

International Knowledge Exchange on Decarbonization

U.S. Pacific Northwest and Denmark collaborate on industrial symbiosis

As the decarbonization movement spreads around the world, many cross-border collaborations have formed to advance sustainability. The blossoming knowledge exchange between the Pacific Northwest region of the United States and Denmark is a prime example. Delegations from the governments of Washington State and the city of Portland (in neighboring Oregon State) traveled to the industrial symbiosis park in Kalundborg, Denmark to learn about its impressive circular economy efforts. Inspired by Kalundborg's achievements, these northwestern U.S. policymakers soon launched similar initiatives in their home states to recycle waste effectively and utilize renewable hydrogen.

These Pacific Northwest policymakers are also interested in learning from the Asia Pacific region, and see Japan as a promising partner. The time has come for Japan to promote its world-class industrial symbiosis initiatives and take a greater role on the global stage.

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Environmental Pioneer Region: Pacific Northwest

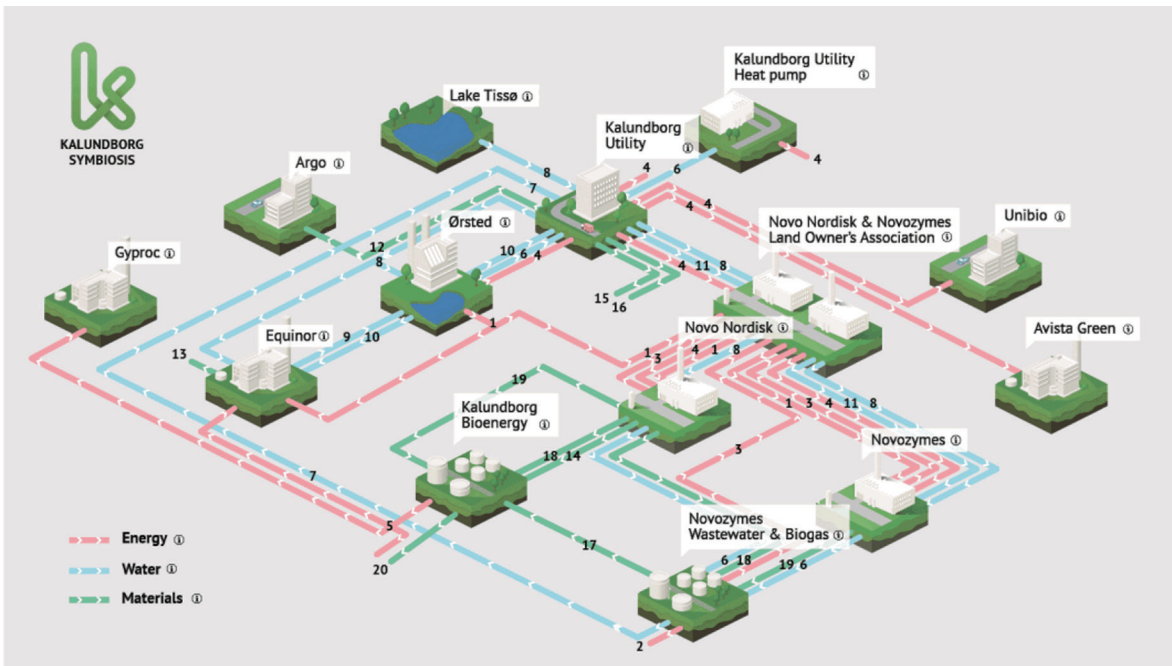
The Pacific Northwest region is known as an environmental pioneer in the U.S. The Center for Sustainable Infrastructure (CSI), an Olympia, Washington-based non-profit organization, is playing a key role in promoting international collaboration on sustainability initiatives, aiming to drive the growth of “clean industry” businesses. CSI has strong connections with the Washington State Department of Commerce, the Oregon Department of Environmental Affairs, and the Portland Metro Chamber, and influences environmental and economic policy at federal and state levels.

In recent years, CSI has developed a fruitful partnership with the Kalundborg Industrial Symbiosis Park. Every year since 2017, CSI has facilitated study trips to Kalundborg, in partnership with the Washington state-based sustainable development promotion firm i-SUSTAIN and the nonprofit Scan Design Foundation.

What is Industrial Symbiosis?

Industrial symbiosis involves sharing of resources and reuse of waste materials among co-located industrial facilities, agriculture, communities, and markets to increase production efficiency and ecological sustainability, all of which provides economic benefits to the government and local communities. In Denmark, the first such symbiosis effort began in the 1960s in the small 900-year-old city of Kalundborg, when a local oil refinery supplied surplus gas to a nearby factory to be used for drying gypsum board.

Conceptual Diagram of Kalundborg Symbiosis



Source: CSI¹

Impressed that industrial symbiosis could not only help reduce industrial waste and pollution, but also contribute to clean economy job creation and economic development, the more than 20 Washington state legislators who have participated in CSI’s study trips to Kalundborg soon introduced and passed bipartisan state legislation to implement an industrial symbiosis initiative in Washington. The state launched the first industrial symbiosis program in the U.S. in 2021, with \$2.5 million in funding through 2022. Efforts to promote clean industry are accelerating.

Initiatives in Portland, Oregon

The Portland city government and the Portland Metro Chamber are collaborating on a strategy to make Portland a center of clean industrial innovation and to promote a decarbonized, circular, inclusive economy. In 2022, a delegation consisting of representatives from Portland's government, citizens, and industry visited Denmark, and Danish experts visited Portland, with these exchanges resulting in a close working relationship. Portland City Commissioner Carmen Rubio - who headed the city's delegation to Denmark - called the Denmark visit a "game changer."

It reinforced her vision of Portland as the pioneer city in the U.S. with regard to environmental initiatives.

To set a course forward for clean industry growth, the City teamed with CSI and other experts to create a clean industry roadmap.²

Turning Waste into Value

One exciting project that grew out of the Portland delegation's visit to Denmark is the "Waste Innovation Campus" established at the City of Roses Disposal & Recycling (COR) in East Portland. COR, the only African American-owned waste management company in the U.S., buys waste that would otherwise be sent to landfills and sorts it into a variety of materials, including metals, plastics, asphalt, and other construction materials for upcycling and recycling.

COR CEO Alando Simpson participated in the Denmark trip, and subsequently worked with the City of Portland to launch the Waste Innovation Campus, the first of its kind in the U.S. The campus is designed to demonstrate cutting-edge technologies and business models for clean materials, including thermal loops that generate electricity from renewable energy sources and circulate waste heat generated from one process to power the next.

Portland City Commissioner
Carmen Rubio



Source: City Council of Portland³

Portland delegation visiting Denmark (June 2022)



Source: CSI

Renewable Hydrogen Projects

The visit to Denmark was also an opportunity to learn about renewable hydrogen projects there, and triggered interest in building related capacity in the Pacific Northwest. In 2021, CSI released the Pacific Northwest Renewable Hydrogen Action Plan, the first of its kind in the region. It inspired Washington State Senator Ruben Carlisle, who participated in a Kalundborg trip, to work with CSI to craft Senate Bill 5910, aimed at "promoting the use of renewable hydrogen in Washington State." The

bill was passed almost unanimously by the state legislature – an impressive show of bipartisan support - and the state has since invested \$2 million to develop a public-private partnership to implement an \$8 billion "Hydrogen Hub Program" supported by the U.S. Department of Energy.

Waste Collection

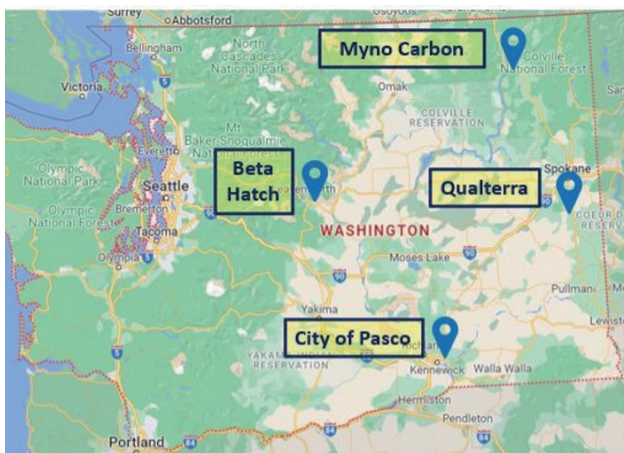


Source: COR⁴

Agriculture Symbiosis Projects in Washington

The Denmark trips have also inspired the development of businesses that reuse waste and/or surplus resources for greener agriculture and energy production. Supported by state grants, a variety of small but exciting projects have blossomed across Washington State, including using heat waste from data centers to grow mealworms to feed livestock, using algae to denitrify wastewater, using biochar to create carbon negative power plants, and using biochar to deodorize compost. To inform planning of future investments in agriculture symbiosis, the state commissioned a study by CSI to explore additional symbiosis opportunities and related economic benefits.⁵

Washington State-supported agriculture symbiosis project examples



Building largest carbon removal and bio production facility in the U.S. to take wood debris from power plant to create biochar steam to generate electricity.



Using waste heat from servers at a cryptocurrency data center to grow meal worms for livestock feed.



Processing agricultural and timber biomass create biochar, and renewable energy for heating buildings.



Treating wastewater discharge from six large food processing plants with algae to reduce nitrates and provide clean water to irrigate farmland.

Source: Washington CORE based on information from Washington State Environment and Energy Committee

State Rep. Beth Doglio

Washington State Representative Beth Doglio (D) - Chair of the State House Environment and Energy Committee - is a champion of these agriculture symbiosis efforts. Ever since participating in a study trip to Kalundborg, she has strongly supported industrial symbiosis and has worked tirelessly to pass supporting legislation and secure funding for implementation. In her remarks to the Environment and Energy Committee about state-funded symbiosis projects, she said, "I have never experienced such excitement in the state... This all started with the Danish tour."



Source: BethDoglio.com

Moving Toward Pacific Knowledge Exchange

The Pacific Northwest region is currently looking for partners to develop a Pacific Knowledge Exchange program similar to the Kalundborg model. Japan could make a strong case for itself as a partner for such an exchange based on its many world-leading examples of decarbonization efforts in the power, transportation, and industrial sectors, urban development, eco-towns, and food symbiosis.

Many of these efforts could be as impactful as Kalundborg-inspired projects. One example is the Fukushima Innovation Coast Initiative, which has transformed the coastal areas of Fukushima Prefecture into a nexus for cutting-edge technologies. Another example is recycling facilities using fermented food processing technologies such as sake, miso, shochu, and sake lees. Japan has many initiatives that showcase the country's clean industry expertise. These initiatives present business opportunities on both sides of the Pacific Ocean. Now is the time to promote Japan's zero waste "Mottainai Culture" to the rest of the world, and to work on cooperation and new business concepts.

Endnote

¹ <https://www.sustaininfrastructure.org/>

² <https://www.portland.gov/bps/climate-action/clean-industry/documents/clean-industry-assessment-final-report/download>

³ <https://www.portland.gov/>

⁴ <https://cordr.com/service/waste-collection/>

⁵ <https://www.sustaininfrastructure.org/ag-symbiosis>

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