CASE STUDY

Net Zero Water

NOVEMBER 2026



Exploring the feasibility of biochar in the Capital Regional District

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ACKNOWLEDGMENTS

This case study is part of the Net Zero Water Roadmap project, which is funded in part by the Government of Canada through its Low Carbon Economy Implementation Readiness Fund.

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Financé en partie par :
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Key insights

- The Capital Regional District (CRD) is advancing a process to produce biochar as part of its biosolids management process. The CRD has selected a technology provider, Pyrocal, and the project is advancing through engagement, permitting, and agreement milestones. The project has received a $7-million grant through the Build Canada Strong Fund's Community stream.
- Biochar offers a dual benefit: the high-temperature production process can help reduce or destroy contaminants of concern (e.g., PFAS and pharmaceuticals) while simultaneously capturing and storing carbon in the resulting biochar.
- Biosolids management challenges are driving innovation. Growing concerns around land application have created a strong need for alternative, more sustainable beneficial-use pathways such as biochar.
- Biochar enables resource recovery and new market opportunities. By converting biosolids into biochar, a waste stream becomes a potentially valuable product for applications like soil amendment, mine reclamation, and construction materials, while also opening potential monetization pathways through carbon removal credits.

Background

With mounting concerns about emerging contaminants of concern, alternative ways to manage these contaminants are being investigated. One possible option is biochar production. This new and innovative method of sequestering carbon is becoming increasingly widespread, especially in Canada. As a net negative emissions approach to managing end products, biochar is gaining traction for uses such as agriculture, forestry, and construction materials. Biochar can also support soil remediation, mine reclamation, and treatment of contaminated lands across Canada. Additionally, carbon removal credits can create potential revenue pathways and improve feasibility.



A few provinces—including Quebec, Ontario, Nova Scotia, New Brunswick, and British Columbia—are exploring biochar as a solution. This case study focuses on the work being undertaken by the Capital Regional District (CRD) in British Columbia, which services 13 municipalities and three electoral areas with a population of 460,000 across 2,500 km^2. It is located within the territories of many First Nations, including but not limited to BOḰEĆEN (Pauquachin), MÁLEXEŁ (Malahat), paaʔčiidʔatx̌ (Pacheedaht), Spune'luxutth (Penelakut), Sc'ianew (Beecher Bay), Songhees, SŦÁUTW̱ (Tsawout), T'Sou-ke, W̱JOŁEŁP (Tsartlip), W̱SIḴEM (Tseycum), and xʷsepsum (Kosapsum) Nations.

Opportunity

In 2020, the CRD introduced tertiary wastewater treatment to manage the biosolids that were produced in its region. Provincial regulations require that biosolids are beneficially used. How best to do so has been an important discussion for the region. Currently, the CRD beneficially uses biosolids primarily through a quarry reclamation project, with smaller amounts being used as fertilizer for non-agricultural landscaping, including trees and shrubs. However, public concern regarding emerging contaminants of concern such as per-and polyfluoroalkyl substances (PFAS) and pharmaceuticals has increased the need to consider alternative end-uses

Biochar is an emerging end-use and carbon sequestration approach in wastewater management. Biochar is a carbon-rich material that, during production, can destroy or significantly reduce contaminants of concern, store carbon, and mitigate greenhouse gases. It is produced in a low-to-no-oxygen environment at high temperatures (400-900°C), known as pyrolysis. The biochar process also creates heat recovery opportunities at the residuals treatment facility, further reducing emissions.

With mounting concern and pressure to manage biosolids differently, the CRD is undertaking engagement and pursuing permitting efforts to advance biochar as a long-term beneficial-use pathway for the region. The CRD has also selected Pyrocal PTY Ltd. as the preferred technology provider, which shows that the CRD has moved from strategy and demonstration planning toward a more defined delivery pathway. Next steps include material permitting, financing, and agreement milestones to clear.



Future impact

The CRD is implementing a process to produce biochar. The aim is to convert biosolids from the regional sewage-treatment system into biochar through a process integrated into the Residuals Treatment Facility located at the Hartland Landfill.

Biochar production is expected to provide an alternative pathway for managing biosolids by processing them at high temperatures to significantly reduce contaminants of concern before the resulting biochar is beneficially used, addressing a growing concern about this end product. While providing these benefits for biosolids management, biochar production can also support carbon sequestration claims if the biochar meets stability and market-use requirements, creating a potentially marketable product for soil, mine reclamation, construction materials, or environmental applications. With these benefits in mind, the CRD may create a new market with biochar.

While biochar produced from wood is relatively well established, biochar produced from wastewater-derived biosolids remains an emerging area in Canada and offers a broad spectrum of applications, including safe carbon storage and flexibility for future use. The CRDs' research and work on biochar may lead the way for this process in Canada. By processing biosolids in an oxygen-deficient environment, they are broken down into biochar and a synthetic gas. The process is self-sustaining because the gas produced is combusted to provide heat to fuel the process and can also be used for other processes.

Conclusion

The CRD selected Pyrocal PTY Ltd. as the preferred technology provider for converting Class A biosolids into biochar using continuous carbonization technology. Pyrocal was selected because it operates a commercial facility in Logan, Australia, that uses biosolids as feedstock to produce biochar. The CRD aims to implement a process to produce biochar by integrating Pyrocol's technology into the existing assets on site and existing processes, with minimal disruption to ongoing operations. The CRD is advancing this process as a long-term beneficial-use pathway for biosolids, which could become Canada's first full-scale biosolids-to-biochar facility. Although several steps remain before it is fully operational, this innovative approach could benefit both the CRD and Canada's broader biosolids management future.