District of Columbia Department of Public Works
Sustainability Strategy Roadmap Project
Executive Summary - Design and Findings

OVERVIEW

Through collaboration and hard work of residents, workers, business leaders and professional experts, the District developed *Sustainable DC*, laying out the strategy to make the District the healthiest, greenest, most livable city in the nation over a 20-year planning horizon to 2032. The *Sustainable DC* plan addresses core urban challenges with innovative, forward thinking solutions focused around sustainability while improving quality of life and creating new economic growth for all residents

To develop programming that achieves sustainability goals outlined in the 2012 *Sustainable DC* Plan, and to optimize the District's MSW programs to contribute to a healthy, clean, green, sustainable city, the DC Department of Public Works commissioned an evaluation strategy and framework that assesses use of air, land, and water (natural capital) as a basis for sustainability-based planning for its long-term MSW management program. The primary goal of this Strategy Roadmap Project is to provide an analytical context for strategic planning and ongoing continuous process improvements to support the DPW's operations and planning to meet sustainability goals. In conducting and reporting this study, the *Sustainable DC* concept of viewing the collected materials as potential assets will be reflected in the design, application, and terminology used in the analysis.

The evaluation strategy and framework used to develop the Strategy Roadmap organizes and depicts multiple categories of data, information, and knowledge needed to address the following operational sustainability elements identified by DPW:

- Meet the goals of the Mayor's Sustainable DC plan
- Identify how to economically increase the District's recycling diversion rate
- Determine how the District can best capture the embedded energy and economic value of its residual asset stream
- Identify the optimal set of components to maximize the value of the residual asset stream while providing economic sustainability over the long term
- Make the most efficient use of constrained air, land, and water assets within the District and in the surrounding jurisdictions to enable both conservation and future growth
- Identify whether the District should seek jurisdictional partners for the solid waste management system

Sustainable DC outlines several goals related to or directly affecting operations of the District's Department of Public Works (DPW) for managing municipal solid waste (MSW), including increasing by five times the number of jobs providing green goods and services, and attracting and retaining 250,000 new and existing residents. At the same time, *Sustainable DC* is looking to achieve "Zero Waste" in 2032 using policies and practices that first reduce waste generation and then capture value from remaining residual materials by diverting them to reuse, recycling, composting and energy production. "Zero Waste" practices also include redefining residual materials from waste burden made to disappear into an asset management system generating economic, environmental, and social value to District residents and businesses. In recognition of this "burden to asset" redefinition of municipal solid waste in *Sustainable DC*, this report will use the transitional terminology residual/asset when describing the discarded materials handled by DPW and its private counterparts.

The Department of Public Works waste management operations are integral to reaching several other *Sustainable DC* goals, including total waste generation reduced by 15 percent, 20 percent reuse of construction and demolition waste, and 80 percent diversion away from a landfill, and developing options for the economic reuse of "assets." Importantly, the plan also calls for a 50 percent reduction in greenhouse gas emissions. The specific and targeted outcomes in the plan are discussed further in this Report and included as Appendix V.

The nature and breadth of participants, actions, facilities, localities, and inter-modal transport elements that make up the current DC-wide residual asset handling system are more widespread and complex than generally noted in current management and legislative policies. This first comprehensive effort to identify and baseline the current operational activities set out in this report provides a more defined framework for both investment and operational decisions going forward.

THE DISTRICT OF COLUMBIA RESIDUAL ASSET MANAGEMENT SYSTEM

The District's residual asset management is comprised of collection, diversion, and disposition services provided either by DPW, private haulers, or other contracted service providers. Of the over 900,000 tons of solid residual assets currently generated in the District, DPW collects and manages approximately 25 percent of the total tonnage. DPW sorts and consolidates approximately 250,000 tons through two transfer stations (which includes privately collected tonnage); less than 5 percent of the residual assets controlled by DPW are currently disposed in a landfill.

Public and private enterprise activities to manage the District's residual assets occur within the District, surrounding local jurisdictions, other states, and internationally. Although a portion of collection activities are carried out by District-based operators (DPW and private haulers) and DPW transfer stations, diversion and disposition companies are located largely outside the District, and can require material transport over distances that range from just over the District line to in excess of 10,000 miles.

Currently, DPW's contracts for post-collection services including revenue-sharing agreements associated with recycling, and tipping fees for energy production, composting, and landfilling. The jobs, revenue from fees and taxes, and secondary layers of economic development (e.g., residential housing, local commercial spending) associated with this economic activity are not--but could be--accruing to the District. Meeting the inter-related *Sustainable DC* goals of economic development, green job creation, and population growth could include localizing residual asset management programs at underutilized or under-optimized areas within the District border where sufficient and appropriate infrastructure capacity exists.

In compiling data related to the current operational baseline of the DPW residual asset handling system, other inter-related issues were identified and are discussed in the report, including the potential for economic and job growth from localizing operational functions within DC borders where possible, expanded application of environmental preferable contracting provisions in DC regulations, environmental and social justice aspects, viable options for flow control, the inter-relationship of DC laws and regulations with Federal law, and opportunities for additional data collection and analysis to support process improvement.

ANALYTICAL PROCESS

The project proposal was for an evaluation strategy and framework that could quantitatively compare the current technology and processes used to manage waste/assets with three to five alternative integrated solid waste management scenarios. The analytical results will serve as the basis for needed data, information, and knowledge to conduct strategic planning for natural and financial capital investments required to meet Sustainable DC goals.

Scenario studies are a common form of analysis and planning, and backcasting methodologies are generally used in strategy planning for sustainability issues. For this project, the analytic scenarios are based on a defined future state established in the Sustainable DC Plan, and prospective options were evaluated in scenarios under a backcasting format. Because the majority of Sustainable DC goals were focused on reducing the use of air, land, and water assets, the assessment was designed with natural capital use as the primary comparative element.[1] By assessing natural capital use as the primary comparative factor, the District elevates the value of environmental asset savings to the same decision making level generally limited to financial asset expenditure.

The Strategy Roadmap identified four phases to the District's residual asset management system that would be assessed for its natural capital use:

- **Generation**: the intentional or negligent discarding of material of all types by various dwelling, economic, or organic sources for repurposing or disposal, and includes material from Households, Public Spaces, Commercial activity (includes educational, medical, and other service providers), Industrial activity, and Landscaping.
- **Collection**: the process of picking up and accumulating discarded waste/assets for repurposing or schools/colleges as well as commercial establishments
- **Diversion**: directing waste/asset material flow away from landfills and other permanent disposal options to alternative reuse or repurposing options
- **Disposition**: the permanent disposal or deposition of collected, treated, or processed waste/asset material into physical and/or natural infrastructure storage systems (e.g. landfill)

Both vehicle and facility natural capital use was compiled and/or calculated for this analysis. Primary data sources included: state air permits, the US EPA Greenhouse Gas Reporting System, annual reports and compliance filings (energy production facilities), utility billing, deeds and leases, as-built plans, and survey results (written followed up by interview).

The Strategy Roadmap analysis was designed as a four-step process:

1. The project compiled a baseline of the current DPW waste/asset management system, to include the tons handled, the processes uses, and the natural capital (air, land, and water capacity) consumption related to each;

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[1] The major distinguishing characteristic of backcasting is a concern not with what futures are likely to happen, but with how desirable futures can be attained. Sustainability policy is commonly developed by first establishing future state goals, and then developing policy, programming, budget, and implementation programming to achieve the goals using backcasting as a tool. Backcasting is also capable of highlighting discrepancies between the current and desirable future, and incorporating large and even disruptive changes.

2. Using a natural capital measurement system, the project calculated best available "use rates" of natural capital on a per ton basis for the waste/asset material handled in each process category currently utilized (recycling, energy production, and landfilling);
3. With input provided from two public meetings, prospective scenarios were then developed which incorporated, to the best extent possible, the future state requirements set out in the Sustainable DC Plan regarding the number of tons to be generated, the methods of processing, specific reductions in natural capital use, particularly greenhouse gases, and localization of processes to enhance employment and economic value within DC;
4. The natural capital use rates were then indexed to the tonnage flow in the revised process streams delineated in the scenarios to determine which technology and process options achieved the lowest natural capital (air, land, and water) use rates when applied under the current geographic facility emplacement, or with more localized options. These indexed results are summarized for each affected natural capital medium according to process activity as Sustainability Quotients.

Once the natural capital use rates are developed for the baseline process, those rates are factored against the revised tonnage flows developed for the scenarios. This generated comparable natural capital use rates likely to result if tonnage flow is increased to a particular diversion option within a particular geographic span. The scenarios developed are depicted in the the following chart:

Alternative Scenarios Matrix

Scenario/ Process Activity	Phase 1 Load Production	Phase 2 Load Collection	Phase 3 Load Diversion	Phase 4 Load Disposition
Baseline	Baseline	Baseline	Baseline	Baseline
Optimization A1	15% Source Reduction	Current Practice	80% Diversion through Recycling with DC Built and Natural Infrastructure	Landfill Minimization/ Elimination
Optimization A2	15% Source Reduction	Current Practice	80% Diversion through Recycling with Regional Built and Natural Infrastructure	Landfill Minimization/ Elimination
Optimization B1	15% Source Reduction	Current Practice	80% Diversion through Refining with DC Built and Natural Infrastructure	Landfill Minimization/ Elimination
Optimization B2	15% Source Reduction	Current Practice	80% Diversion through Refining with Regional Built and Natural Infrastructure	Landfill Minimization/ Elimination

ASSESSMENT FINDINGS

The primary strategic result of the best available data analysis results shows that overall, the production of energy in localized facilities requires the lowest levels of natural capital use or consumption on a per-ton handled basis. The following factors affect this outcome:

- Current systems for recycling organic material uses a high level of airshed capacity to absorb emissions from decomposition
- Diverting waste/assets to energy production is a single step process from transfer facilities, in contrast to recycling diversion, which can, and often does, require several transport and processing actions that consume natural capital capacity
- Energy production facilities are highly regulated and controlled facilities compared to other material handling facility types, resulting in minimal natural capital capacity consumption per ton managed
- Multi-step handling processes can include foreign jurisdictions that do not prevent excessive or potentially harmful use of natural capital capacity

The report details findings in operational, flow management, data availability, and data consideration categories as they relate to DPW's strategic planning to meet the Sustainable DC goals. Key findings include the following:

- The DPW diverts almost all of its collected tonnage away from landfills, making it already compliant with the *Sustainable DC* goal for diversion.
- In the absence of enhanced data regarding load composition and management by private haulers, DPW activities currently emit more greenhouse gases per ton handled than private haulers mainly due to composting of leaves and other organic material
- Scenario A2 (15 percent reduction in tonnage and 80 percent diversion to energy production localized in DC) produced the greatest reduction in overall greenhouse gas emissions (6,453,061 tons CO2E) for management of the total DC residual asset load.
- In the absence of flow control or other enforceable process requirements that take natural capital "spending" into account, private market practices default to lowest monetary cost options for residual asset handling among diversion and disposition options.
- Technology and process activities currently used for residual asset management (landfilling, energy production, recycling/reprocessing) do not each practice the same level of data compilation and reporting regarding natural capital consumption and use for residual asset handling, preventing District leadership from having the information and knowledge required for informed decision-making.
- Waste reduction is the single best mechanism for reducing natural capital use related to residual asset creation and handling, and provides the greatest opportunity to meet sustainability and other policy goals.
- Fully regulated combustion facilities that produce electricity are the most natural-capital efficient residual asset management option per ton generated when available actual data on air, land, and water use is evaluated. Residuals, in this context, have the greatest value as an asset as it is directly converted to energy without additional natural capital use.

STRATEGIC RECOMMENDATIONS

Meeting the ambitious goals of *Sustainable DC* over its 20-year time span, while also addressing legislative requirements for greener purchasing and hierarchy-based residual asset management processes,

will require planning, investment, and new system design elements over the immediate, intermediate, and long term planning horizon. The full report includes detailed recommendations for developing operational and investment programming to achieve *Sustainable DC* goals in the following categories:

Optimized Reduction Programs: Following passage of the Pollution Prevention Act of 1990, the U.S. Environmental Protection Agency established a national policy that ranked prevention at the top of the pollution management response hierarchy, a policy that remains the best option for sustainability in the residual asset management field today. Thus, the generation phase of residual asset handling provides the best opportunity to achieve sustainability goals by avoiding or preventing the creation of discarded material in the first instance.

Manage Data Gaps/Increase Information and Knowledge For Decision-making: Virtually all the current legal and policy requirements for sustainable residual asset handling require are data based, driven by measured incremental changes from current baselines. These include economic development activities, renewable energy (use and credits), and natural capital use, especially greenhouse gas emission limits. The Strategy Roadmap compiled a Preliminary Baseline using DPW operational data and robust information collected and reported by several private and contracted service providers. However, to measure incremental improvements toward goals and legal requirements, data collection procedures can be updated to include more information and knowledge for program and planning decisions. Current DPW Operations data collection and private partner reporting processes can be expanded to include technology performance data and additional reporting from private operators as part of contracting as well as regulatory procedures.

Formalize Sustainability Performance Metrics for DC Residual Asset Handling: The performance metrics derived in the report from *Sustainable DC* goals are macro calculations applied to DC residual asset handling. More detailed and specific performance metrics can be developed as guidelines for program budgeting and planning to reach numeric sustainability targets by the 2032 deadline.

Evaluate Revised Flow Design and Optimization to meet Economic Development Goals, Create Green Jobs and achieve Sustainability Performance Metrics: Current technologies and practices that may disproportionately consume natural capital capacity can be replaced with alternative options that use less natural capital current utilized in the District's residual asset management system

CONCLUSION

To achieve 80% waste diversion, 15% waste reduction, contribute to a 50% reduction in greenhouse gases while supporting population growth, green job expansion, and economic development, the Strategy Roadmap demonstrates that future residual asset handling systems can be designed to:

- Encourage, if not require reuse
- Limit waste creation
- Compile and use actual data where available, accessible, documentable
- Drive evidence based-decisions
- Expand contractor and private sector participation in achieving milestones
- Minimize material movement and localize jobs
- Source advanced technology

The above categories can all contribute to reduced natural capital use, and improved economic and social capacity for a *Sustainable DC.*