonesia, which together supply 80% of the world's coconut, the shift toward sustainable replanting has been largely unsuccessful.

A Growing Market with a Shrinking Supply

Despite the rising popularity of coconut-based products, supply is struggling to keep up. Murray pointed to a fundamental disconnect — while consumption has soared, farmers haven't benefited.

"Coconut water took off in the mid-2000s, thanks to all the New York yoga studios," Murray said. "That repositioned coconut oil as healthy, which in turn repositioned coconut milk. Then you had all the alt, gluten-free, dairy-free trends

keeping coconut in demand. But none of this translated into improvements upstream."

While demand has surged, supply has been declining for decades due to aging trees, lack of replanting, and poor farmer incentives. Large coconut processors are now lobbying governments for intervention. Murray mentioned that in Indonesia, large processing companies are expressing their inability to obtain sufficient coconuts. These companies are petitioning the Indonesian and Philippine governments to prohibit the export of whole nuts, as countries such as Malaysia and Thailand are net importers, which is diverting supply away from domestic processors.

This problem is exacerbated by a long, fragmented supply chain, where middlemen and commodity traders dictate prices. A long supply chain results in everyone taking a share, but ultimately, pricing is determined by global commodity markets, which aim for the lowest possible price.

One potential solution is creating direct farmer-to-processor relationships. "With coffee, they realised that farmer-to-roaster relationships were the way forward," Murray said. "In cacao, it's farmer-to-chocolate manufacturer relationships. In coconut, we need to move in the same direction."

However, shifting away from the commodity model isn't easy. Many factories still require bulk buying to remain economically viable. Murray pointed out that if 200,000 coconuts are needed daily, the math becomes intractable. If trees produce 150 nuts each, it is manageable, but if they only produce 20, the required number of hectares increases significantly.

Turning Waste into Value

To tackle the coconut industry's sustainability challenges, CKC has launched projects that turn waste into revenue. These initiatives focus on maximising every part of the coconut plant — from husks to biomass waste.

"We're working on how to best aggregate coconut husk waste," Murray said. "If we can get that to a gasifier, it will produce bio-methanol for sustainable aviation fuel."

In Thailand, CKC is helping a European conglomerate convert coconut waste into plant fibre — some

for food, some for industrial applications. In Africa, CKC is tackling the low productivity of old coconut trees by working with a company that harvests senile trees and converts them into revenue. Another large-scale biofuel project involves aggregating coconut husk waste in Sumatra and transporting it to Batam, where it is converted into bio-methanol for marine diesel used by the Singapore shipping industry.

All of these outcomes are meant to create more value for farmers, so they stay in the coconut industry. By finding new uses for coconut by-products, CKC aims to shift the industry from low-margin bulk trading to a circular economy, where farmers benefit from waste-based revenue streams.

Coco Story and the Case for Direct-to-Consumer

Traditional coconut processing depends on bulk sales to corporate buyers, a system strained by low-yielding trees and the high volumes needed to stay profitable. "If you're running a B2B operation, you need to move huge quantities: milk, oil, water, desiccated coconut," Murray said. "That means sourcing 200,000 coconuts a day, which is tough when productivity is so low."



Direct Micro Expelling (DME) in action

To counter this, Coco Story has developed a direct-to-consumer (D2C) model that allows coconut factories to operate at lower capacity but with higher margins. Murray said, "If I develop my own D2C business, I don't need to run the factory at full scale. I can source fewer coconuts but still make the same money."

D2C models also offer greater flexibility in sourcing, reducing reliance on large-scale supply chains. However, they require strong branding and retail expertise, which not all coconut businesses have. While the B2B model remains dominant, Coco Story highlights an alternative path for coconut businesses looking to adapt to shifting market conditions.

The Road Ahead for Coconut Farming

Coconut farming is overwhelmingly fragmented, with production largely run by smallholders who lack financial support, access to high-yield genetics, or structured market links. This keeps farm-gate prices low and makes aggregation—the process of collecting coconuts, husks, and biomass in large enough volumes for efficient processing—one of the industry's biggest bottlenecks.

The lack of large-scale investment is another problem. Capital markets have largely ignored coconut farming, keeping it trapped in a decades-old business model. Without major business model shifts, coconut farming risks continued low productivity, inefficiencies, and declining farmer participation. While new entrants could modernise the industry, the sector remains undervalued and overlooked.

Despite the challenges, CKC remains committed to helping reshape the coconut industry through advocacy and education. "We can give examples of how successful coconut businesses work. The question is—who's going to get involved?" said Murray. With increasing interest from new players and sustainable innovators, the coconut sector may yet see the transformation it needs.

14 Extracting Deep Benefits from a Superfood

Bali Balance, which produces a variety of products made from coconut oil, has a unique approach to extracting and using the richness of the nutrition packed in the coconut. The company creates skin, face, and hair care products harnessing the wonders of the “versatile superfood.”

The Wonder that is the Coconut

Indeed, coconut is a truly miraculous ingredient, being a fully biodegradable resource with low environmental impact.

Coconut products offer a range of benefits, with coconut juice aiding in kidney stone prevention, digestion, energy, immunity, and skin health, while coconut milk is a staple in cooking across many Asian countries. Coconut husk can be used as fertilizer, or as a household floor polisher. And because of the high concentration of medium-chain fatty acids easily absorbed by the human body, coconut oil has been used for centuries as a natural moisturiser.

For Bali Balance’s product line, a gentle, natural solution is used - the company produces products that are free from harsh chemicals, emulsifiers, agents, synthetic fragrances, preservatives, and color, making them generally tolerated by all skin types.

A Unique Production Process

While large manufacturers produce coconut oil from dry coconuts and take weeks to manufacture products, Bali

Balance extracts virgin coconut oil within one hour of opening the coconut. After harvesting the coconuts from farms and plantations in Bali, the coconuts are taken to the company’s coconut production facility, which runs without electricity, and thus has zero waste footprint. Using a method called direct micro expelling (DME), the company extracts oils manually, producing a cold press virgin extract of pure and unrefined oil. This consists of all spectrum of nutrients, antioxidants, and minerals. Through this entire process, the company is able to support the communities where it harvests the coconuts from, and avoids wastage by having its production facility located in the same province where the coconuts are sourced.

True to its core value of giving back to nature, the company is also aiming for a fresher, more sustainable look for its products. The process of redesigning new bottles and stickers is ongoing, and bamboo will likely be used for packaging.

While the company has a flagship store in Bali, it has launched its products in Singapore, and is targeting further expansion in China, Russia, and Japan. As it looks to expand to more markets, Bali Balance will add more teams overseas, on top of its teams in Bali, Dubai, and Singapore.



A range of Bali Balance products

15 Turning Waste into Energy



Mailhem's biogas plants for heat generation

Every year, billions of tonnes of waste is generated globally. This could range from agricultural waste, such as animal manure and unused parts of vegetables, to pharmaceutical waste such as syringes. In fact, according to a 2024 United Nations Environment Program report, municipal solid waste – the waste generated by individuals in their personal lives – accounts for only a small percentage of the world's waste, and already amounted to 2.1 billion tonnes in 2023. This number is predicted to grow to 3.8 billion tonnes by 2050.

Besides its human and environmental impact, waste management is currently costing the world an estimated US\$252 billion per year and might reach US\$640.3 billion by the year 2050. However, by adopting a circular economy model—which encourages waste avoidance and the repurposing of waste materials—it is possible to turn waste into products that benefit society and the economy.



Mailhem's 5 MTPD biogas plant in Mathikere, Bengaluru

Waste Management in India

As the world's most populous country, India alone generates 62 million tonnes of waste annually, of which over 80% is either unaccounted for or discarded. This is partly due to inadequate waste management infrastructure or lack of awareness and expertise, which the Indian government is working to solve through initiatives such as new regulations and public campaigns. Private enterprises with a focus on sustainable waste management are similarly expanding their capacities to accommodate the growing amount of waste, especially from urban areas, while addressing climate and environmental issues.

Turning Organic Solid Waste into Energy

Among the most sustainable ways to manage organic solid waste, i.e., waste such as food waste and animal or vegetable waste, is by converting it into fuel, thus eliminating waste while reducing dependence on fossil fuels. There are various ways to do this, including simply burning the waste to produce heat, which is then converted to electricity.

One of the safest and most efficient methods is to utilize biogas, that is, gas that is naturally produced when

organic matter decomposes. The earliest known use of biogas, according to the World Biogas Association, dates back to 900 BC, when it was used by the Assyrians to heat their bathwater. Following that, the birth of the modern, scientific application of biogas took place in the 1700s, when Italian scientist Alessandro Volta discovered methane. About a century later, the first biogas plant was built on a leper colony in Mumbai, India, using a process known as anaerobic digestion.

Mailhem: How a Private Enterprise is Spearheading Biogas Use in India

Today, biogas is still popular in India, both on a domestic and industrial scale, with some private enterprises focusing on manufacturing and operating biogas plants of different capacities.

And example of such an enterprise is the Mailhem Group, which entered the biogas sector in 1995. Focusing on the reduction of greenhouse gases through sustainable solid waste management, Mailhem has treated more than a million tonnes of solid waste to date and is responsible for more than 350 biogas plants across India. The company also aims to contribute to India's energy self-reliance, which the country hopes to achieve by the year 2047.

Mailhem's core business is the manufacture and operation of biogas plants of various capacities, allowing small and large enterprises alike to convert solid waste into energy. Each plant is able to process different types of organic waste materials, such as kitchen and livestock waste, crops, and waste water. Using the company's proprietary anaerobic digester, which can efficiently contain and digest large amounts of waste, clients are able to generate their own heat, electricity and even biomethane fuel for vehicles and gas grids. Leftover waste can also be converted into fertilizers and soil enhancers.

Tackling Municipal Solid Waste in India

One of the biggest challenges facing India is its growing population and rapid urbanization, which leads to less space for waste disposal. By 2030, India is estimated to need land the size of Singapore for its waste, if traditional landfill waste disposal continues.

To tackle this issue, municipal corporations are turning to biogas in order to manage the massive amounts of waste collected each day. As such, companies such as Mailhem have been commissioned to build and operate large biogas plants that can convert waste into different types of biogas. The city of Nashik, for example, is utilizing a biogas plant with a 500 tonne per day capacity. In addition to converting day-to-day waste, the city is also bio-mining legacy waste already deposited in current landfills. In just three years, Nashik has succeeded in processing 190,000 tonnes of legacy waste, along with 709,408 tonnes of municipal solid waste.

Smart Cities: Compressed Biogas for Fuel

One of the most impactful ways to manage waste is by converting it into compressed biogas, also known as Bio CNG or biomethane. This is a renewable and clean-burning gas that is of the same quality as natural gas, and can therefore be used for transportation fuel and power grids.

As part of India's Smart Cities mission, the government is encouraging urban centres to adopt smart solutions in order to foster a clean and sustainable environment. In line with this initiative, cities are utilizing Mailhem's Bio CNG plants to fuel public transportation. The city of Indore, for instance, now produces enough bio CNG to

fuel 6 or 7 buses per day. Likewise, the city of Bhopal has commissioned a 200-tonne per day plant - Mailhem's second largest Bio CNG plant to date. As part of the Bhopal Smart City Initiative, this plant will produce fuel that will be sold at gas stations throughout the city.

Another of Mailhem's current Bio CNG projects is a 50 tonnes-per-day plant commissioned by the city of Rudrapur. This 25-year ongoing project will collect organic waste from the city to be converted into Bio CNG. In the future, large FMCG companies may also forward their waste to the plant for processing through a public-private partnership in sustainable waste management.

Portable Biogas Plants

Mailhem's most popular product is their portable biogas plant, which allows users to generate electricity from the waste they produce, thereby reducing their reliance on centralised power grids. These 100 kg per day, 300kg per day, 500kg per day and 1000 kg per day portable biogas plants are usually procured by large organizations, many of whom use them to manage canteen waste. Such organizations include General Motors India and Hindustan Coca-Cola, each possessing a 500kg per day plant. The biogas can be used in multiple ways, including cooking and lighting.

Recently, Mailhem launched a portable biogas plant for home use. Known as Chotu, this small unit is able to fit into 2 metre by 1 metre spaces, and operates without electricity. Home users can deposit their waste into the unit to generate cooking fuel equal to 40kg LPG gas per month, as well as nutrient-rich fertilizer.

The Future of Biogas

Biogas plants, which are becoming increasingly efficient, are a viable alternative to natural gas and fossil fuels. With companies such as Mailhem, which are dedicating resources to research and development, the future of biogas is promising and will make the circular economy model a reality.

18 Water Solutions for Tomorrow, Today



Water conservation and management isn't just an individual problem, but an organisational one. Globally, many enterprises are already taking steps to help address the world's water crisis, but there's a lot more that can be done, and there are smarter ways to do them.

Singapore's ECOSOFTT, or ECO Solutions for Tomorrow Today, focuses on decentralised management of water, wastewater, and environmental services. Realising that managing water and its related ecosystems is complex and multifaceted, the company is on a mission to help enterprises protect water sources while reducing water footprint and wastage.

Presently, the company has presence in Singapore, Hong Kong, India, Vietnam, the Philippines, Malaysia, Indonesia, and Chile through its subsidiaries and local partners.

Global Water Situation

Water makes up 71% of the planet, yet only 0.007% of this is considered potable water. A total of 2.5 billion people do not have access to safe drinking water and another 2.5 million do not trust their source of drinking water. Sadly, this is just the tip of the iceberg on the global water crisis.

Less than 5% of human daily water footprint is for potable use, while the remaining 95% is for non-potable purposes. In a lot of places, water depletion and water contamination continue to persist, significantly reducing the amount of fresh water available. However, used water can actually be treated to the highest quality for full reuse for non-potable purposes, as well as in the replenishment of sources.

ECOSOFTT deals with the recycling of used water, along with sludge management and resource recovery. The company considers it a responsibility to use every drop of water more than once and discharge it after necessary treatment.

Meanwhile, in countries where it rains for more than 100 days a year, harvested rainfall can meet up to 70% of the water demand of residential areas. On the other hand, water sustainability can be achieved through full recovery and reuse of used water in countries where there is little to no rainfall.

As the construction of living spaces continues to accelerate, ECOSOFTT believes that a water sensitive design is necessary to achieve sustainable living.

Tech-Enabled

Using its Water SMART Blue Building and Communities platform, ECOSOFTT enables organisations to access low-cost and highly-efficient sustainable water solutions. One of these solutions is its rainwater harvesting system, which can be designed for specific needs depending on location. Some of its rainwater harvesting system components are filtration and storage, rainwater reuse, integration with other water sources, and recharge of groundwater.

Aside from this, ECOSOFTT also has a drinking water treatment solution, capable of producing 100% safe



Ecosoft waste water recovery system

drinking water regardless of source. The company uses several treatment solutions, depending on the condition. These include:

- Flocculation and coagulation
- Multimedia filtration
- Ultra filtration
- Reverse osmosis
- Removal of hazardous contaminants, such as Arsenic and Fluoride
- Seawater desalination
- Disinfection
- Softening
- Water quality and wellness assurance

For wastewater recovery, ECOSOFTT leverages four technologies, the first of which is its Aerobic Biofilter Without Sludge (ABWS), a highly-efficient wastewater solution for small residential or mixed communities of up to 10,000 households, as well as food industries. Secondly, its Airlift Circulating Floating-Carrier Bed (ACFB) is a compact wastewater solution for homes, hotels, schools, and commercial buildings. Next is its Alternating Intermittent Recirculating Reactor (AIRR), a highly adaptable wastewater solution for individual homes, small communities, and open sewers. Finally, Waste to Energy (WTE) is a multi-purpose system that generates energy and recovers water from human and animal excretion.

Meanwhile, ECOSOFTT also employs its expertise in water conservation to help restore and conserve lakes and rivers. The company does it through measures such as interception and decentralised treatment of wastewater entering rivers and lakes, management of solid waste around the water bodies and catchment areas, enhancement of waterfront and catchment areas, cleaning of water through low-cost

methods such as de-silting, and mobilisation of local communities to encourage collective action.

Consultative Approach

One of the ways ECOSOFTT approaches water management is through the conduct of water audits and efficiency improvement, after which its team develops a water efficiency management plan to generate cost savings and sustainability improvements.

Some of the topics explored in the water efficiency management plan are:

- Volume consumed by source of water, such as groundwater, piped water, rainwater, recycled water
- Inventory of water-consuming equipment and processes
- Leaks and wastages
- Wastewater generated by type and volume
- Potential for wastewater recycling and reuse
- Upgrades, retrofits, or new equipment that will save water
- Long-term water sustainability plan
- Water SMART Blue Buildings & Communities design
- PUB Water Efficient Building Certification assessment and advice (relevant to Singapore)
- Dollar savings and payback

One of the clients ECOSOFTT has worked with is Singapore's Coastes Group of Restaurants, which operates four restaurants located along Sentosa's Siloso Beach. The latter engaged ECOSOFTT to conduct a water audit and review the water consumption involved in food preparation, dishwashing, cleaning, ice machines, toilets, and patrons' usage-related activities. The report identified ways to save water by 10%, which represented significant savings for the restaurant group, amid the 30% tariff increase in water in the country.

Ultimately, ECOSOFTT has set out a bold vision for 2050. Their aim is to treat 1 trillion litres of used water daily, restore and protect 1,000 rivers, lakes, and water bodies for future generations, and cultivate 1 million entrepreneurs in water, used water, and environmental services. Additionally, they aspire to initiate 10,000 community-led transformation programmes focused on water, sanitation, and livelihoods, and engage 10 million students globally through their AQUA education programme.



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