# MAYORS CHALLENGE

## Houston, TX

BLOOMBERG PHILANTHROPIES
TOP 20 FINALIST
MAYORS CHALLENGE

***One Bin for All***

**Mayors Challenge Final Application**
**City of Houston *One Bin for All***
**January 31, 2013**

## Executive Summary

### The One-Liner

*One Bin for All* is a revolutionary idea for residents to discard all materials in one bin, treating "trash" as valuable assets, dramatically increasing recycling using game changing technologies.

### The Elevator Pitch

*One Bin for All* is a revolutionary idea for residents to discard all materials in one bin, treating "trash" as valuable assets, dramatically increasing recycling using game changing technologies.

This cost-neutral, technological innovation is a paradigm shift, changing how people think about waste and recycling. The concept of "trash" will be extinct and replaced by an understanding that all discarded material has value and can be recycled.

Houston will apply proven technologies and new processes, redefining municipal solid waste from a liability to a valuable asset. This first-of-its-kind innovation uses technology in a way that has never been done before. This approach has the potential for cities across the globe to reduce greenhouse gas emissions, save money and create high value materials.

Almost half of Houstonians cannot recycle curbside. The Mayor is besieged by citizens who want recycling in their neighborhoods. However, the City struggles to pay for waste and recycling services from its general fund. Thus Houston has one of the lowest residential recycling rates in the nation and does not have a fully implemented recycling program.

Houston's innovation will:

- Provide every residence with curbside *One Bin for All* services;
- Decrease the volume of waste sent to landfills;
- Reduce air pollution; and,
- Manage waste and recycling costs.

Houston will divert up to 75% of its waste, up from its current 14%. Houston has evidence the technology can work, significantly increasing its recycling rate at a price that is affordable.

### Evolution

Houston's innovation has been enhanced by outside support and the team's reliance on tools from Ideas Camp. For example, the storyboarding workshop helped the team realize that the interaction between residents and *One Bin for All* was a critical benefit. The team's fictional representatives Eleanor and her children, created at the workshop, inspired the plot of Houston's final application video.

BennettMidland helped Houston think through the necessary pieces of a successful public private partnership, including a business plan, advisory committee and local government corporation creation, which was incorporated into the implementation plan. Since this innovation has not been tried before, Houston had to thoroughly explain challenges and proposed strategies to reduce risks. The coaches provided feedback to support the *One Bin for All* brand, and a more succinct elevator pitch. The coaches encouraged the team to add specific guarantees for uptime performance and diversion rates in the RFQ and contract. Houston also realized it needed to clearly state that the City will have no equity position in the proposed public private partnership and that the contractor is responsible for the capital requirements. The calculations show a reasonable ROI which can be found in the budget.

Before coming to Ideas Camp, the Houston team assumed that the City would provide a site for the facility. However, business model questions raised during coaching calls forced the team to rethink the issue. The City realized that to successfully decrease transportation costs and reduce permit requirements, the best option for a successful proposer is to co-locate the facility at an existing landfill,

Houston also has responded to concerns that its idea would simply be a so-called "dirty MRF," a materials recovery facility incapable of effectively separating trash and recyclables. This final application actively addresses the risk, describing technologies seen in Europe as well as numerous conversations regarding how technologies can accurately sort commingled materials by removing small pieces early in the process and handle items such as food waste. In addition, new technologies discussed can handle items such as food waste. The Houston team remains confident that its research and facility tours have demonstrated that these novel process systems will be effective and that there exist partners who can deliver this game-changing facility.

Finally, since *One Bin for All* has become a public idea, additional partners and companies have come forward to support and encourage Houston to proceed with the innovation.

**Vision**

Houston has the opportunity to improve the health and quality of life of its citizens, divert more municipal solid waste than any other large City in the nation, save money, change the way citizens think about materials, reduce extraction of raw materials and influence other cities to embrace this transformation. Houston will build the first total material resource recovery facility in the US. Houston will divert up to 75% of the waste stream – relying on technology, not individuals, allowing residents to place everything in one bin.

Most curbside recycling programs rely on residents to make many decisions about what is trash vs. recycling. *One Bin for All* will provide the City with access to a five-fold increase in the volume of valuable resources for recovery, eliminating any distinction between "trash" and "recycling." The innovation will foster an understanding that all discarded material has value.

Allowing technology and new process systems to sort household materials and derive an initial 55% diversion rate, and upwards of 75% with composting, anaerobic digestion and catalytic conversion (biomass-to-fuel) is more efficient and effective. Proven technologies (shredders, sensors, density separators and optical scanners) have been used previously in the waste, mining, or refining industries, but combined in a new process will yield a much higher recycling rate. This innovation will reduce greenhouse gas (GHG) emissions and improve air quality, provide an easy-to-use program for residents, save money and increase revenues.

Recycling and diversion of waste from landfills are basic tenets of most municipal environmental programs. Cities are constantly trying to improve recycling rates at the absolutely lowest overall cost and greatest environmental benefit. To date, Houston has not been able to increase its recycling rate above 14% due to numerous barriers, including:

- *Political*: Unlike most other cities, Houston has never had a fee to recover either the costs of basic solid waste services or a recycling program. Therefore, all of Houston's solid waste services are paid out of the city's general fund. Historically, there has been little political pressure to institute a fee, but recent trends indicate a much greater interest in recycling, which is reflected in recent increases in recycling rates.
- *Regulatory*: There is no state or local mandate for recycling.
- *Economic*: The Houston area has very inexpensive landfill costs, because generally, land is cheap and abundant.
- *Geographic*: Houston has 625 square miles served by its solid waste management department.

Houston began to explore creative methods to expand its residential single stream recycling program and in the process discovered options from Europe that had been relied upon conceptually in the United States. After a long due diligence period Houston has elected to move forward with this technological revolution which dramatically alters the conventional wisdom in the waste industry that trash needs to be separated from recyclables.

Houston's *One Bin for All* provides a solution that will:

- Enroll every residence in curbside recycling services;
- Decrease the volume of waste sent to a landfill by recovering more materials;

- Reduce GHGs by eliminating the separate single stream program routes and reduce methane emissions from landfills, improving both regional air quality and overall quality of life for Houstonians; and
- Manage costs associated with waste collection and disposal and recycling, saving cities money.

*One Bin for All* demonstrates two types of configuration innovation and at least one type of experience innovation:

**Configuration – Networks**: Houston will create numerous networks and partnerships as part of this innovation. A public-private partnership will build and operate the facility. An Advisory Committee will provide counsel to the Mayor and a local government corporation (LGC) will administer the contract and provide oversight.

Though Houston is the fourth largest city, the City controls only residential waste and does not own any landfills. Houston has to be creative to increase its recycling rate affordably. Creating partnerships is one way to build a facility that is financially sound, meets recycling goals and addresses environmental concerns. The due diligence process concluded that co-location at an existing landfill was an important factor to reduce transportation costs across a very large geographic area. Another issue that needed to be addressed was the volume of discarded materials available for processing by the contractor. Houston will act as the long-term anchor tenant, providing 60% of the necessary volume to make a facility fully financially feasible. To gain the remainder, Houston has had informal discussions with commercial entities and regional government partners to educate them about *One Bin for All*. Encouraging them to move their waste disposal contracts would enhance ROI. This is a model that could easily be replicated by other cities, large and small.

Houston already has a well-established industrial and energy base. This high-profile development will provide incentives for networks to form around newly separated materials that will be available as feedstocks.

**Configuration – Economic Model**: *One Bin for All* recognizes value from assets that are now being discarded, and stimulates associated growth in companies in materials management. By having access to more volume, *One Bin for All* will separate material into new commodities. With larger volumes of materials, new feedstocks will be created, thereby extracting maximum value from material to create new products. For example, using DOE funded research, a scalable and commercial process can occur in which a catalyst transforms discarded paper products directly into gasoline or diesel for use in standard internal combustion engines.

**Experience – Delivery Channel**: Houston will deliver a service in a new way that creates customer ease of use (one bin). Residents can experience *One Bin for All* both at home and at the visitors education center in the new facility. The newly-branded bins will be very easy to use: every discarded item will go into the same bin. The *One Bin for All* logo will be distributed to all single-family customers. The visitors education center will demonstrate how these processes work in one integrated system. Groups of school children and community leaders can take ownership of the program and Houstonians will feel a sense of pride in participating in *One Bin for All*.

**Implement**

By establishing achievable components, Houston can transition from the historical approach to municipal waste (single-stream/dual-stream source separation/remainder to landfill) to an innovative, sustainable program of recycling and comprehensive resource recovery.

*Who will lead us?*

Initially, the Project Team represents three critical areas of Houston's city government, each providing its commitment and expertise to key components. Andy Icken, Chief Development Officer, will serve as Team Leader, drawing upon his vast experience in complex economic development projects. Harry Hayes, Solid Waste Management Director, will oversee operational changes. Laura Spanjian, Sustainability Director, will identify the metrics of success for environmental improvements and health benefits, and will help coordinate the public relations and education campaign.

The Project Team will hire the program manager, will coordinate issuing an RFQ to solicit a firm (public private partnership – P3 contractor) to build and operate the facility, will recommend to the Mayor members to serve on the Advisory Committee and LGC and will hire the public relations firm. The Mayor will form the Advisory Committee of outside stakeholders with technical, business, environmental and financial expertise. A key responsibility of the Advisory Committee will be advising the Project Team and communicating and receiving feedback from residents about the *One Bin for All* program. The Advisory Committee will also recommend members for a *One Bin for All* LGC.

The Project Team will transition its leadership to the *One Bin for All* LGC. An LGC provides expert and community oversight as well as enhanced flexibility to implement a large economic development project. The Mayor will appoint members of the LGC, which will be approved by City Council. Mayor Parker has created two of these types of entities in her administration (for Houston's Recovery Center and Forensics Science Center). The *One Bin for All* LGC will negotiate and secure City Council approval of the long term contract with the successful proposer. In addition, the *One Bin for All* LGC will oversee and deliver crucial project management tasks including governance, expertise, performance management and communications. The Project Team will continue to provide oversight of the LGC throughout the multiple year contract to ensure the successful implementation of *One Bin for All*.

*Who will partner with us?*

Houston will continue to work with the following organizations who all have expressed an interest in supporting *One Bin for All,* by either serving on the Advisory Committee, or the *One Bin for All* LGC: C40/Clinton Climate Initiative; Rocky Mountain Institute; Environmental Defense Fund; William McDonough + Partners; Houston-Galveston Area Council; Houston Advanced Research Center; University of Houston; Keep Houston Beautiful; Air Alliance Houston; the Greater Houston Partnership; and the Johnson Space Center/NASA.

*What are the implementation risks? Is this innovation too good to be true?*

This project can serve Houston with great benefits, but with new innovations can come risk. Below are the major risks and Houston's plans to mitigate them.

Will the technology work?
Many of the individual components contemplated to be deployed have long been used in the waste, mining, food, or refining industries. Currently, no facility integrates all of the technologies, processes, and systems in the manner envisioned for *One Bin for All*—but, that's the innovation. *One Bin for All* will expand on successful projects in California, Canada, Greece, Germany and England. City staff members have visited several of these facilities, and have seen that residential commingled materials can be processed into valuable resources.

Houston will rely on an RFQ Review Committee (appointed by the Project Team), leveraging its technical and financial expertise to evaluate critical components of the RFQ responses. Based on informal conversations, the City believes there will be multiple companies who will submit responses. To enhance implementation and scalability, the Advisory Committee will provide guidance to the City and recommendations to the *One Bin for All* LGC regarding technology evaluations, partnerships, education and outreach.

During negotiation of the anticipated long-term contract the LGC will strive to include guarantees for equipment uptime performance and diversion rate. The LGC will require the P3 contractor to escrow funds to compensate the LGC, and in turn, the City, if there is a breach of contract or default.

Finally, Houston anticipates that even if the technology fails to perform optimally (e.g., 55-75% diversion), it is likely that the City can substantially improve its current waste diversion rate. Plus, Houston will continue its expansion of its current single-stream recycling program until *One Bin for All* is fully implemented.

Is land available for this facility?
In order to optimize *One Bin for All* the 20 acre facility should be co-located at a landfill. The Project Team has had positive informal conversations with landfill operators.

Can this facility be financed?
The financial burden of raising the capital and providing a location lies with the successful proposer. However, Houston can guarantee the city's residential waste stream and a per ton processing fee for a long-term period, thus providing investors with the assurance they require as well as reasonable rate of return. Houston can also cultivate commercial and regional partnerships with surrounding communities to bring their waste streams to this facility, increasing the amount of material processed and sold (this will also increase the rate of return for the P3 contractor) and creating a regional model that will enhance replicability.

Will there be resistance to large scale change?
In theory, there should be no resistance because *One Bin for All* is so easy to use. But, humans can be resistant to change. The public has been educated for decades to separate their materials, and asking residents to believe that technology can sort all materials, may be difficult. The *One Bin for All* LGC will retain a private-sector public relations firm to develop a robust public education and outreach plan to smooth this transition, emphasizing that all materials have some value, whether expressed in dollars or costs avoided.

**Budget - City of Houston *One Bin for All***

**CITY BUDGET: BUDGET NEUTRAL IMPACT -** "Can we expand recycling service to the entire City for no more than what it costs today to reach half of the City? Can we get more without spending more by unlocking the value of trash?" This is the paradigm shift of *One Bin for All* , that trash has value.

| **Budgetary Activity** (fiscal year = 7/1 - 6/30) | **Create LGC** | **Project Initiation** | **1st Full Yr Operations** | **Established Operations** |
|---|---|---|---|---|
| **City of Houston ($thousand)** | **FY14** | **FY15** | **FY16** | **FY17** |
| **Sources:** | | | | |
| Mayors Challenge Award | 1,000 | - | - | - |
| Recycling Revenue Fund & DOE Grant | 40 | 857 | - | - |
| Refuse Disposal (i.e., landfill fees) | - | - | 13,222 | 13,222 |
| Single Stream Recycling Program | - | - | - | 2,440 |
| **Total** | **1,040** | **857** | **13,222** | **15,662** |
| **Uses:** | | | | |
| Waste Characterization Study | 125 | - | - | - |
| LGC Start-up Fees (filing, legal fees, etc.) | 147 | - | - | - |
| LGC Operating (offices, prof. srvcs.) | 230 | 460 | 460 | 460 |
| Salaries (incl. LGC, Program Mgr) | 275 | 550 | 550 | 550 |
| Public Relations Firm | 25 | 50 | 50 | 50 |
| Recycling Processing Fee (UP TO) | - | - | 12,162 | 14,602 |
| **Total** | **802** | **1,060** | **13,222** | **15,662** |
| **Net** (balance will rollover) | **238** | **(203)** | **-** | **-** |

**P3 CONTRACTOR PRO FORMA: ROI BASED ONLY ON THE CITY'S WASTE STREAM –** "What is the maximum ROI available IF the City were the only customer?" These are estimates and actual numbers may vary materially. A competitive proposal process will determine the recycling processing fee and a revenue share of commodity sales. *One Bin for All* should be at least budget neutral, if not budget positive.

| **P3 Contractor ($thousand)** | **FY14** | **FY15** | **FY16** | **FY17** |
|---|---|---|---|---|
| **Sources:** | | | | |
| Recycling Processing Fee (UP TO) | - | - | 12,162 | 14,602 |
| Commodity Sales (no revenue share) | - | - | 8,892 | 8,892 |
| **Total** | **-** | **-** | **21,054** | **23,494** |
| **Uses:** | | | | |
| P3 Contractor Capital Costs | - | 100,000 | - | - |
| Operating Expenses | - | - | 5,000 | 5,100 |
| **Total** | **-** | **100,000** | **5,000** | **5,100** |
| **Operating Cash Flow** | **-** | **(100,000)** | **16,054** | **18,394** |

| | |
|---|---|
| **Internal Rate of Return (20 yrs)** | **17%** |

## TIMELINE - CITY OF HOUSTON *ONE BIN FOR ALL*

**Key**

- Mayor's office
- Local Government Corporation
- P3 Contractor
- Advisory Committee
- Solid Waste Management
- Major Milestone

High | Medium | Low

**Milestone**

**Key Deliverable**

**Risk Level**

### 2013-Q1

**Hire Program Manager**

A qualified expert in economic development projects

### 2013-Q3

**Appoint Advisory Committee**

Mayor appoints stakeholder Advisory Committee

**Issue Request for Qualifications (RFQ)**

*One Bin for All* Project Team publicly issues RFQ

**Launch**

**Recommend Local Government Corporation (LGC) membership**

Provides recommendations for technical, business, environmental and financial members for local government corporation to the Mayor

**Create LGC**

Mayor appoints members of the LGC and secures City Council approval

**First measurable progress**

### 2013-Q3

**Recommend firm for selection to LGC**

RFQ review committee recommends approval of contractor to Project Team; Project Team endorses and recommends to LGC

**Hire public relations firm for outreach & education**

Launch a multi-year, multi-phase public relations initiative beginning with project communication to media and public, concluding with rebranding program for residents

### 2014-Q1

**Negotiate performance guaranteed long-term contract**

Mutually agreeable, financially responsible, favorably termed, executable contract with P3 contractor

**First win**

**Convert existing recycling programs**

Comprehensive operations plan which optimizes routes and processes communicated to public relations firm

### 2014-Q2

**Design and secure permits for facility and site**

Set of approved construction drawings and permit applications

**Early win**

### 2015-Q2

**Equipment installed in facility**

Equipment with performance guarantee is formally accepted

**Facility construction completed**

Formal acceptance and dedication of the facility

**Win**

### 2015-Q3

**Deliver first residential solid waste to facility**

Begin *One Bin for All* process; deliver 2,000 tons per day, 4 days a week, 52 weeks of the year

**Win**

***One Bin for All* facility operating**

30 days of sucessful operation

### 2015-Q4

**Achieve initial performance guarantee**

Waste diversion at 55%

**Phase One**

**Issue first annual report of operations**

Operations report details equipment performance, equipment uptime and waste diversion rate

### 2016-Q4

**Achieve target diversion performance guarantee**

Waste diversion at 75%

**Project completed**

### 2017-Q1

**Achieve success**

Conduct customer satisfaction survey and receive positive results

**Mayor's vision realized**

**Impact**

The impacts of *One Bin for All* are significant. This program will dramatically reduce the amount of Houston's residential waste being buried in a landfill, tripling the current recycling rate. Customers will find the program easy to use, since they will have only one bin for all discarded material. Simultaneously, the City will have full participation in recycling. *One Bin for All* will reduce operating costs to the City while offering economic growth opportunities to the community. Houston expects to improve its air quality as a result of *One Bin for All.*

**Customer service improvement and ease of use:** No one will have to think, "Does a plastic cup go into a recycling bin?" or "Does aluminum foil really have to go in the trash?" The *One Bin for All* solution is an efficient, effective and streamlined approach for all residents to increase material reuse and recovery, and to improve the environment.

Currently, Houston residents may find themselves in one of three scenarios: 1) no curbside recycling, 2) limited curbside recycling using a small 18-gallon bin, or 3) full single-stream recycling using a 96-gallon bin. With *One Bin for All* those with no curbside recycling will be the least affected. They simply will continue to put all of their material in their existing bin once a week. Those with limited curbside recycling will stop lugging their bins out to the curb twice a month and revert to placing their material into one bin. And finally those with full single-stream recycling can stop trying to figure out what is recyclable and what is not.

**Waste diversion benefits**: Most cities in the U.S. provide trash collection services, and for nearly 40 years, cities have understood the value of diverting waste from landfills and the benefit of recycling material. Unfortunately, even the best cities only divert between 20%-40% of their waste. Of the 25 largest cities in the U.S., only four have residential diversion rates greater than 50%. More than half are less than 27%. (*Waste & Recycling News* Municipal Recycling Survey, February 2012).

The rate of recyclable materials recovered from the municipal solid waste stream has increased nationally from 6% in 1960 to only 34% in 2010. ("Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2010," U.S. EPA 2010). The recovery rate is quite variable for different material types. Items like metals with a high market value have equally high recovery rates (up to 70%), whereas less desirable materials such as food waste have recovery rates as low as 2%. Houston's innovation reduces variability and equalizes recovery opportunity for all materials.

*One Bin for All* will dramatically increase Houston's waste diversion, because technology and new process systems will separate discarded materials more effectively into commodity streams. At full implementation *One Bin for All* will divert up to 75% of the waste, creating bio-fuels from anaerobic digestion and gasoline and diesel from biomass.

**Environmental benefits:** As Houston is able to recover and recycle more material from its waste stream, the City will have a reduction in greenhouse gas emissions. The principal source of the reduction will come from diverting organic material (primarily food) away from the landfill, because its decomposition releases methane. Methane is estimated by EPA to be 21 times more potent, in terms of its ability to warm the earth, than the more common carbon dioxide.

Currently, almost all food waste is landfilled. This innovation will ensure that no more than 25% is ever taken to the landfill.

Food and goods production account for 42% of all the GHGs generated in the United States (West Coast Climate and Materials Management Forum). According to EPA's Waste Reduction Model, by diverting 75% of the mixed municipal solid waste to reuse/recycling and composting processes, Houston will reduce roughly 3.72 metric tons of carbon equivalent per ton of MSW diverted.

Houston has been designated a severe non-attainment area for ozone, a criteria pollutant under the Clean Air Act. *One Bin for All* will allow solid waste collection routes to be optimized resulting in the removal of the equivalent of 5,000 vehicles off the road each year. The associated emissions reductions in ozone precursors (nitrous oxide and volatile organic compounds) will benefit Houston in its ongoing efforts to achieve attainment status.

Ozone, commonly known as smog, adversely affects human health by causing respiratory issues and is of particular concern for the very old and the very young. A recent EPA report cites research showing that while the exact cause of childhood asthma is not known, for those children already diagnosed exposure to certain air pollutants including particulate matter and ozone can exacerbate their symptoms. "America's Children and the Environment," (January 2013).

Beyond these localized effects on air quality, *One Bin for All* will provide regional and global benefits because reclaimed material will replace virgin raw materials for manufacturing. Using reclaimed material as feedstock reduces or eliminates the energy used in extraction and manufacture of new products. Existing landfills can be mined for their plentiful resources the globally.

**Cost savings, government efficiencies and other economic benefits**: The City will buy and maintain fewer trucks and residential bins, and will have fewer truck routes to develop, manage, and operate. There will be increased revenue with additional commodities sold into the market, and less management of multiple contracts, routes and facilities. The innovation will reduce vehicle miles traveled by 600,000 miles, leading to operational and maintenance cost savings. At full implementation *One Bin for All's* facility will provide newly separated commodity streams that will be available for use in industry and manufacturing. Houston anticipates growth in new material management companies.

**Job Creation:** Due to the innovative and large scale use of technology in the *One Bin for All* process, it is estimated that 100 direct jobs will be created. These are local, not foreign jobs. The anaerobic digestion and catalytic conversion (biomass-to-fuel) subsystems will also create jobs for which Houston, with its petrochemical refining and fuels industries, is well poised to fulfill and excel. Finally the P3 contractor will have more than 60 personnel on site operating the system six days a week on two full shifts. The economic impact of these activities is estimated to be $90-100 million.

## METRICS AND MEASUREMENT TABLE – CITY OF HOUSTON *ONE BIN FOR ALL*

| | What will we do? | What will we measure? | How will we measure it? | On what timeline? |
|---|---|---|---|---|
| **Resources**<br>In order to accomplish our set of activities, we will ***need*** the following: | 1. Hire program manager<br>2. Appoint community stakeholders to form an Advisory Committee<br>3. Establish a Local Government Corporation<br>4. Hire PR firm to communicate about the project to the media and public<br>5. Choose public private partner (P3) contractor with the capacity, technology and skills to provide the facility | | | 1. 2013-Q1<br>2. 2013-Q3<br>3. 2013-Q3<br>4. 2013-Q3<br>5. 2014-Q1 |
| **Activities**<br>In order to address our problem, we'll conduct the following ***activities***: | 1. Draft, solicit and review a request for qualifications to identify P3 contractor<br>2. Introduce *One Bin for All* utilizing radio, TV and social media<br>3. Partner with P3 contractor to finance, build and operate facility<br>4. Reach out to community through presentations at neighborhood groups<br>5. Begin collecting residential discards in one container for processing and recovery | | | 1. 2013-Q3<br>2. 2013-Q3<br>3. 2014-Q1<br>4. 2014-Q4<br>5. 2015-Q3 |
| **Outputs**<br>We expect that once completed or underway, these activities will produce the following ***evidence*** of service delivery: | 1. Program rebranded by providing new *One Bin for All* logos to residents and airing messages on TV and radio<br>2. Deliver material to facility that is operating and processing<br>3. Review contractor performance report<br>4. Increase customer satisfaction | 1. New logos on bins used by residents<br>2. Tons delivered to facility<br>3. Contractor performance<br>4. Public opinion of Houston's recycling efforts | 1. Observe a sample of collection routes<br>2. Weight tickets from the contractor<br>3. Look to see if performance uptime and diversion goals are being met<br>4. Baseline survey before program begins and follow-up survey after program implementation | 1. 2014-Q4<br>2. Daily, beginning 2015-Q3<br>3. Monthly and quarterly, beginning 2015-Q4<br>4. 2015-Q1; 2016-Q1; 2017-Q1 |
| **Outcomes**<br>We expect that if completed or ongoing, these activities will lead to the following ***changes in the short term***: | 1. Increase diversion rate to 55%<br>2. Reduce greenhouse gas emissions by diverting more organic material from the landfill thereby avoiding the associated methane emissions<br>3. Reduce vehicular emissions from trash collection<br>4. Reduce overall operations and maintenance cost for the Solid Waste Management Department by maximizing route efficiencies and consolidating fleet<br>5. Increase revenue to the City | 1. Tons diverted from the landfill<br>2. Greenhouse gas emissions<br>3. Nitrous oxides and volatile organic compounds, which combine to form ground level ozone (smog)<br>4. Net cost per ton diverted<br>5. Revenue dollars from the sale of commodities | 1. Weight tickets supplied by the contractor<br>2. Utilize the US EPA's Waste Reduction Model (WARM)<br>3. By modeling the estimated reductions with known reductions in vehicle miles traveled by City trash trucks<br>4. Use costs of collection and processing less revenue<br>5. Review the receipts from payments received from the contractor | 1. Monthly and annually, beginning 2014-Q4<br>2. Annually after the first full calendar year of the program being in place<br>3. Monthly and annually, beginning 2015-Q4<br>4. Monthly and annually, beginning 2015-Q4<br>5. Quarterly and annually, beginning 2015-Q4 |
| **Impact**<br>We expect that if completed, these activities will lead to the following ***changes in the long term***: | 1. Increase diversion rate from 55% to 75%<br>2. Improve air quality and public health<br>3. Influence more cities to adopt similar materials management strategies<br>4. Grow Houston's economy by adding jobs in materials management, processing and manufacturing<br>5. Decouple trash generation from population growth | 1. Tons diverted by adding technologies, e.g., anaerobic digestion; biomass-to-fuel<br>2. Qualitative improvements such as reducing childhood asthma<br>3. Number of Cities that adopt a similar technology after Houston implements its program<br>4. Jobs added in key industries related to materials management<br>5. Per capita volume of tons being landfilled | 1. Compare baseline tons at 55% with increased tons diverted<br>2. Review reports produced by local organizations: Center for Houston's Future; Shell Center for Sustainability<br>3. Scan cities using municipal networks, e.g., US Conference of Mayors; Sustainability Directors Network<br>4. Local and federal data sets<br>5. Weight tickets and census data | 1. Monthly and annually, beginning 2014-Q4<br>2. Two years after project completion<br>3. Beginning 2013-Q4, ongoing thereafter<br>4. Two years after project implementation<br>5. Five years after project implementation and annually after that |

**Replicate**

The two major challenges facing cities trying to implement Houston's multi-faceted innovation:

1. *Do cities have enough waste volume to make the facility financially feasible?*
   While the innovation is optimized for a large city's waste stream, small and mid-size cities that do not control all of their waste services can benefit by working together through intergovernmental agreements, MOUs or joint partner authorities. This is the case for Houston's initiative. Houston will be the anchor tenant with over 60% of the necessary tons and has had informal discussions with commercial sector companies, waste companies, and regional governments regarding forming partnerships. This public private partnership model will transform the waste industry and can easily be replicated.

2. *Will cities overcome conventional wisdom that source separated recycling programs are successful?*
   Though conventional source separated recycling programs have been implemented for over 50 years, according to EPA the national recovery rate of recyclable materials from the municipal solid waste stream has not topped 34%, and for the top 25 largest cities, is not above 27%. Source separation is difficult, costly and apparently ineffective.

   In addition, many cities and states with source separated recycling programs are enacting strict recycling mandates. Clearly, local governments are seeking innovative ways to increase recycling, realizing it will be difficult to achieve higher rates using conventional systems that rely on thousands of individual actions.

   *One Bin for All* can help cities with the design limitations of traditional recycling programs. Houston will prove that the technologies work, and that new process systems can be created to increase recycling rates. Cities must have the political will and leadership with vision, as well as the desire to institute large scale change.

Overcoming these challenges will enhance quality of life for residents, improve health and environmental benefits and yield cost savings—all large benefits to mayors.

Houston has learned that many other cities are interested in this innovation, particularly cities that are members of the Urban Sustainability Directors Network. Some cities are adopting "zero waste" initiatives. In other cities, landfills are closing (Puente Hills, Los Angeles County's largest landfill closes this year), which creates a demand for innovations to address the municipal waste stream. California and Florida have regulations requiring 75% diversion by 2020. Other states have landfill constraints and high landfill costs such as those faced in the northwest and northeast (Washington, Delaware, New Jersey, New Hampshire, Rhode Island, Pennsylvania, Vermont, Maine and Massachusetts).

Houston is sharing its experience evaluating innovative waste diversion technologies, and conclusions on where unrealized potential could be gained. Our vision is to obtain the highest possible diversion rates, greatest reductions in greenhouse gas emissions, most improved air quality, reduced operations costs, increased revenue and easiest to use program for residents. *One Bin for All.*