SDG6: CLEAN WATER AND SANITATION

Government Protection of Water Resources in India:

Water Conservation Programs: The Indian government has initiated various programs to conserve water, such as the National Water Mission, focusing on sustainable water management and conservation.

Drinking Water Initiatives: Schemes like the Jal Jeevan Mission aim to provide clean drinking water to all households, emphasizing the importance of safe and accessible water sources.

Rural Water Supply Schemes: Implementation of schemes like the Swajal Yojana, which focuses on providing clean water in rural areas, supporting local communities with water purification technologies.

UPES University's Water Treatment Initiatives:

Water Treatment Research: UPES conducts research in water treatment technologies, exploring innovative methods to ensure access to clean water for both its campus and surrounding communities.

Community Outreach: The university organizes awareness campaigns on water conservation, pollution control, and responsible water usage to engage local communities and promote better water management practices.

Sustainable Practices: UPES integrates sustainable practices within its campus, ensuring responsible use of water resources through rainwater harvesting, waste-water treatment, and water recycling systems.

Future Goals and Impacts:

UPES University's commitment to water treatment and conservation aligns with the government's efforts to protect and manage water resources. By furthering research, expanding community engagement programs, and promoting sustainable practices, UPES can significantly contribute to ensuring clean water availability for its community and beyond.

In summary, while the Indian government is dedicated to protecting water resources, UPES University's water treatment initiatives and community engagement play a pivotal role in promoting responsible water usage, fostering awareness, and contributing to the conservation of clean water resources in the region.

HELPING INDIANS BRING WATER, SANITATION, AND HYGIENE TO THEIR COMMUNITIES

https://www.waterforpeople.org/india/?ea_tracking_id=googlegrant&gad=1&gclid=EAIaIQobChMIrNOijciiggMVhoVRCh3Zwws7EAAYAiAAEgLzj_D_BwE

POPULATION: **1.3 BILLION**	RURAL ACCESS TO BASIC WATER SERVICES: **91%**[1]
RURAL ACCESS TO BASIC SANITATION SERVICES: **14%**[2]	EVERYONE FOREVER DISTRICTS: **10**

WATER FOR PEOPLE IN INDIA

Separated from mainland Asia by the Himalaya mountains, India is the world's largest democracy. With 1.3 billion people, it is a country of great cultural, religious, and linguistic diversity.

Water For People began working in India in 1996, and in 2008 we developed a locally registered arm to work in tandem on projects funded by Indian corporations, foundations, and individuals. To date, we have reached over one million people in India through water and sanitation solutions.

WATER

Water For People installs and rehabilitates community water systems and handpumps. Many water points in India are broken due to poor maintenance, and we have addressed this issue by training water user committees and developing a network of mobile mechanics known as Jalabandhus (Friends of Water). To further promote sustainability, we work with local water and sanitation committees that oversee the operation and maintenance of their local systems. We also partner with the One Drop Foundation to implement social art programming, using art and theater to promote safe water, sanitation, and hygiene practices.

SANITATION

The government of India's Swachh Bharat Mission is for the country to be open defecation free, and we are promoting that mission through a variety of sanitation initiatives. A Water For People Sanitation Hub researches and invents new sanitation products, ideas, and tools. We support local sanitation entrepreneurs with loans and training to develop their businesses that sell toilets and

supplies, and we also partner with local microfinance institutions to provide loans for investment in bathrooms.

SCHOOLS AND HYGIENE

Water For People's work in schools improves sanitation and water services and promotes good hygiene practices among students. All school sanitation facilities include changing rooms for girls to provide privacy during menstruation. Teenage girls are also empowered through menstrual hygiene trainings. Through school Water and Sanitation Committees, students are encouraged to take ownership of water and sanitation facilities. These committees help maintain the facilities and promote good hygiene to their fellow students.

INDIA WATER AND WASTEWATER TREATMENT INDUSTRY

https://www.trade.gov/market-intelligence/india-water-and-wastewater-treatment-industry

India's growing demand for wastewater recycling and zero discharge system are opportunities for U.S. companies offering wastewater technology and solutions.

Water and wastewater management is a promising subsector in India's environmental technology segment. India's demand for water is projected to be twice as much as the available supply by 2030. To overcome these challenges, public and private sector facilities have ambitious plans to develop comprehensive water and wastewater treatment and distribution infrastructure. Demand for high-end treatment technologies is growing in India.

According to a 2022 Frost & Sullivan report, the Indian water and wastewater treatment market will likely reach $2.08 billion by 2025 from $1.31 billion in 2020, registering growth at a compound annual growth rate (CAGR) of 9.7 percent. The report also ranked India as the sixth largest market for environmental technologies in the world, with subsector rankings of second for water/wastewater management.

Various governmental initiatives, such as the Atal Mission for Rejuvenation and Urban Transformation, National Mission for Clean Ganga, Jal Jeevan Mission, and Community Drinking Water Schemes, contribute to the growth of the Indian water and wastewater treatment market. In May 2019, the Indian government created the Jal Shakti Ministry, bringing all water-related agencies under one ministry to provide safe drinking water to the people of India. Soon after it was founded, the Jal Shakti Ministry launched the Jal Jeevan Mission, designed to provide piped drinking water to 146 million households in 700,000 villages by 2024. The mission earmarked a budget of $51 billion for states to increase household water connection coverage from 18.33 percent in 2019 to 100 percent by 2024. This ambitious project is creating opportunities for suppliers of water meters,

water quality monitoring systems, water management-related IT systems, tertiary treatment technology, and water-related Engineering, Procurement, and Construction companies.

The private sector power, food and beverage, chemicals, pharmaceuticals, refineries, and textiles industries prefer advanced treatment technological systems such as reverse osmosis membranes for treating their wastewater. These water treatment markets are gradually shifting from chemical treatment and demineralization plants to membrane technology. The concept of wastewater recycling and zero discharge systems is becoming more widely accepted as new technologies such as sequencing batch reactor (SBR) and membrane bioreactor (MBR) based treatment gain in adoption.

The coastal states of Tamil Nadu and Gujarat are frontrunners in setting up desalination plants to bolster drinking water supply. Some industries are also setting up desalination plants to meet process water requirements. As examples, some power plants, oil refineries, iron and steel plants, distilleries, cement plants, and fertilizer plants are pursuing the principle of Reuse, Recycle, and Zero Liquid Discharge to better manage water usage and improve their environmental footprint.

The growth in this industry makes it very attractive for U.S. exporters, especially small and medium-sized enterprises, and new-to-market companies. Technologies and services in demand include:

- Engineering and construction services
- UV disinfection
- Water reuse equipment and services (process specific)
- Anaerobic digestion
- Advanced filtration
- Nitrification
- Membrane filtration
- Biological denitrification
- Reverse osmosis (RO)
- Membrane bioreactor systems
- Forward osmosis (FO)

High tariffs, particularly in the area of monitoring and instrumentation, and price sensitivity in government tenders, which favors the lowest bidder with little assessment of cost/quality trade-offs, are examples of market challenges for the export of environmental technologies and services to India.

For entry into the Indian market, it is preferable for U.S. companies to identify quality partners who know this market and are well-versed in procurement issues. Strategic planning, due diligence, and consistent follow-ups are the prerequisites for doing business successfully in India.

U.S. companies may consider the following local trade shows to showcase their technologies and meet Indian companies.

Water and Solid Waste Expo, February 16-18, 2023 - New Delhi

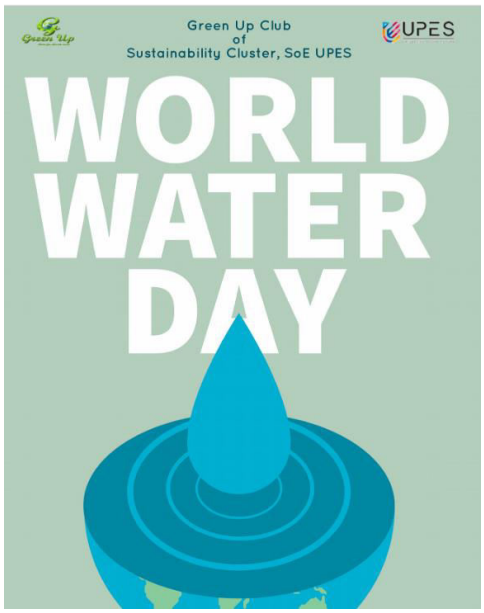
Water Today's Water Expo, February 22-25, 2023 – Chennai

Water India Expo, March 26-29, 2023 – New Delhi

Water & Plumb Skills Expo 2023, May 18 - 19, 2023 – New Delhi

World Water Day

https://www.facebook.com/greenupupes/photos/a.1533322970215340/3115674395313515/



The purpose to celebrate this world water day is to remind that we should follow the guidelines to save water for us and for our future generations. United Nations and its member nations celebrate this day by promoting and implementing the recommendations of UN to save water resources. Different organizations promote the ways to save water, treatment of waste water to make it clean, and to protect the aqueous habitats.

Each year, World water day has a different theme, and it is celebrated according to that theme.

The theme of WWD 2022 is "Groundwater – Making the invisible visible".

Channels for Water Innovation(CHANNELS)

https://waterstart.com/channels-for-innovation/?gclid=EAIaIQobChMIrNOijciiggMVhoVRCh3Zwws7EAAYAyAAEgKxJvD_BwE

CHANNELS is steadily increasing water industry resiliency and capacity to address climate change and other pressing water resource challenges through innovation.

Founded by the WaterStart community, CHANNELS advances viable technology solutions through philanthropic and impact investment. Based in Las Vegas, Nevada, CHANNELS is a 501(c)(3) (EIN 82-1061688) with the mission of evaluating, educating, and promoting water innovation. WaterStart's vision for CHANNELS is to bring together public water agencies, large private water users, government, and philanthropists to share risk and reward in deploying innovative water technology across systems serving 100 million people globally.

Priorities

CHANNELS lowers the risk and costs associated with piloting technologies, while specifically targeting challenges in delivering more, safer, and cheaper water. Our demand driven model is structured around innovation priorities. Collectively, the WaterStart community have identified over 100 priorities for which they are seeking solutions. Priorities have been identified in the following categories:

- Drinking Water
- Wastewater
- Agriculture
- Smart Water Networks
- Water Recycling
- Commercial
- Mining

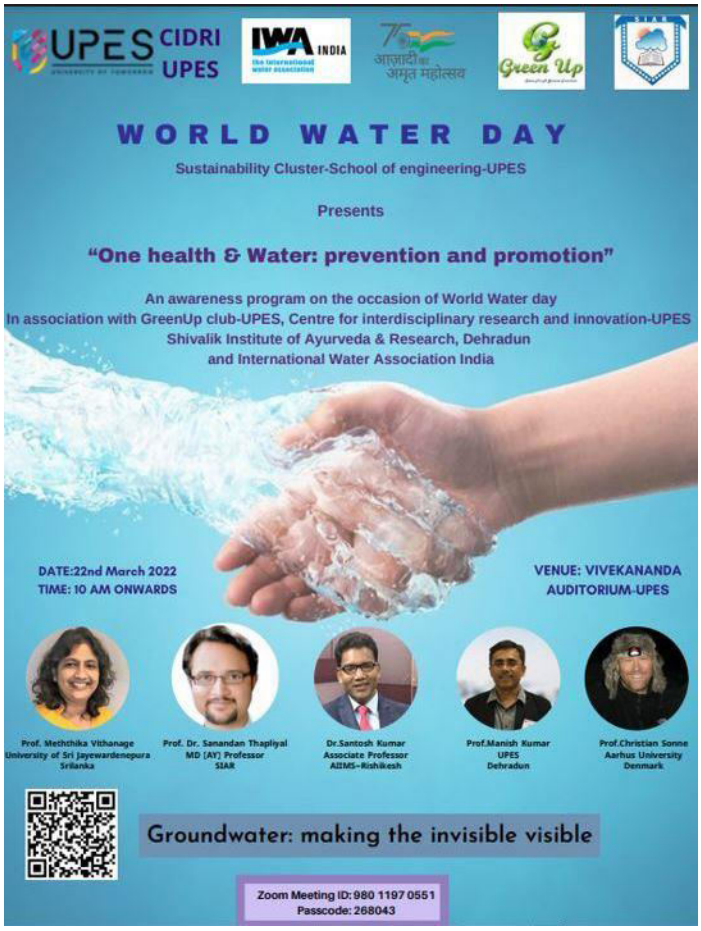
Role of Microbes / Algae in Wastewater Treatment

https://research.upes.ac.in/2019/03/08/national-seminar-on-role-of-microbes-algae-in-wastewater-treatment/

Disposal of wastewater from an industrial plant is a challenging and expensive problem. Most petroleum refineries, chemical and petrochemical plants have onsite facilities to treat their wastewaters so that the pollutant concentrations in the treated wastewater comply with the local and/or national regulations regarding disposal of wastewaters into community treatment plants or into rivers, lakes or oceans. The environmental challenges posed by industrial processes, such as paper and pulp production, which produce a lot of wastewater lead to development of processes for recycling of water before its final treatment and disposal. This seminar will present the recent advancement in the methodology and laboratory techniques of wastewater treatment using biological means such as microbes and algae. Eminent speakers from industries and reputed institutions will address key issues in the treatment of wastewater from various sources.

One Health & Water: Prevention & Promotion" on the occasion of World Water Day

https://research.upes.ac.in/2023/02/20/one-health-water-prevention-promotion-on-the-occasion-of-world-water-day/



UPES researcher leads first-of-its-kind wastewater reclamation project in India

https://blog.upes.ac.in/upes-researcher-leads-first-of-its-kind-wastewater-reclamation-project-in-india/

DIANA GEORGE · APRIL 10, 2023

Inspired by Prime Minister Narendra Modi's Swachh Bharat Mission, Dr. Bhawna Lamba and her team of researchers are working for a spotless, sparkling India, through their novel integrated wastewater plant that uses microalgae to purify sewage water

In an uncharacteristically quiet corner, away from the hustle and bustle of the UPES campus in Dehradun, lies the recycle-green and grey structure of the integrated wastewater reclamation plant, a pilot scale project where Dr Bhawna Lamba and her team of researchers scurry about conducting experiments, surrounded by vials and flasks full of powders, chemicals, and oils.

The wastewater plant is part of ₹ 73 lakh project to treat sewage water using microalgae, and leaving behind zero waste, with its byproducts, such as bio-oil, bio-gas and bio-manure, being used for one purpose or another.

The site – the first of its kind in India – consists of a lab, an open racetrack-maze pond, a Continuous Stirrer Tank Reactor (CSTR), and a Hydrothermal Liquefaction Reactor. The project is sponsored by the Department of Science and Technology (DST) and is a collaborative effort between UPES and Vikalp Nai Dishayen.

Dr Bhawna, who has been with UPES since 2004, says that she was inspired to launch this project due to the Swachh Bharat campaign initiated by Prime Minister Narendra Modi. Her background in Polymer Technology and increasing concern over the difficult wastewater problem in communities across India only strengthened her resolve to do something about it.

The plant is currently at a Technology Readiness Level (TRL) of 7, which means that it is a fully functional prototype of demonstrable readiness.

The 20,000 ltr open pond draws in sewage water from a nearby canal and subjects it to algal purification treatment for about 7 days.

The 20,000 ltr open pond for sewage water treatment

“This is a sustainable approach for the removal of toxic contaminants from sewage water. By growing microalgae in the open pond, we minimize the usage of fresh water and external nutrients required for algal growth,” explains Dr. Bhawna, Professor of Applied Sciences at the UPES School of Advanced Engineering.

“This treated water and algal biomass are utilized for the production of bio-oil in the Hydrothermal Reactor,” she adds.

The remaining sludge, along with other biodegradable household waste and the algal-treated water, is fed into a Continuous Stirred Tank Reactor (CSTR) which yields biogas and bio-manure.

Bio-oil can replace diesel in the near future, says Dr. Bhawna, while biogas and bio-manure can be used for a variety of purposes, thus making this a zero-waste and cost-effective project.

“Bio-oil can solve the problem of decomposition of plastic. Plastic-to-oil is another area I am keenly interested in,” Dr. Bhawna explains. The 43-year-old has converted pandemic-era PPE kits into bio-oil through the means of pyrolysis.

The researcher is thankful to UPES for offering her “full support” for her campaign.

“That is why I have been at UPES for so long. I have finished 6-7 projects here,” she adds.

Waste Paper Recycling Laboratory

https://upes-production-cvb3e7frghdda0a4.z01.azurefd.net/drupal-data/2023-09/annual-report-upes-2021-22-compressed_1.pdf

Primarily focus of this Research Laboratory is on waste paper recycling. The rationale of this focus stems mainly from the fact that the world consumption of paper products is massive and therefore the DISPOSAL problems are enormous; traditionally involving either incineration or land ll. Our basic idea was to bring a balance between the environment and the use of technology for the economic independence of rural women. This project aimed to help rural women from the indigenous community to earn a fair wage by teaching them how to make high-quality goods using waste paper viz paper pencils, jewellery, stationery items etc. In a lab we have a set of six machines is required (Figure 1). Rolling Machine, oven, cutting machine, abrading machine and coating machine.

Cost: The cost of machines is around 9.5 lakhs [Including about 50kgs of gum and 10 cartons [3500 of HB lead per carton].