

Pyrolysis to Biochar in NYC:

Technology assessment for pyrolysis equipment and market demand analysis of biochar from pyrolysis

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Sponsored By: Town+Gown: NYC on behalf of the Department of Sanitation of New York (DSNY) **Mentored By:** Prof. Pavel Kots, Errol Elbasan

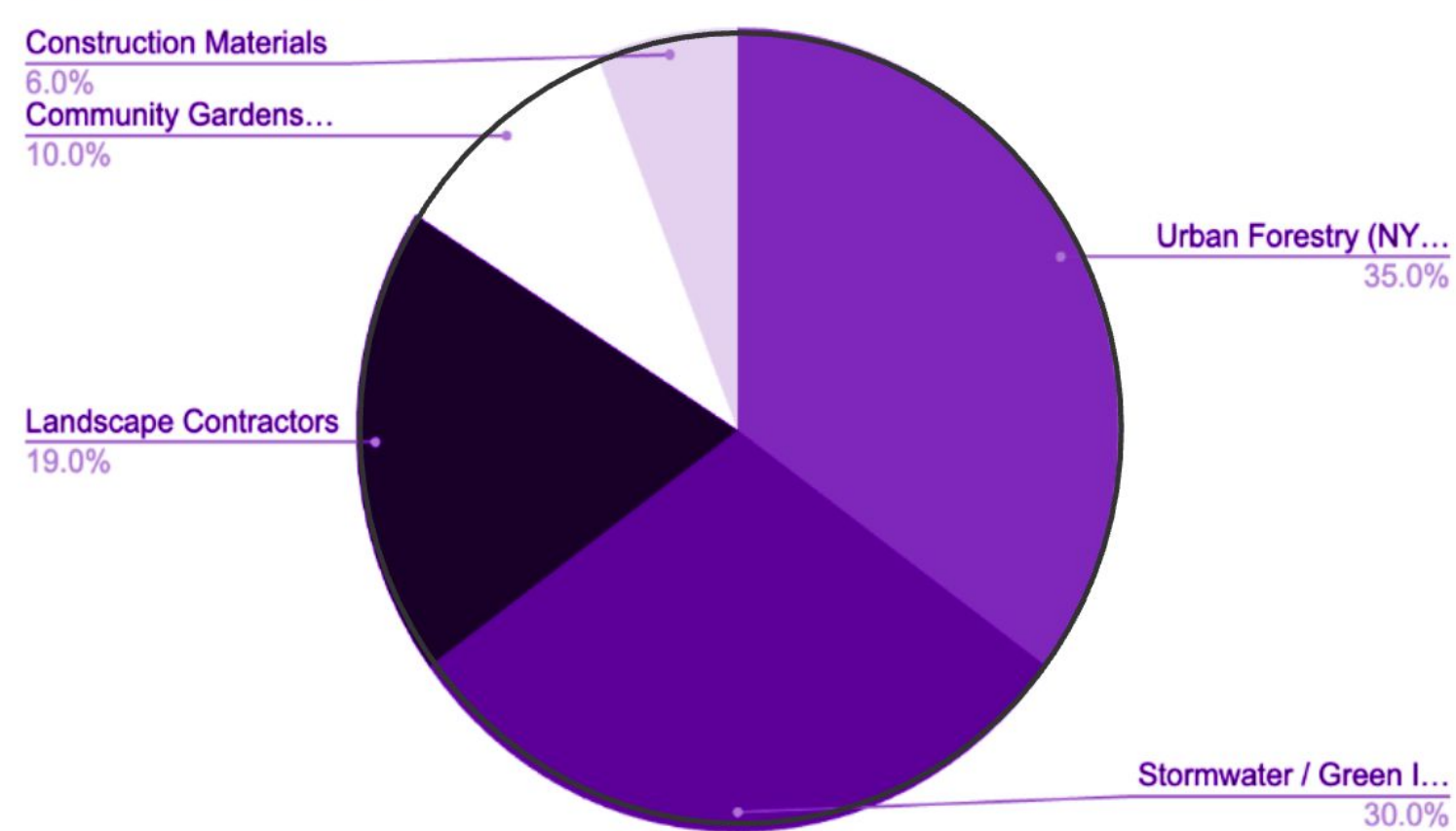
Project Scope

- DSNY runs compost facilities that process woody debris and compost overs (coarse leftovers after screening).
- These materials are bulky, carbon-rich, and hard to use fully within current compost operations.
- Pyrolysis can convert this waste into biochar, a stable carbon product with useful physical properties.
- Our project explores whether pyrolysis + biochar is a practical, beneficial addition to DSNY's organic waste management.

Sponsor Vision

- Find pyrolysis equipment that fits DSNY's waste streams and sites.
- Understand who can use biochar in NYC and how.
- Recommend a realistic pilot setup DSNY can try and later scale.
- Our project supports DSNY's broader goals of waste reduction, climate action, and soil health.

Percentage (%)



Key Findings and Results

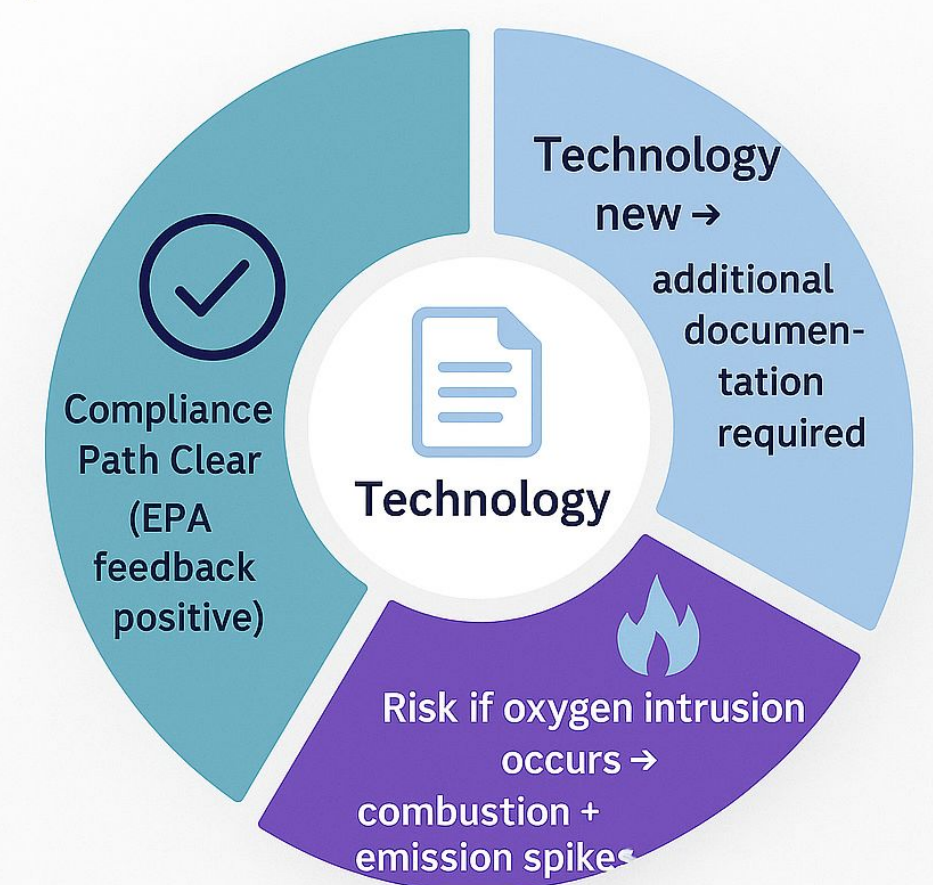
Pyrolysis Equipment

- Pyrolysis is heating biomass with very little oxygen, so it does not burn like a normal fire.
- The process produces biochar (solid), syngas (gas), and sometimes oily liquids; DSNY is most interested in the biochar.
- Operating conditions like temperature, time, and heating rate strongly affect how much biochar is produced and its quality.
- For DSNY, the focus is slow or moderate-temperature pyrolysis, which gives more char rather than liquid fuels.

Biochar Market Analysis

- Market is early-stage but expanding, especially in urban forestry, stormwater, soil improvement, and landscape uses.
- Stable, soil-based inputs are essential; mixed or inconsistent feedstocks increase production and market risks.
- Collaboration with city agencies, nonprofits, and private partners is key for feedstock access and application development.
- Cases like Cincinnati Parks and TerraSoka show that biochar-based soil products can be adopted when they align with municipal needs and performance standards.

Air Quality Concerns



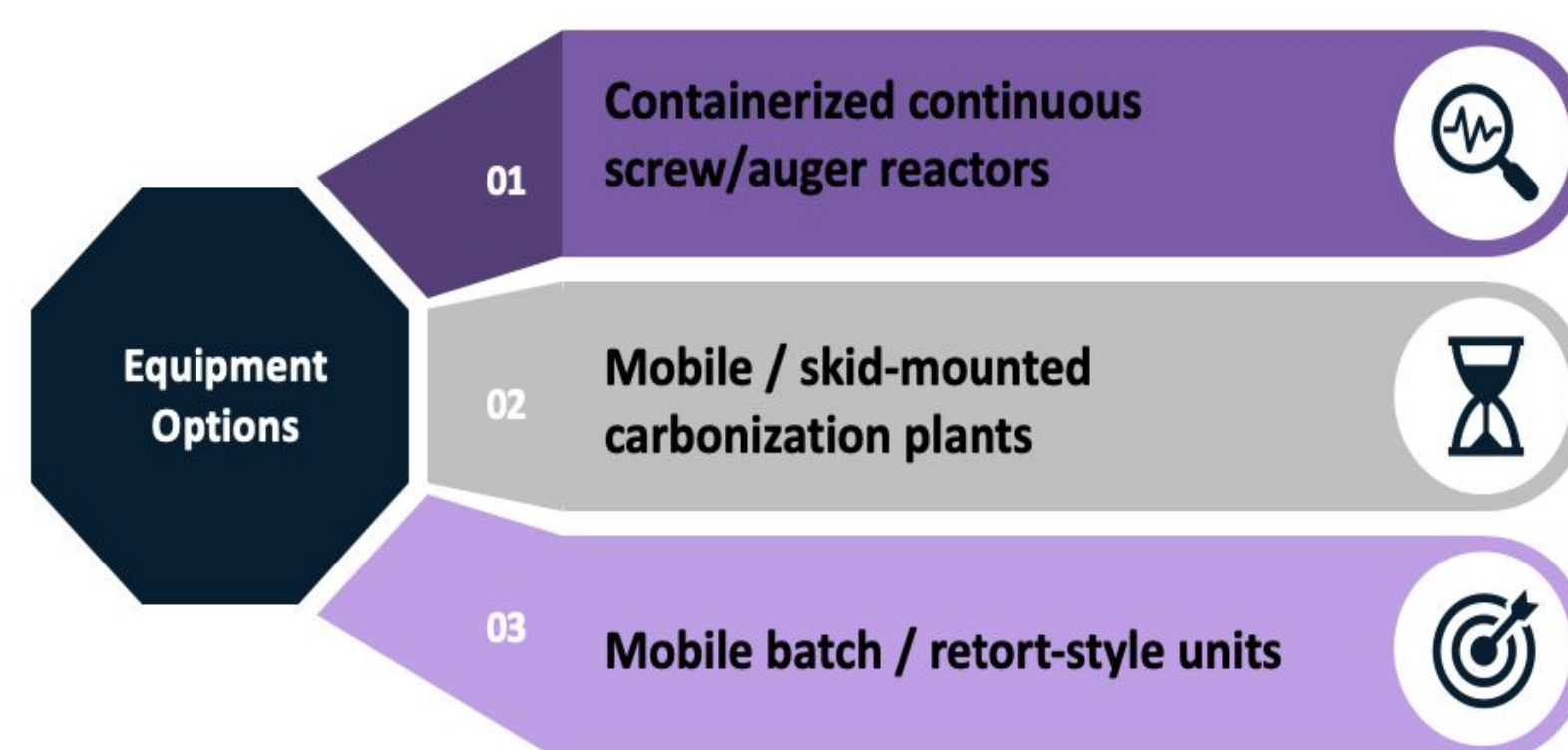
Key Milestones

- Kickoff: Defined project goals with Town+Gown and DSNY.
- Research: Reviewed pyrolysis and biochar literature and DSNY background.
- Interviews: Talked with DSNY staff, operators, vendors, and potential users.
- Analysis: Compared equipment options and identified best-fit technologies.
- Results: Developed pilot recommendation and prepared final report + poster.

Methodology



Equipment Options



Impact & Implications

- DSNY managers emphasized: equipment must be safe, reliable, and not overly complex for existing staff to operate.
- Compost operators highlighted limits on space, staff time, and tolerance for downtime, pushing us toward modular, plug-and-play systems.
- Vendors stressed that performance depends on consistent feedstock and clear expectations for biochar quality and emissions.
- Overall, stakeholders want a realistic pilot that proves the concept without over-promising revenue or underestimating operational needs.

Recommendations

- Start with a containerized or skid-mounted pyrolysis unit at the Staten Island Compost Facility using woody debris and overs.
- Design a clear operating plan: feedstock specs, daily hours, staffing roles, and safety procedures.
- Monitor key indicators: quantity processed, energy use, emissions, and biochar quality (carbon content, ash, pH, potential contaminants).
- Use pilot results to refine equipment specs, decide whether to scale up, and identify other DSNY sites suitable for future units.

Lessons Learned/Conclusion

- A technology that looks great on paper must still fit the site, staff, and regulations.
- Feedstock preparation (chipping, drying, screening) is critical to performance.
- Emissions, safety, and permitting can become bottlenecks if not addressed early.
- Stakeholder Management

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