

Pathways Call for Evidence Submission

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NSW NET ZERO COMMISSION SUBMISSION

From waste to resource: Biosolids carbonisation as a low-carbon pathway to net zero

What opportunities or barriers could improve the effectiveness of NSW's transition to net zero?

Biosolids carbonisation offers a practical pathway to cut carbon emissions by directly reducing waste volumes, transport emissions and contaminant risks. It can turn a problematic residual stream into biochar, a stable carbon product, with additional benefits for PFAS reduction, resource recovery and lower freight emissions and costs.

Illustrative modelling using [Australia and New Zealand Biosolids Partnership's](#) 2025 biosolids survey data demonstrate the scale of emissions savings that could be achieved under enabling policy and infrastructure settings.

Under the assumptions provided in the survey, NSW produces the equivalent of 80,000 MT (dry) which equates to 444,000 MT (wet) at 18% dry solids content. Transported on an average of 200 km from source, this would result in more than 16,000 truck movements and over 6.5 million kilometres travelled. By comparison, biochar would require an estimated 150,000 km of transport, reducing travel by more than 6 million kilometres along with emissions reductions.

Biosolids biochar contains 35-40% fixed carbon, which can remain stored for more than 100 years, delivering an additional sequestration benefit of approximately 22,500 MT CO₂e. Combined with reduced transport emissions, this represents a material contribution to NSW's net zero ambitions and to the waste and water sectors.

Biosolids carbonisation can also reduce emissions indirectly by avoiding methane emissions associated with land application of biosolids, which remains current practice in some cases.

This is supported by the following literature: Yang, X., Wu, Y., Deng, Y. et al. Gaseous Pollution from Biosolids Land Application: A Review of Malodor and Greenhouse Gas Emissions and their Mitigation Strategies. Curr Pollution Rep 12, 6 (2026).

<https://doi.org/10.1007/s40726-026-00396-8>

Towards a comprehensive greenhouse gas emissions inventory for biosolids

J.P. Alvarez-Gaitan, Michael D. Short, Sven Lundie, Richard Stuetz

<http://dx.doi.org/10.1016/j.watres.2016.03.059>

Uptake in NSW is currently constrained more by regulatory and market uncertainty than by technology. A clearer, technology-neutral end-of-waste style pathway for biosolids-derived biochar, supported by product standards, risk-based approvals and procurement settings that recognise low-emissions recycled products, would help unlock private investment and scale deployment.

How could the NSW Government better stimulate private finance at the scale and pace needed for the net zero transition?

NSW Government could stimulate private finance by reducing policy and offtake risk for carbon removal projects such as biosolids carbonisation. Investors are more likely to back biochar projects when there is long-term feedstock certainty, clear regulation for the output product, and confidence that biochar can access lawful end markets. Regulatory clarity for biosolids-derived biochar would improve project bankability and unlock capital for carbon removal infrastructure.

Public co-investment in enabling infrastructure would further de-risk investment. For a regional model, support for local drying and aggregation assets, planning approvals and first-of-kind carbonisation centres would lower upfront costs, while grants or concessional finance could be paired with private capital under long-term offtake and feedstock agreements.

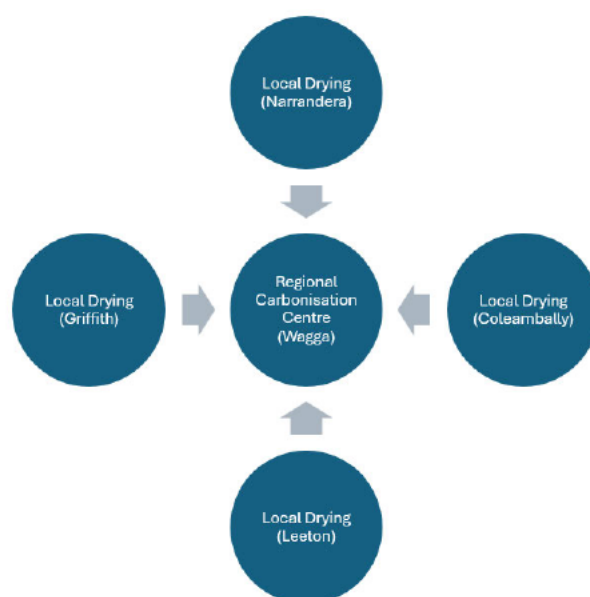


Figure 2: What a centralised carbonisation centre could look like in regional NSW

What are the drivers and risks to reaching NSW's interim targets in 2030 and 2035, and net zero by 2050?

One of the key risks to NSW meeting its interim and long-term net zero targets is continued reliance on biosolids and organics pathways that generate avoidable carbon emissions. If land application and landfill options become more constrained because of PFAS concerns and landfill capacity pressure, emissions and costs are likely to rise unless alternative processing infrastructure is deployed quickly. Carbonisation can help close that gap by converting a difficult waste stream into a stable carbon product while reducing transport emissions, methane-related disposal burdens and environmental risk.

The main driver for success is policy certainty that enables private and public investment to flow into regional treatment infrastructure. Without that, NSW risks staying locked into fragmented, higher-cost, carbon-intensive waste pathways.

What are the opportunities or barriers for collaboration across sectors to support the transition?

A major opportunity for collaboration is to align waste, water and carbon policy so biosolids can be converted into durable carbon products close to source, reducing freight and improving project economics. Carbonisation is inherently cross-sectoral and would benefit from cooperation between water utilities, councils, regulators, agriculture, freight operators and regional development agencies.

The main barrier is fragmented responsibility across multiple policy domains, which makes it harder to coordinate approvals, feedstock supply, finance and end-use markets. NSW could improve collaboration by supporting regional precinct-style pilots that bring all parties into a single delivery framework

Technology and behaviour change**What are the opportunities and barriers to technology development, deployment for each sector?**

Biosolids carbonisation is a proven technology, but deployment is constrained by regulatory uncertainty, high upfront capital costs and limited market recognition for biochar. NSW's role is to provide clearer product pathways, support first-of-kind regional projects and align procurement and carbon policy so low-emissions recycled products can scale.

What are the opportunities to foster demand reduction and behaviour change?

The main behaviour change opportunity is to shift biosolids and organics from being seen as disposal problems to being seen as feedstocks for durable carbon storage and resource recovery. That shift would support earlier investment decisions by councils, utilities and industry, and help create demand for low-emissions recycled products such as biochar.

Economic impacts and just transition

Carbonisation and regional biochar infrastructure can create regional jobs, lower freight costs and improve waste resilience, while reducing pressure on landfill and land

application pathways. A just transition will depend on fair access for regional and remote communities, including First Nations engagement and local participation in project planning and benefits. Ensuring that regional projects deliver social, environmental and financial co-benefits will be important for long-term acceptance and success.

Evidence and other considerations

Australian project evidence shows that biosolids carbonisation can reduce volumes, cut transport requirements and lower lifecycle emissions while producing a carbon-rich product with potential market value. The ANZBP 2025 production data provide a useful indicative basis for assessing scale, but NSW-specific deployment would depend on local feedstock, approvals and market conditions.

Sector specific areas of focus

Waste - Opportunities, barriers and timelines for driving circular economy principles

Within the waste sector, biosolids carbonisation can reduce the carbon footprint of waste treatment by cutting transport emissions, avoiding landfill methane and storing carbon in biochar for the long term. Australian projects show lower lifecycle emissions than conventional biosolids handling, with added benefits from reduced freight and resource recovery.

NSW's tightening biosolids controls, including new PFAS-related guidance and monitoring requirements, strengthen the case for alternative processing pathways that avoid reliance on land application of untreated or lightly treated material. Carbonisation offers one such pathway, consistent with circular economy aims to keep materials in use and design out pollution.

Carbon management - opportunities, barriers and timelines for engineered carbon removals

Biochar from biosolids carbonisation can support durable carbon storage by locking a portion of carbon into a stable solid form, contributing to long-term carbon management. NSW could recognise this as part of its carbon removal toolkit, alongside stronger evidence, monitoring and carbon accounting rules, while maintaining proportionate, evidence-based claims about its role and permanence.

Conclusion

Australian biosolids carbonisation projects show that advanced thermal treatment such as carbonisation can cut volumes, reduce transport, produce a carbon-rich product with market potential, and reduce carbon emissions. With the right regulatory and investment settings, biosolids carbonisation and regional biochar infrastructure can become a practical part of NSW's net zero transition, supporting emissions reduction, resource recovery and regional economic development.

Thank you.

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