

## INTRODUCTION

Biosolids are treated and stabilized wastewater treatment residuals. In BC, this material is largely beneficially re-used as a soil amendment in agriculture or other applications, including landscaping and site reclamation. The land application of biosolids is regulated by the [Organic Matter Recycling Regulation \(OMRR\)](#). There are a number of other biosolids management options available including: incineration (with or without energy recovery), pyrolysis, gasification and landfilling. The table below provides a general, high-level comparison of the main biosolids management options used around the world. To evaluate and compare specific projects or specific management options for a given region or site, a detailed evaluation would have to be done using project specific information.

**Table 1.** A comparison of various biosolids management options.

	<b>Land Application</b>	<b>Incineration (with waste to energy)</b>	<b>Pyrolysis</b>	<b>Gasification</b>	<b>Landfill</b>
<b>Environmental Outcomes</b>	✓✓✓ <sup>(1)</sup>	✓✓ <sup>(2)</sup>	✓✓ <sup>(2)</sup>	✓✓ <sup>(2)</sup>	X
<b>Greenhouse Gas Reduction<sup>(3)</sup></b>	✓✓✓	✓ or X <sup>(4)</sup>	✓ or X <sup>(4)</sup>	✓ or X <sup>(4)</sup>	X
<b>Food Security</b>	✓✓✓	✓✓	✓✓ <sup>(5)</sup>	✓✓ <sup>(5)</sup>	X
<b>Cost</b>	✓✓✓	X <sup>(6)</sup>	X	X	✓✓
<b>Commercial Success<sup>(7)</sup></b>	✓✓✓	✓✓✓	X	✓ or X <sup>(8)</sup>	✓✓✓
<b>Authorization</b>	Regulation	Permit	Permit	Permit	Permit or OC

Ratings Overview: ✓✓✓ = strong net benefit; ✓✓ = marginal net benefits; ✓ = small net benefits; X = net negative or neutral

Notes:

- (1) Assumes that land application is done in compliance with OMRR.
- (2) A significant amount of air emissions would occur from incineration, pyrolysis or gasification. Liquid by-products from pyrolysis would likely require disposal as established commercial markets/uses are known to currently exist. Incineration can have a higher environmental rating if it replaces the use of coal or other similar fuel (e.g., at existing cement kilns). This rating assumes a facility would need to be built.
- (3) Greenhouse gas reduction depends on transport distances and process temperatures, and should be evaluated for specific scenarios using a life cycle assessment. What is presented in this table is a generalization that has been made based on multiple detailed assessments.
- (4) The positive or negative rating depends on the energy required for drying and the source of that energy (rating may be positive if waste heat is used for drying)
- (5) The rating assumes that the solid by-product would be land applied to recycle nutrients (note that most of the nitrogen would be lost in the process). However, the solid by-product would need to be established as safe for land application (there is currently limited information available on this topic).
- (6) This rating assumes that a facility would need to be built. Costs for incineration, pyrolysis and gasification are all fairly similar. However, the fact that incineration of biosolids or sludge is commercially proven may result in a lower perceived risk of investment.
- (7) Commercially proven refers only to commercial success with processing biosolids or sludge.
- (8) The commercial success of gasification has had mixed results and requires further evaluation.
- (9) In general, the rating of an individual technology (e.g., pyrolysis) can vary significantly depending on the process parameters (e.g., temperature, retention time), use of by-products, transport distances, facility management and many other factors.

## EVALUATION CATEGORIES

### *Environmental Outcomes*

The category of “environmental outcomes” includes general consideration of:

- air emissions;
- resource recovery, e.g., recovery of nutrients;
- use or disposal of by-products resulting from the process; and
- contaminant considerations in by-product use or disposal.

### *Greenhouse Gas Reduction*

This is a measure of greenhouse gas reduction relative to the greenhouse gas production associated with the landfilling of biosolids (not considered to be a beneficial use). For thermal treatments (i.e., pyrolysis, gasification, and incineration), it includes a consideration of the energy required to dry sludge or biosolids, although it does not factor in emissions associated with transport (this varies significantly depending on a specific management scenario).

### *Food Security*

Food security is a measure of how much organic matter and nutrients are used as soil amendments for growth of food crops. It also reflects the potential for decreased or increased reliance on commercial fertilizer.

### *Cost*

The cost assessment includes direct capital and operating expenses, as well as a consideration for utilizing finite landfill capacity.

### *Commercial Success*

The commercial success of the various management options is based on scans to find instances of commercial success in other jurisdictions. It does not include pilot projects.

### *Authorization Required*

This category provides a description of which authorizations may be required under the *Environmental Management Act* (EMA). Options include:

- compliance with the requirements set in a results-based regulation, i.e., the [OMRR](#)
- permits (described in [Section 14 of EMA](#))
- approvals (described in [Section 15 of EMA](#))
- operational certificates (OC) (described in [Section 28 of EMA](#)) under solid waste management plans

For more information on biosolids or the Organic Matter Recycling Regulation, please visit:

- [www2.gov.bc.ca/gov/content/environment/waste-management/recycling/organics/regulations-guidelines](http://www2.gov.bc.ca/gov/content/environment/waste-management/recycling/organics/regulations-guidelines)