In our Going Green Whitepaper, we discuss the effects of environmental water pollution, including how sources of water contaminants can be monitored, understood and managed, illustrated with a number of case studies.

All this environmental research relied on the availability of ultrapure lab water.

MONITORING

Evaluating the full extent of our impact on global water resources requires robust and accurate monitoring systems that function as an early warning system and guide immediate pollution control.

- **The study of interactions of pharmaceuticals in wastewater with sludge to understand the environmental fate of drug substances.**
  Detection of wastewater contaminants can be compromised by adsorption of active pharmaceutical ingredients (APIs) and other contaminants onto sludge particles. To study this adsorption, a team from AstraZeneca and the University of Portsmouth, UK, has developed a solid-phase extraction method to generate data for modelling that will greatly improve the understanding of the environmental fate of APIs and in risk assessments.
- **Monitoring methods to rapidly identify and monitor heavy metal pollutants in water.**
  Monitoring heavy metal pollutants has become an important part of water pollution testing. A team from the University of Sindh in Pakistan were the first to study the influence of industrial effluent on silver and heavy metal concentrations in freshwaters of Pakistan, the spatial variation in metal concentrations, and dilution from canal run-off and sediment erosion. Monitoring methods such as this are invaluable in guiding the development of effective management strategies.

UNDERSTANDING

The better we understand a change, the better equipped we are to plan and deal with it.

- **Techniques to quantify metabolic disruption caused by environmental pressure**
  Pollutants can affect amino acid- and protein metabolism, and researchers have investigated how metabolism may be disrupted in crop-pest interactions. This included showing that the herbicide glyphosate controls the parasitic pest broomrape by inhibiting amino acid synthesizing enzymes. Such insights can help in managing pests and developing more detailed baseline measurements, as well as offering a means of quantifying metabolic disruption of pollutants.
- **Seasonal variations in the efficiency of removal of hormone pollution from wastewater**
  Endocrine-disrupting chemicals (EDCs) affect hormonal control of both humans and wildlife at very low concentrations, and research conducted at an urban sewage treatment plant in Tunisia showed that the removal of certain EDCs was more effective during the summer, which emphasises the importance of predictive modelling of environmental behaviour.

MANAGING

Knowledge gained from monitoring and understanding the sources of pollution give us a sound basis for managing the situation.

- **The impressive adsorptive potential of activated carbon for removing contaminants in wastewater.**
  New ways are being found to capitalise on the impressive adsorptive capacity of activated carbon (AC) in wastewater treatment. Lab bench- and pilot plant filtration studies by researchers at Technische Universität, Berlin have shown that powdered AC is significantly more effective at removing organic micropollutants than granular AC.
- **The power of hardy bacteria in wastewater treatment and bioremediation.**
  In the effort to avoid the use of toxic dispersants for the treatment of oil spills, a research group at the University of Sheffield, UK studied the biomechanical properties of the hardy bacterium Rhodococcus that can feed upon oil droplets. They found that the bacterium produces more extracellular polymeric substances that bind oil spill contaminants early in growth.

INNOVATION

The development of methods to monitor, understand and manage water pollution draws upon technological innovations and a growing body of expertise. The concerted efforts of numerous environmental labs across the world, such as those in these case studies generate valuable datasets by employing highly accurate equipment and techniques, combined with access to ultrapure lab water.

Be aware of environmental water pollution. Be one of the sustainable labs of the future

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