

Leading Organizations Build Case for Green Infrastructure

WASHINGTON, Jun. 11 /CSRwire/ - Experts from The Dow Chemical Company, Shell, Swiss Re and Unilever, working with The Nature Conservancy and a resiliency expert, evaluated a number of business Case Studies, and recommend in their newly published White Paper that green infrastructure solutions should become part of the standard toolkit for modern engineers.

Green infrastructure employs elements of natural systems, while traditional gray infrastructure is man-made. Examples of green infrastructure include creating oyster reefs for coastal protection, and reed beds that treat industrial waste water.

The research team evaluated the assumption that green infrastructure can provide more opportunities than gray infrastructure to increase the resilience of industrial business operations against disruptive events such as mechanical failure, power interruption, raw material price increases, and floods. The evaluation concluded that hybrid approaches, utilizing a combination of green and gray infrastructure, may provide an optimum solution to a variety of shocks and improve the overall business resilience.

“Instead of thinking about independent solutions, we must look at integrated systems,” said Andrew Liveris, Chairman and Chief Executive Officer of Dow. “Natural systems not only serve multiple functions, but have multiple benefits – often requiring less capital and less maintenance while promoting biodiversity that we all enjoy.”

“Green infrastructure can bring benefits for companies, for communities and for the environment,” said Peter Voser, Chief Executive Officer of Royal Dutch Shell plc. “It can be cheaper, provide new opportunities for engagement with stakeholders, and create wildlife habitats. Green infrastructure should be part of mainstream business thinking.”

“Protecting nature and the services it provides to people and business is one of the smartest investments we can make,” said Mark R. Tercek, president and CEO of The Nature Conservancy. “This is the case whether we are talking about the production of clean, abundant freshwater, protection from storms or healthy and productive soils. Green infrastructure solutions also provide many co-benefits, such as wildlife habitat, and typically appreciate over time, rather than depreciate as happens with gray infrastructure.”

The case studies gathered to support this research encompass a wide variety of possible applications of green infrastructure. They range from growing plants that cost-effectively remediate contaminated soil (phytoremediation), to constructing wetlands that naturally treat industrial waste water, to mitigating air pollution through innovative forest management approaches.

Two green infrastructure solutions from the business case studies are described below, which illustrate the recurring benefits and challenges inherent to green infrastructure solutions.

Union Carbide Corporation (subsidiary of The Dow Chemical Company) uses constructed wetlands to treat wastewater near Seadrift in Texas. This 110-acre (approximately 44.5-hectare) engineered wetland was designed to consistently meet regulatory requirements for water discharge from the manufacturing plant, and has operated successfully for over a decade.

The green infrastructure solution, which was implemented in half the expected time for the gray infrastructure alternative, and was fully operational in 18 months, delivered a series of additional benefits. The capital expense was between \$1.2 million and \$1.4 million, compared to an expected \$40 million for gray infrastructure. The wetlands also require no electric power and very little operations and maintenance support as opposed to the energy-intensive gray infrastructure alternative requiring 24/7 support.

The cost savings associated with this decision yield value year after year and increase exponentially over time.

Petroleum Development Oman LLC (PDO) uses constructed wetlands to treat produced water from oilfields in Oman. The Nimr oilfields, in which The Shell Petroleum Company Ltd is a joint venture partner, not only produce oil, but also more than 330,000 m³ of water per day. PDO built the world's largest commercial wetland, and it treats more than 30% (or 95,000 m³ per day) of the total produced water. This volume would normally require extensive infrastructure to treat and inject the water into a subsurface disposal well. Gray infrastructure would thus result in a high-cost facility, requiring large amounts of electric power and producing greenhouse gas emissions.

Instead, a green infrastructure solution was selected, consisting of a four-tier gravity-based wetland system. As gravity pulls the water downhill, reeds act as filters, removing oil from the water. The oil is eaten by microbes that naturally feed on hydrocarbons underground. Oil content in the produced water is consistently reduced from 400 mg/l to less than 0.5 mg/l when leaving the wetlands.

Power consumption and CO₂ emissions are 98% lower than they would have been with the alternative man-made solution. Also, the wetlands are providing habitat for fish and hundreds of species of migratory birds.

Visit The Nature Conservancy website for more information about green infrastructure solutions, research findings from the case studies and conclusions in the White Paper.

About Dow

Dow (NYSE: DOW) combines the power of science and technology to passionately innovate what is essential to human progress. The Company connects chemistry and innovation with the principles of sustainability to help address many of the world's most challenging problems such as the need for clean water, renewable energy generation and conservation, and increasing agricultural productivity. Dow's diversified industry-leading portfolio of specialty chemical, advanced materials, agrosiences and plastics businesses delivers a broad range of technology-based products and solutions to customers in approximately 160 countries and in high growth sectors such as electronics, water, energy, coatings and agriculture. In 2012, Dow had annual sales of approximately \$57 billion and employed approximately 54,000 people worldwide. The Company's more than 5,000 products are manufactured at 188 sites in 36 countries across the globe. References to "Dow" or the "Company" mean The Dow Chemical Company and its consolidated subsidiaries unless otherwise expressly noted. More information about Dow can be found at www.dow.com.

About Royal Dutch Shell plc

Royal Dutch Shell plc is incorporated in England and Wales, has its headquarters in The Hague and is listed on the London, Amsterdam and New York stock exchanges. Shell companies have operations in more than 70 countries and territories with businesses including oil and gas exploration and production;

production and marketing of liquefied natural gas and gas to liquids; manufacturing, marketing and shipping of oil products and chemicals and renewable energy projects. For further information, visit www.shell.com.

About The Nature Conservancy

The Nature Conservancy is a leading conservation organization working around the world to protect ecologically important lands and waters for nature and people. The Conservancy and its more than 1 million members have protected nearly 120 million acres worldwide. Visit The Nature Conservancy on the Web at www.nature.org.

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