Actionable Science for Communities

Management of Wood from Site Clearing and Storm Debris

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Purpose/Utility of Research

The Superfund program has increased its focus on the environmental footprint of cleanups through EPA's Office of Land and Emergency Management's (OLEM's) Greener Cleanups policy, Superfund's Green Remediation Strategy, and individual regional green remediation policies, such as EPA Region 2's Clean and Green Policy.

Region 2's green remediation program has grappled with the issue of wood generated during cleanup activities. In addition, natural disasters can generate large amounts of vegetative and woody debris that present challenges in post-generation management. Hurricane Sandy, for example, generated more than 168,000 cubic yards of woody debris in New York City alone.

Research focusing on organics management from municipal solid waste (MSW) and wood management from construction and demolition (C&D) is available; however, there is no product that is strictly dedicated to land-clearing and site cleanup. The objective of this project was to develop a decision-makers guide to assist in evaluating a variety of wood management options considering multiple criteria including life-cycle assessment (LCA) information/data from existing literature to help decision-makers identify tradeoffs between options.

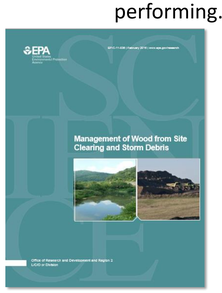
Application & Translation

Case Study: Woodbrook Road Dump Superfund Site, a 70 acre heavily wooded contaminated site in New Jersey – In evaluating the potential environmental impacts of the different wood management options being investigated, we focused on carbon emissions as well as potential carbon emission offsets and carbon storage potential. The table below shows these on a per-ton-of-wood basis, along with the approximate net carbon emissions per ton. As the table shows, the options are comparable based on carbon emissions and all appear to provide a net carbon reduction. Carbon emissions from the processing of wood into lumber were not found. However, the carbon offset and storage potential for this end-use application were approximately five to six times the carbon offset and storage potential for other options.

Option	Carbon Emissions	Carbon Offsets	Carbon Storage	Net Total Carbon
Bioenergy	140	(440)	0	(300)
Compost	140	0	(480)	(340)
Lumber	NA	(2,700)	(2,878)	—
Mulch	140	0	(480)	(340)
Municipal WTE	120	(440)	0	(320)
Pulp and Paper	140	(440)	0	(300)

Highlights

- This ORD/Region 2 collaborative project is summarized in the report ***Management of Wood from Site Clearing and Storm Debris*** (under review).
- A literature search identified options for wood management and data characterizing the cost and environmental aspects of the options. The report enumerates and summarizes quantitative data from the literature for the targeted metrics of cost, GHG emissions (***Figure 1***), and energy consumption (***Figure 2***) for different wood management options.
- A flow chart (***Figure 3***) and checklist were created to help decision-makers weigh various wood management options for a given set of scenarios, focusing on site remediation and NetZero communities of practice.
- Approaches are provided to combine the information from flow chart Steps 1–3 to synthesize what was learned and narrow in on what may be the best option or options for managing the wood from a project site:
  - a decision matrix, as ***Table 1*** shows, includes the use of symbols to represent the best (++), good (+), and worse (-) performing options based on the decision,
  - ***Table 2*** presents an example of a numerical ranking decision matrix using un-weighted and weighted rankings to produce overall scores. Rankings are hypothetical and range from 1 for best-performing to 7 worse-performing.



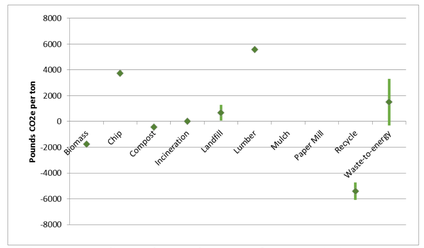


Figure 1. Median Value and Range of GHG Emissions Reported for Wood Management Options.

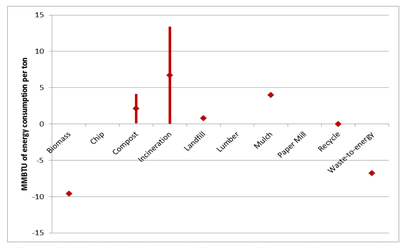


Figure 2. Median Value and Range of Energy Consumption Reported for Wood Management Options

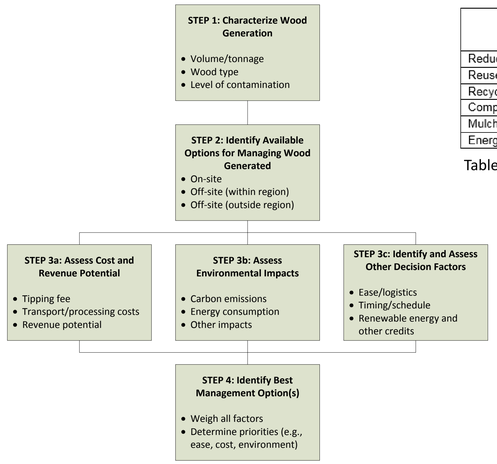


Figure 3 Recommended Steps for Site Managers and Materials Management Practitioners.

	Net Cost (per ton)	Net GHG Emissions (per ton)	Complexity of Logistics	Landfill Diversion Credit	Renewable Energy Credit
Reduce	++	+	++	+	-
Reuse	+	+	+	+	-
Recycling	+	++	-	+	-
Compost	+	+	+	+	-
Mulch	+	+	+	+	-
Energy	-	+	+	-	+

Table 1. Example Decision Matrix for Wood Management Using Multiple Decision Criteria

	Net Cost	Net GHG Emissions	Complexity of Logistics	Landfill Diversion Credit	Renewable Energy Credit	Score
Un-Weighted						
Reduce	1	6	1	1	0	9
Reuse	2	7	4	1	0	14
Recycling	3	2	7	1	0	13
Compost	5	5	5	1	0	16
Mulch	4	4	3	1	0	12
Energy	7	3	6	0	1	17
Weighted						
Weights	*5*	*4*	*2*	*3*	*1*	
Reduce	5	24	2	3	0	34
Reuse	10	28	8	3	0	49
Recycling	15	8	14	3	0	40
Compost	25	20	10	3	0	58
Mulch	20	16	6	3	0	45
Energy	35	12	12	0	1	60

Table 2. Example Decision Matrix for Wood Management Using Un-Weighted and Weighted Rankings

Intended End users

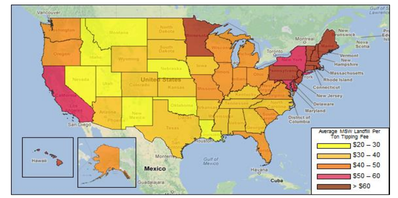
The project is aligned with OLEM's strategy on climate change and could lead to significant reductions of GHG emissions. OLEM is committed to leveraging its materials and land management programs to achieve measurable GHG emission reductions while yielding multiple environmental, human health, and economic benefits for communities across the nation. In its Climate Change Implementation Plan, finalized in October 2014, OLEM identified 26 actions to begin over the next 3 years, including but not limited to reviewing remedy effectiveness, management of storm debris, and emergency management planning. This work is directly relevant to management of wood storm debris.

Research in this area also benefits the Net Zero community of practice (a Region 2 science priority). Zero waste programs provide ways to realize the environmental, economic, and social benefits of environmental stewardship through waste reduction, reuse, recycling, and composting.

Lessons Learned

There are key gaps or uncertainties in the available literature, and further research needs to be performed to better understand and refine decision-making guidance for wood management specific to land-clearing and site cleanup.

- Cost data for potential wood management options is limited. Although tipping fee data is readily available for landfills and Waste-to-Energy (WTE) facilities, similar tipping fee data for smaller-scale options including mulch, compost, and other reuse/recycling applications is not readily available.
- There are few dedicated life-cycle or environmental studies for land-clearing and site cleanup operations. Rather, much of the literature that includes life-cycle and other environmental analyses is focused more on organics (e.g., yard trimmings) or wood as part of the MSW stream or C&D wastes. Research is necessary to conduct an LCA for wood management options that is specific to site cleanup and land-clearing operations.



2011 MSW Landfill Tipping Fees in the United States (EPA, 2015)