

RECYCLING FROM A PRIVATE COLLECTOR'S PERSPECTIVE

A New Chapter for Recycling: Using GIS and mixed methods approach to improve the market development and transportation of recycled materials



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Memphis joining the smart cities movement



ADVANTAGES OF SMART CITY

- Smart cities = more efficient, responsive, more sustainable
- More efficient in managing solid waste
- Improved in operational performance in many sectors, including waste management
- Overcome environmental challenges
- Optimize the efficiency of waste collection value chain in circular economy
- Eliminate contamination coming from multifamily housing units and commercial sectors as well as single family housing

PRODUCTION	CONTROL	UTILITY	SERVICES	TRANSIT	PUBLIC SAFETY
ORGANIC FOOD	WATER TREATMENT	SMART WASTE MANAGEMENT	MOBILE PAYMENTS	INTELLIGENT RAIL AND TRANSIT SOLUTIONS	VIDEO SURVEILLANCE
SAFE PRODUCTS	WATER MANAGEMENT	RECYCLING	REMOTE DUTAGE NOTIFICATION	FLEET MANAGEMENT	REMOTE SECURITY MONITORING
REDUCE THE COST OF DELIVERY	ENVIRONMENTAL CONTROL	REUSE	ONLINE ORDERING	ASSET TRACKING	EMERGENCY RESPONSE
HAZARDOUS MATERIALS EMERGENCY RESPONSE	CONSERVATION OF ANIMAL POPULATIONS	EQUIPMENT MONITORING/CONTROL	REMOTE CONTROL	MOBILE PAYMENTS	SMART STREET LIGHT
			24 HOUR ACCESS	SMART ROADS	MASS NOTIFICATIONS

Smart cities and waste management



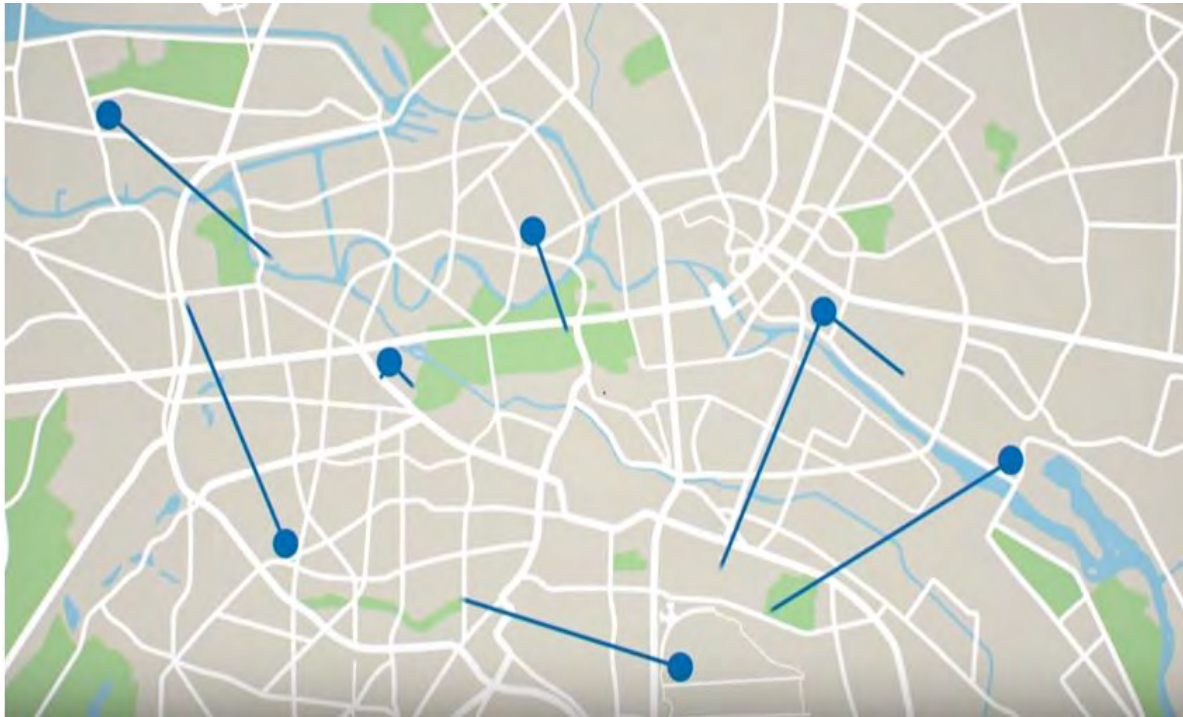
- Zero waste goal and high diversion rate (e.g. 90 %)
- Mandate waste, recycling and organic collections (most smart cities)
- To be more data driven to ensure financially for city and customers
- Collect data, track and analyze and develop more strategic programs
- To establish baseline metrics to help inform sustainability and resiliency planning
- Use web-based smart device solutions and enable operators to monitor their assets in real time

How smart cities are managing solid waste

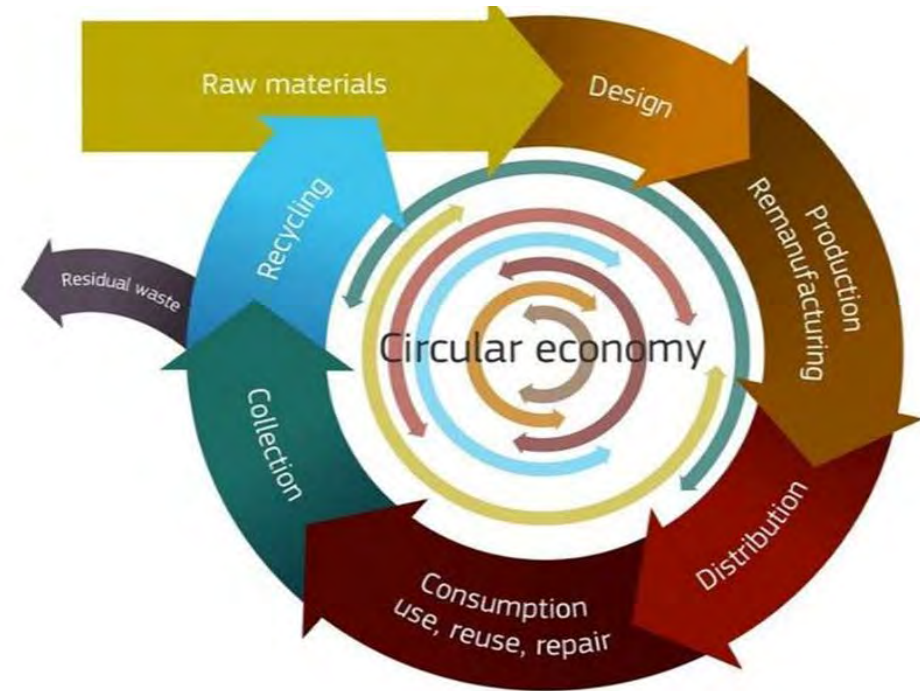


- Equip transfer stations with software and technology to track recycling, waste, organics, later turn into reporting
- Collect data via radio frequency identification tags, placed on all the carts used for collections
- Per capita waste generation rates, disposal rates, greenhouse emission savings, diversion and recycling rates, participation rates

Circular economy and recycling in smart cities



Understand waste pattern generations in each locations so that collections points can be recommended and number of trips are reduced.

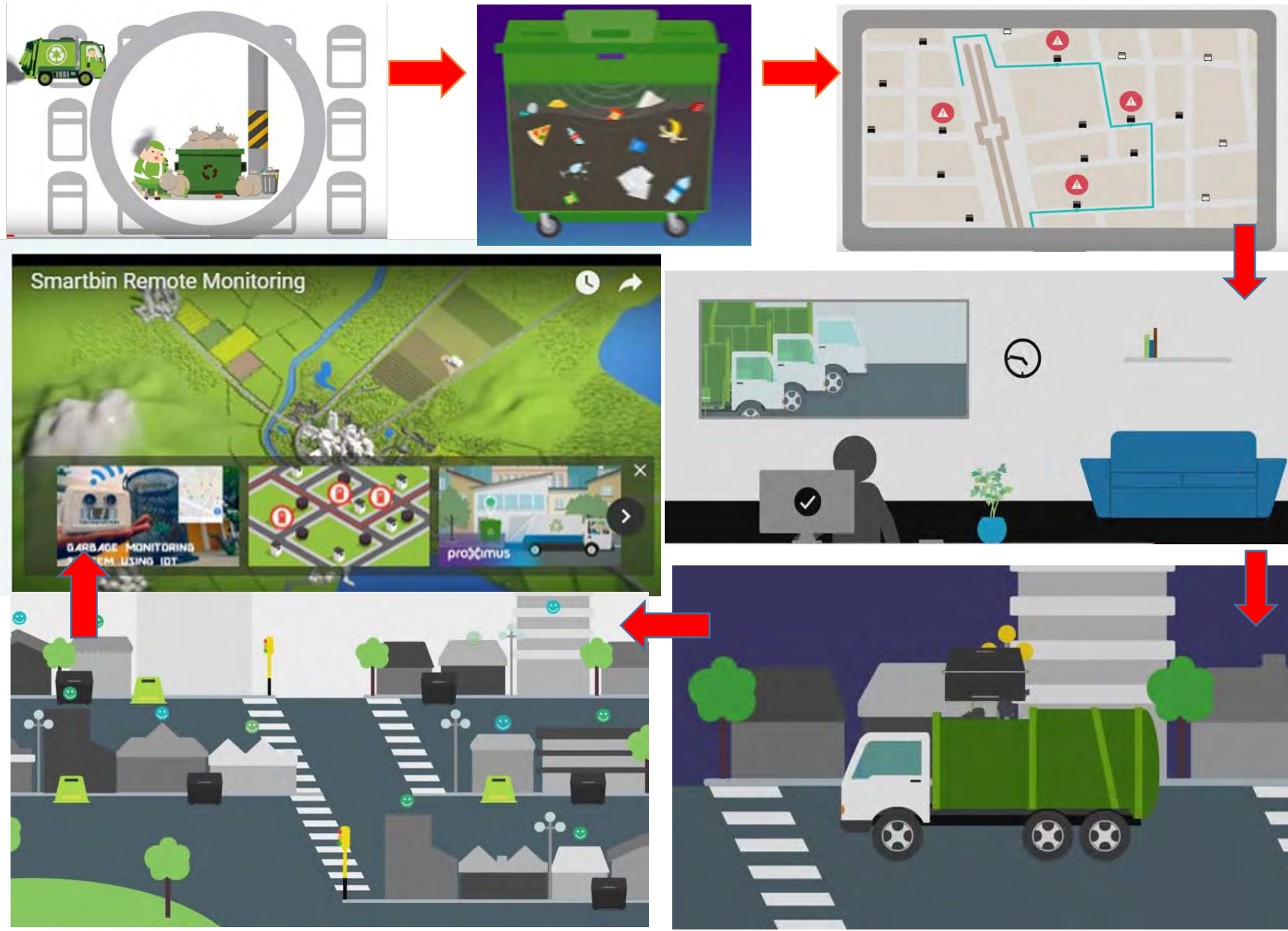


Vs

Linear economy

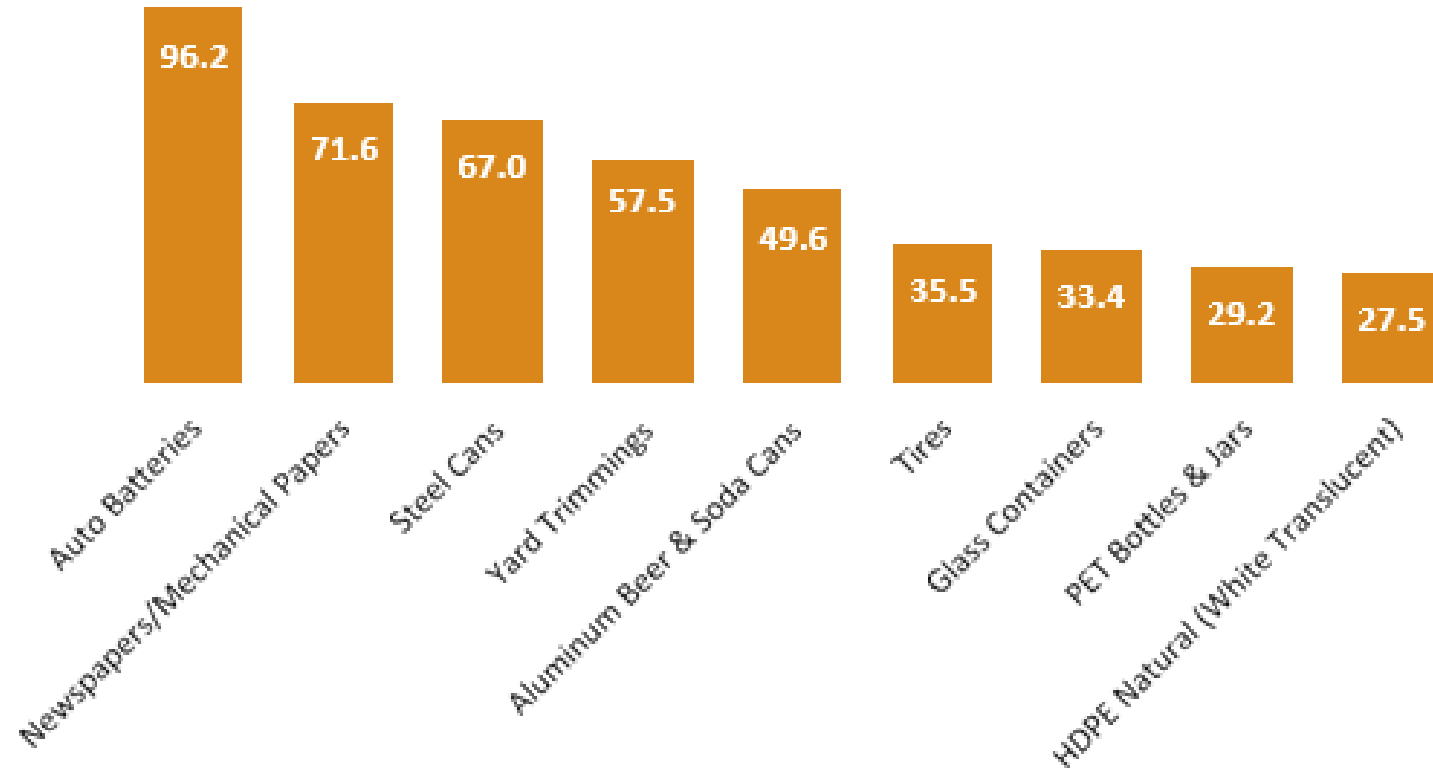


Operation side of managing solid waste



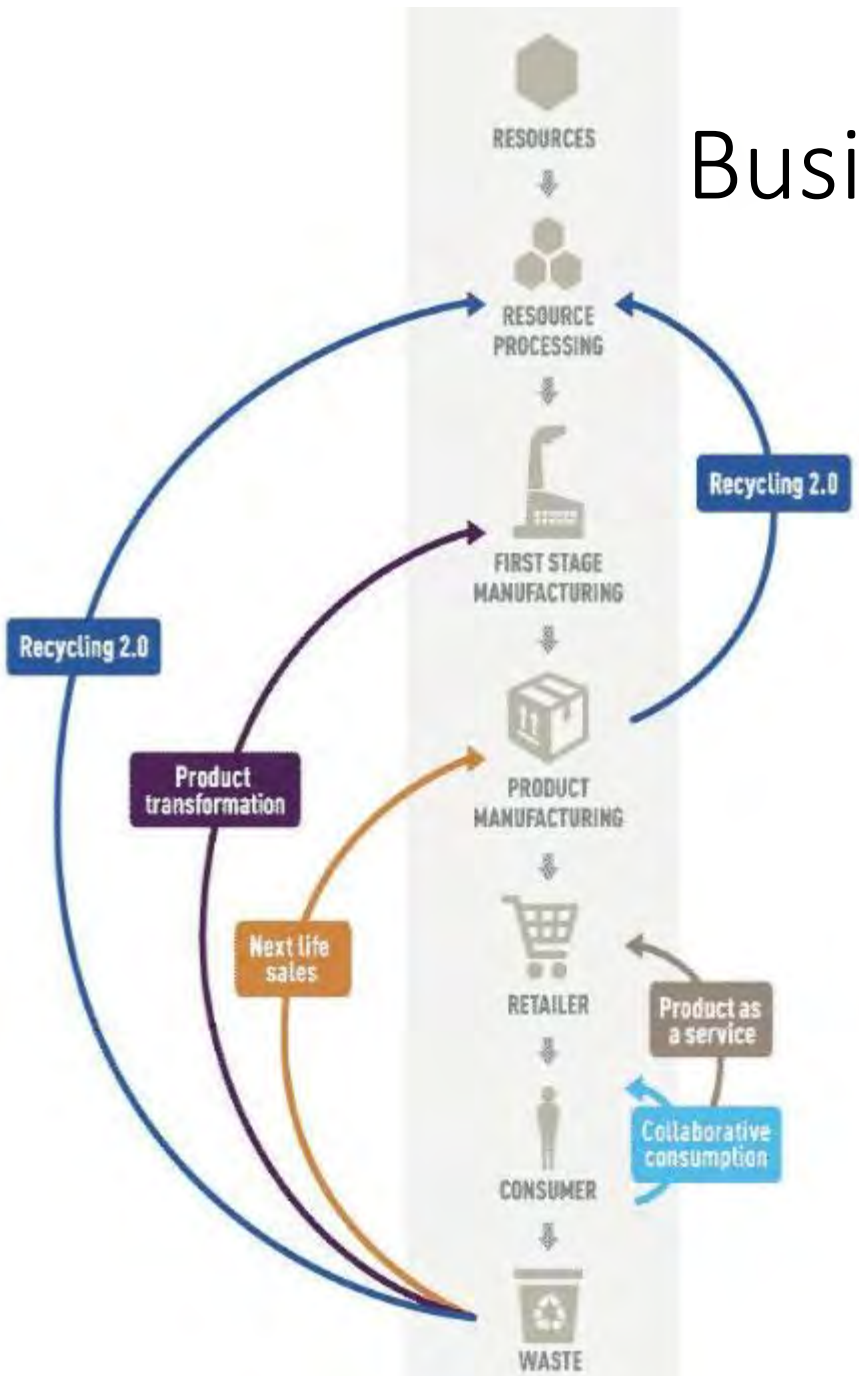
- Solar-powered waste compacting bins measures fill level information so that collectors know which bins to collect and optimized route that goes only full bins
- Led indicators identify the status of the bin
- Offer food waste collection, even residences
- Digitalization of waste and recycling, hauling technologies (tech in trucks) and big data platforms enable dispatchers and operation professionals to optimize assets
- Digitalization, truck routes to tonnage, to details about service sites
- Use sustainability technology verify diversion metrics, carbon tracking and reporting
- Customer facing technology provides visibility

Recycling percentage rates of products

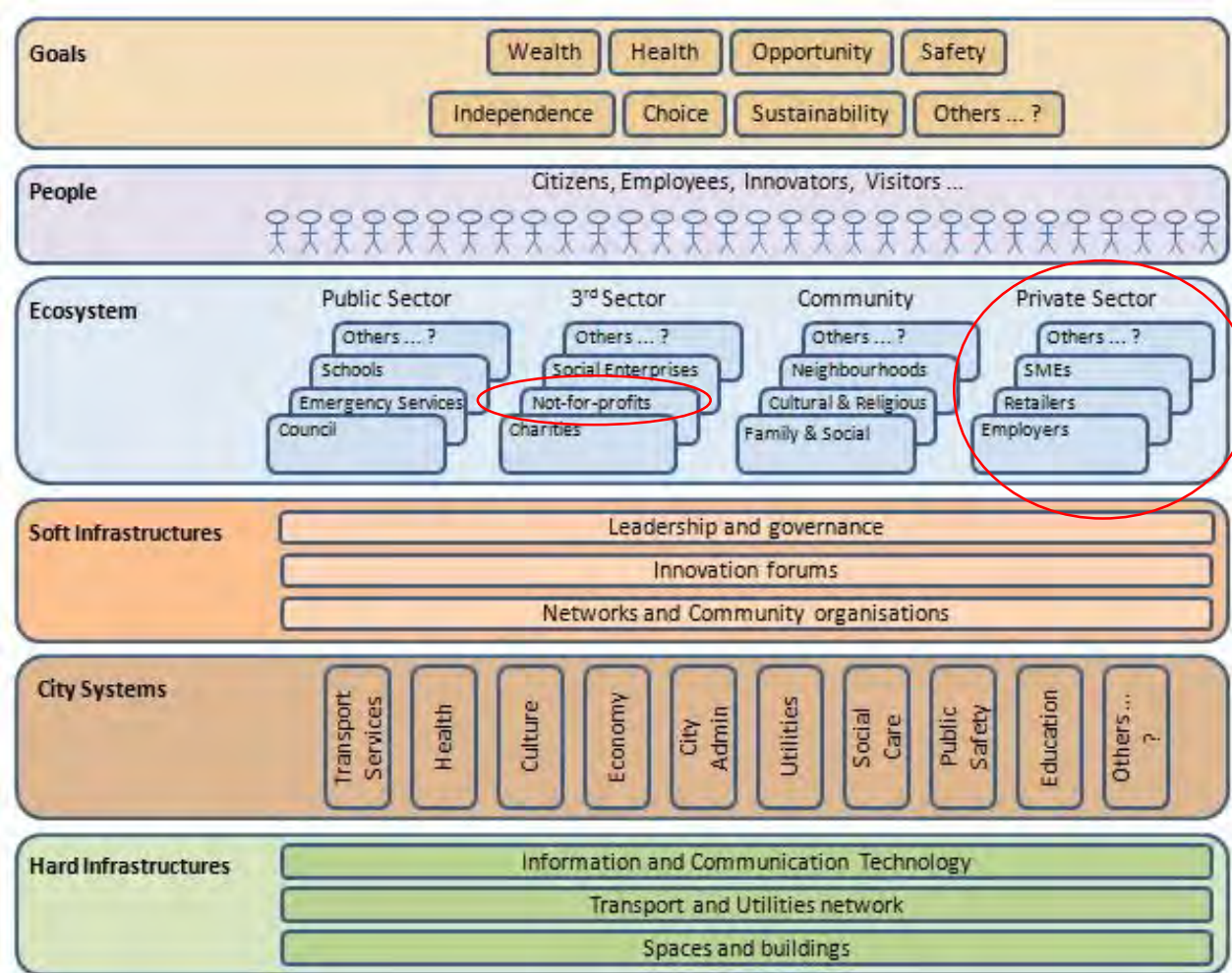


Source: U.S. Environmental Protection Agency

Business strategies in smart city recycling



Leveraging non-profits in smart city recycling

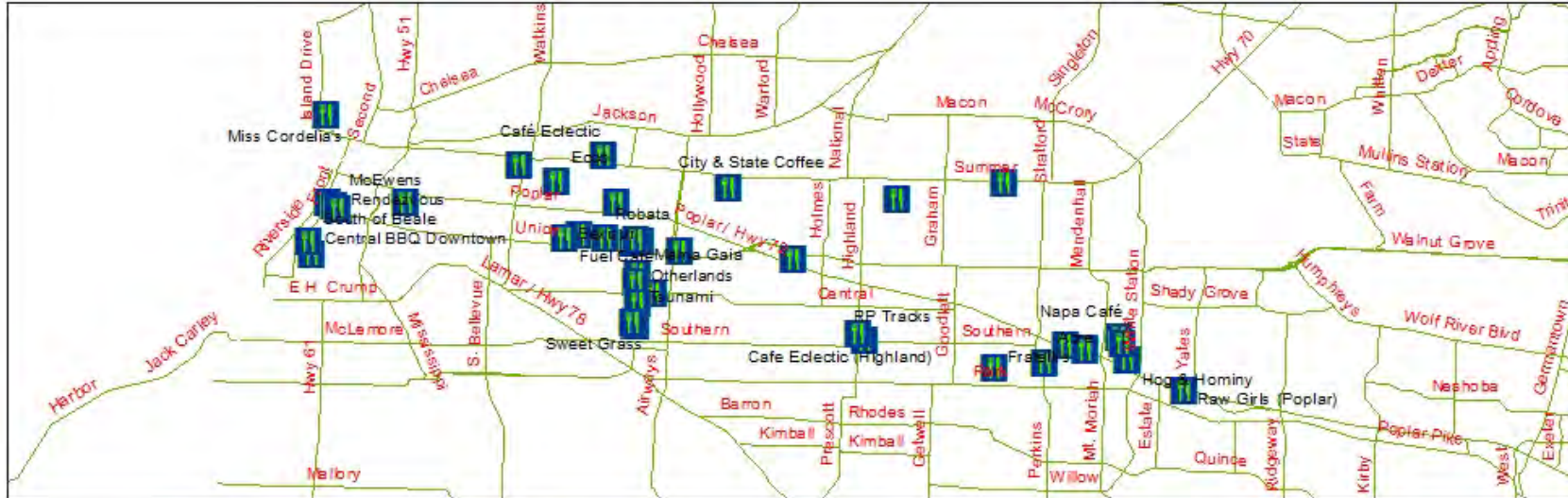


- Public profit from non-profits:
- Leverage non-profits so cities can help them become more successful with what they are doing instead of the city taking control of the programs or starting a new program with additional costs.

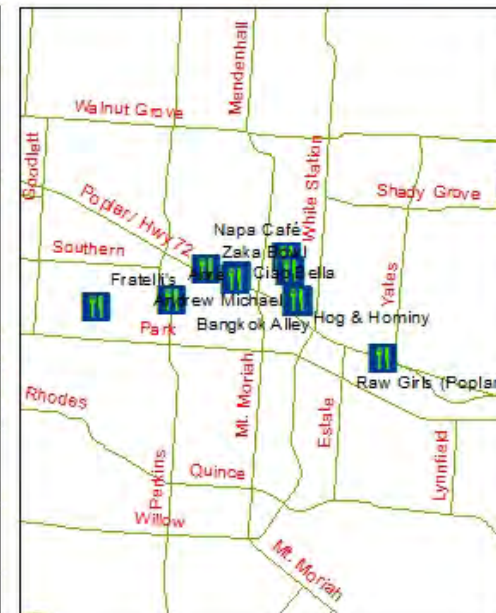
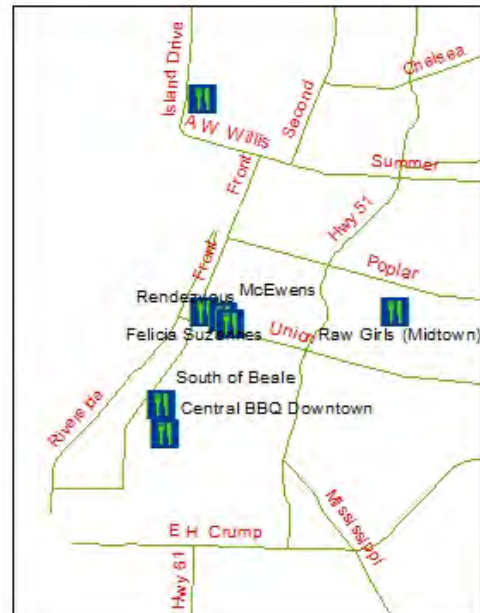
- Certification Steps to be a member of Project Greenfork
- 1- Compostable, biodegradable, recyclable, or made from recycled content.
- 2- Required to recycle all items to prevent materials from ending up in the trash (and eventually a landfill)
- 3- Help restaurants develop a composting process to collect pre-consumed fruit, vegetable, coffee grounds, and eggshell scraps and other compostable waste.
- 4- Reduce the usage of toxic cleaners wherever possible with plant-based and/or biodegradable cleaners.
- 5- Completing an energy audit to reduce and conserve vital energy and water. Help you identify energy waste and find ways to save.
- 6- Properly maintained grease traps and kitchen hoods prevent overflows and emissions to sewer and storm drain systems. Clean and free of debris at all times including cigarette butts and other outside trash.



Project Green Fork Certified Restaurants in Memphis, TN



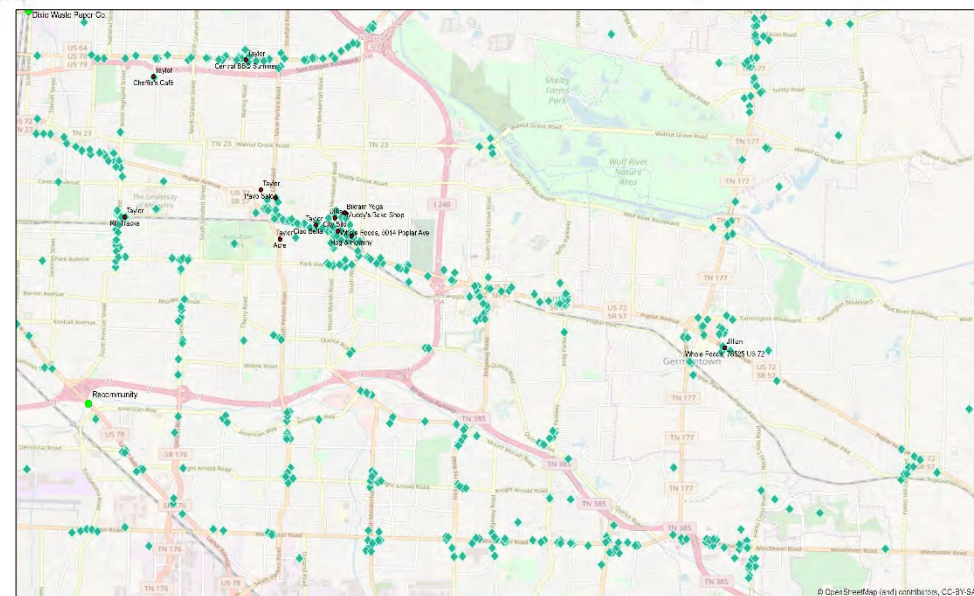
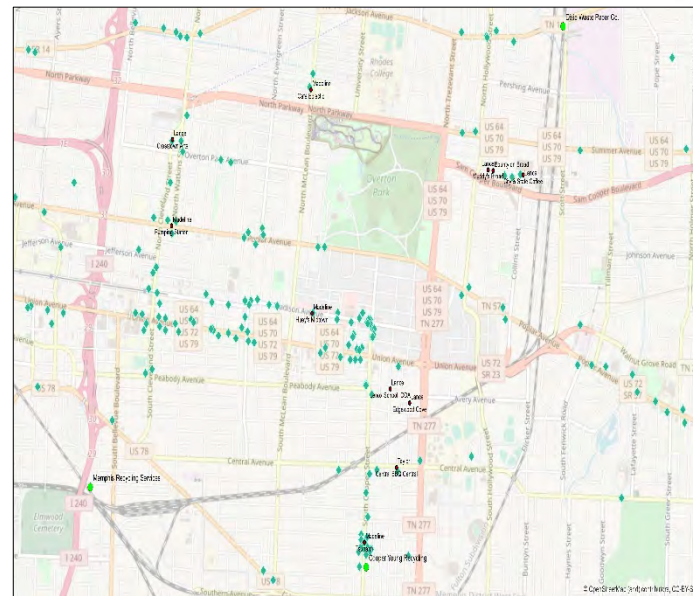
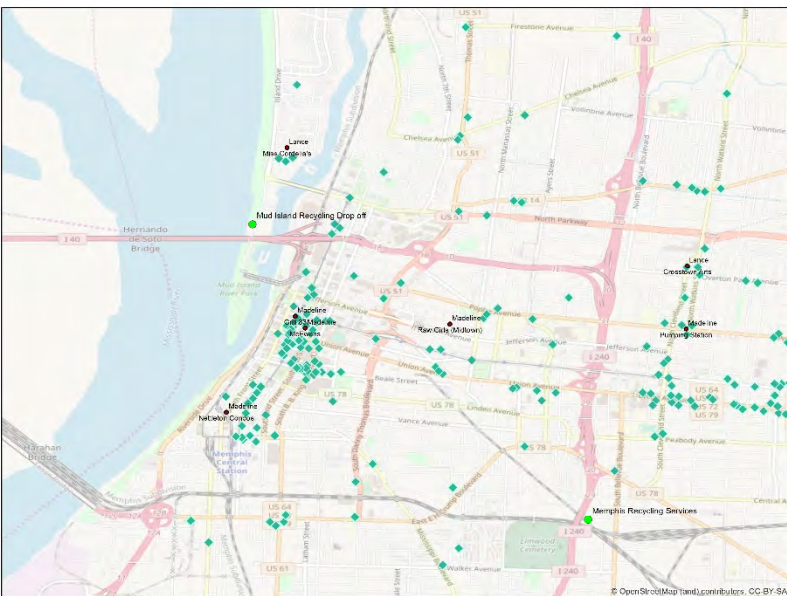
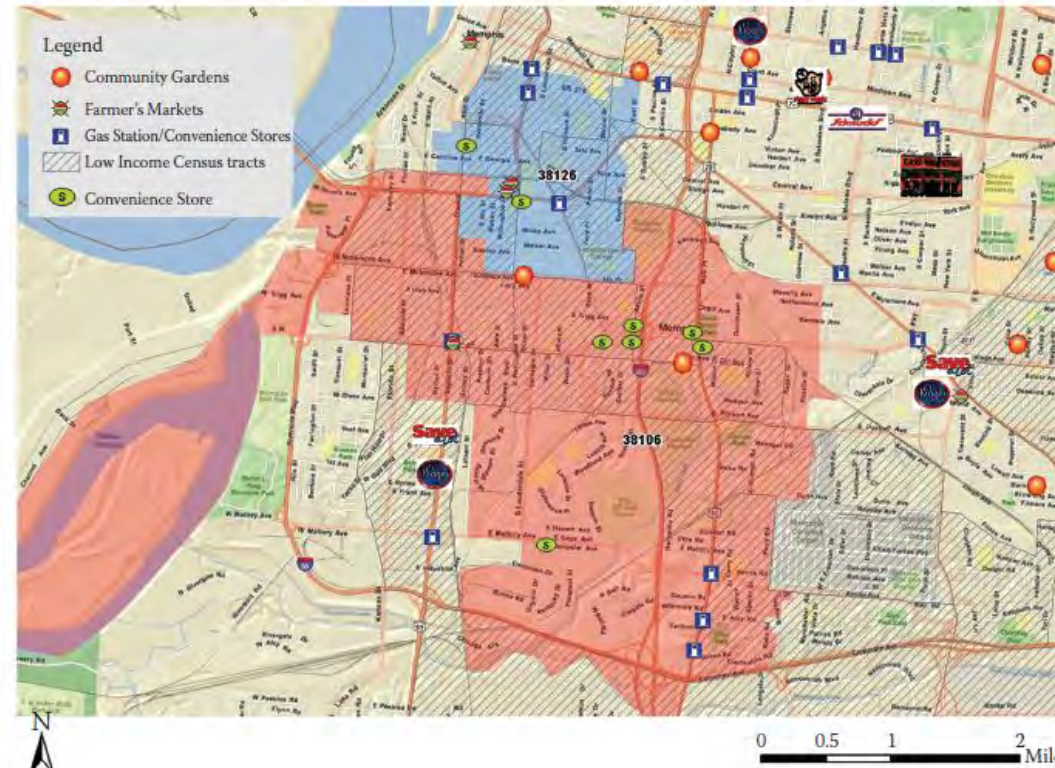
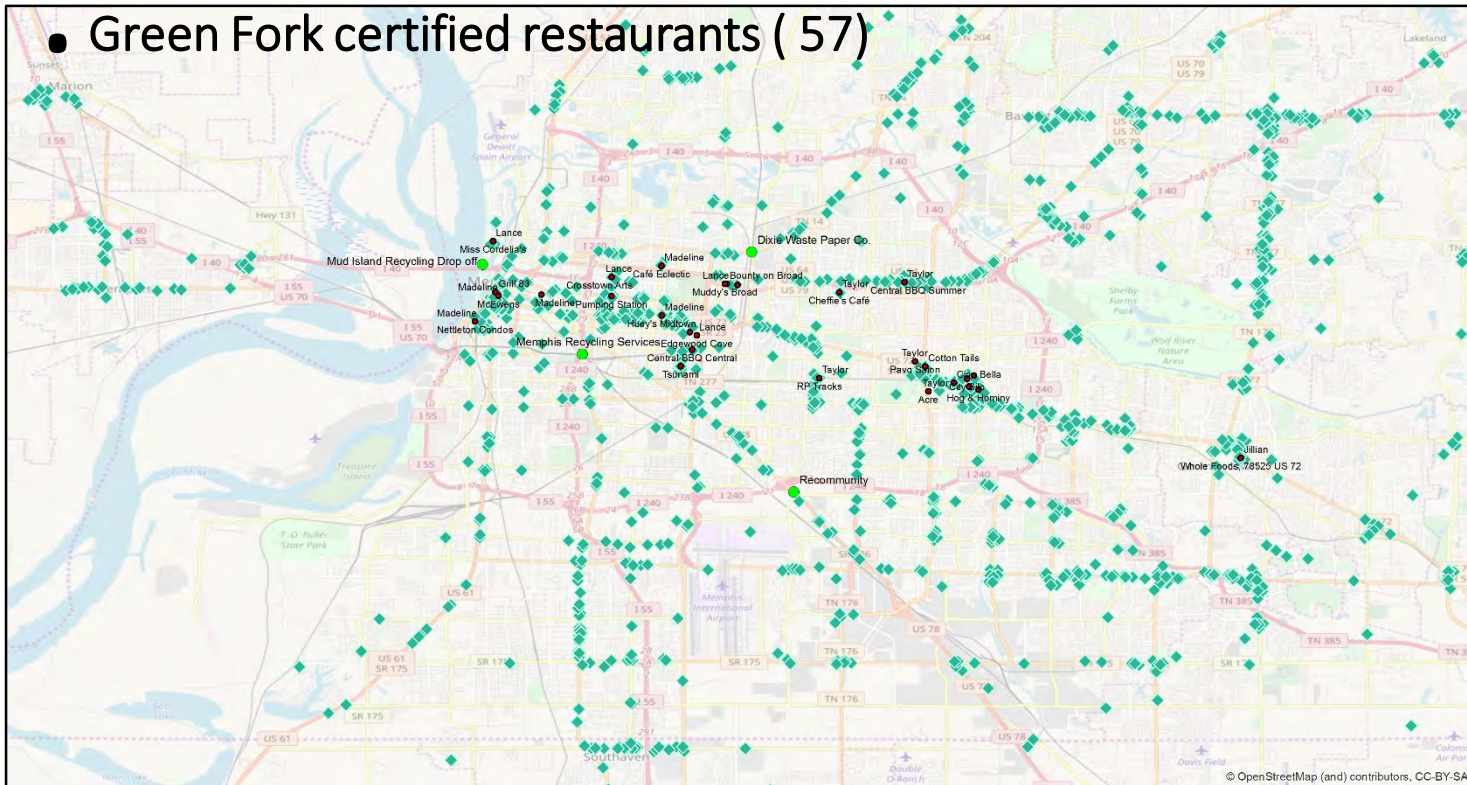
Project Greenfork, a program offered through Clean Memphis works to make area restaurants sustainable.



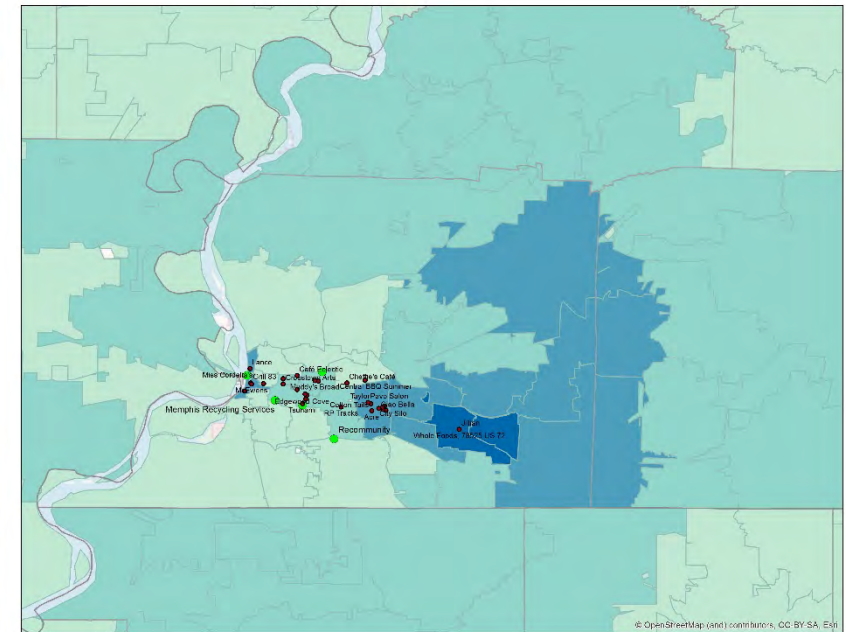
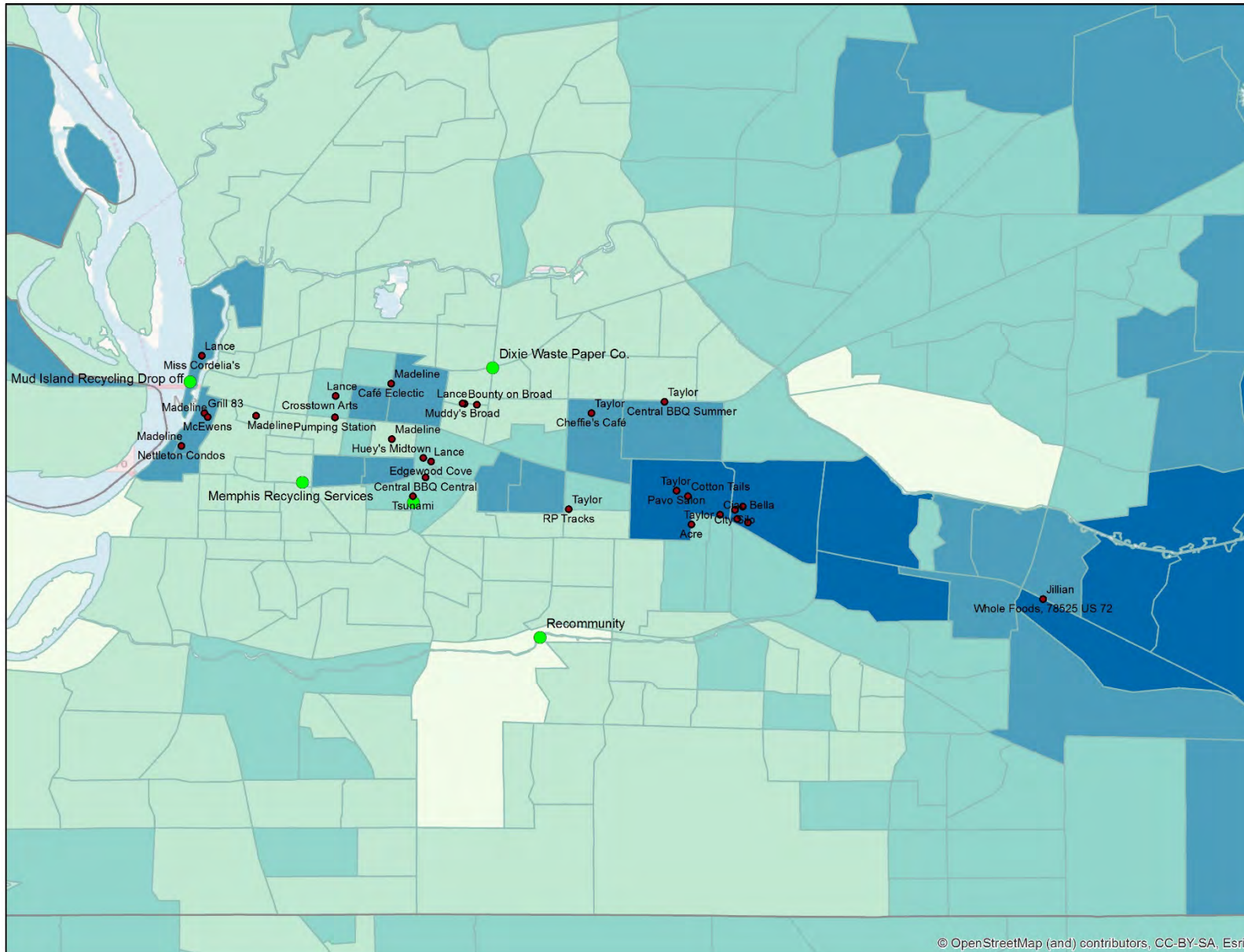
Certified restaurants (57) are required to recycle all items that are recognized as recyclable by Project Green Fork.

Green Fork certified restaurants (57)

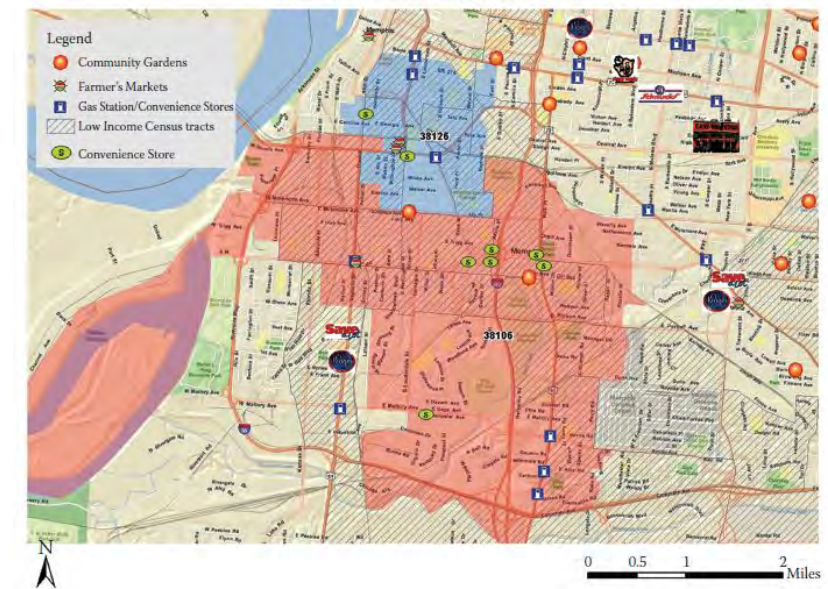
Zip Codes 38126 & 38106 Food Desert



2017 USA meals spent at restaurants per household in the U.S.



Zip Codes 38126 & 38106 Food Desert



New Green Business Frontier: Recycling for Profit.

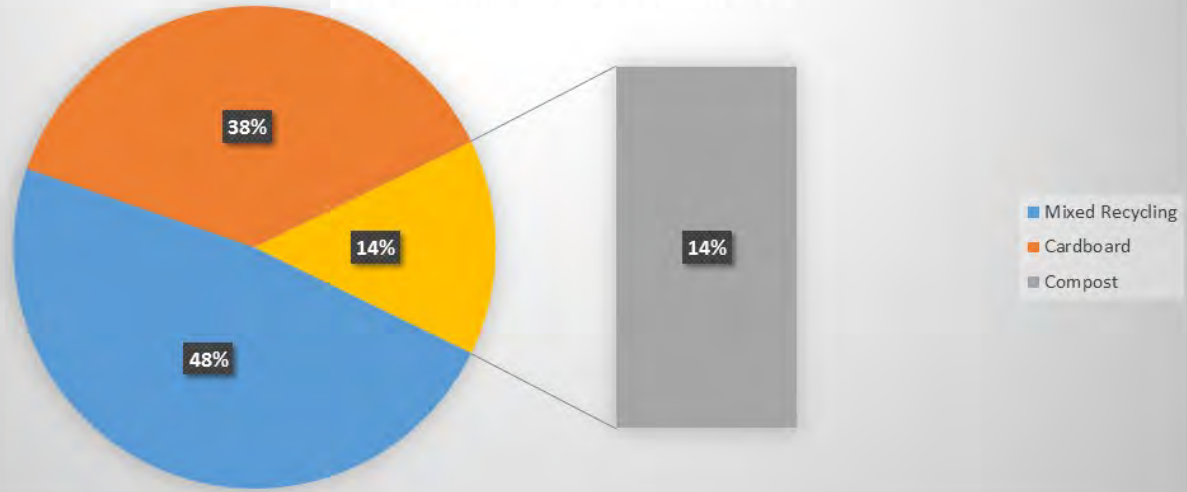
GET GREEN Recycleworks

Small entrepreneurs are taking the lead in Memphis.

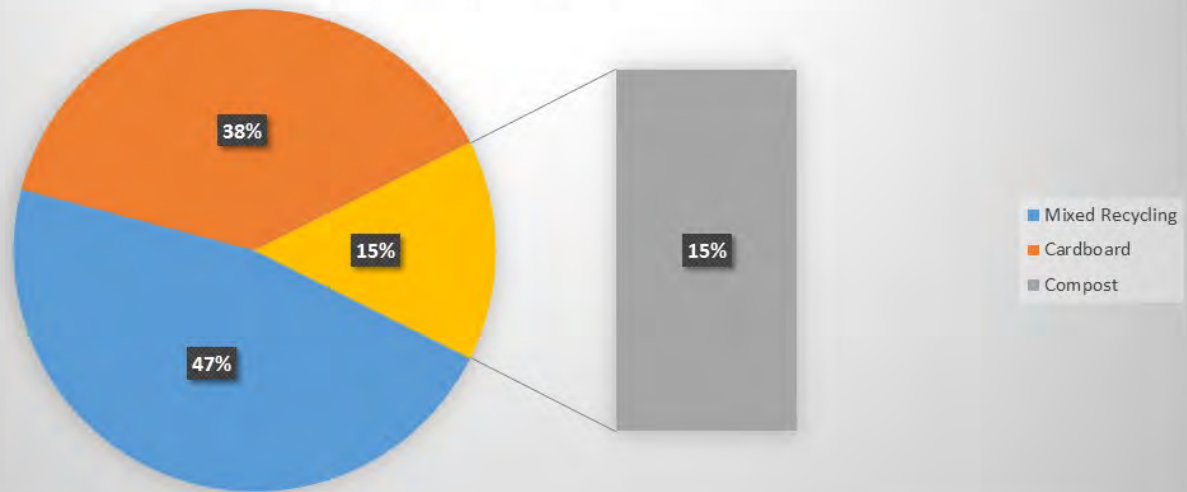


- Private Collector in Circular Economy
- Reduce regular waste disposal costs
- Make recycling affordable
- Support the local and circular economy
- Train and educate on recycling
- Daily, weekly, as needed basis collection

January Pickups: 516 visits



July Pickups: 440 visits



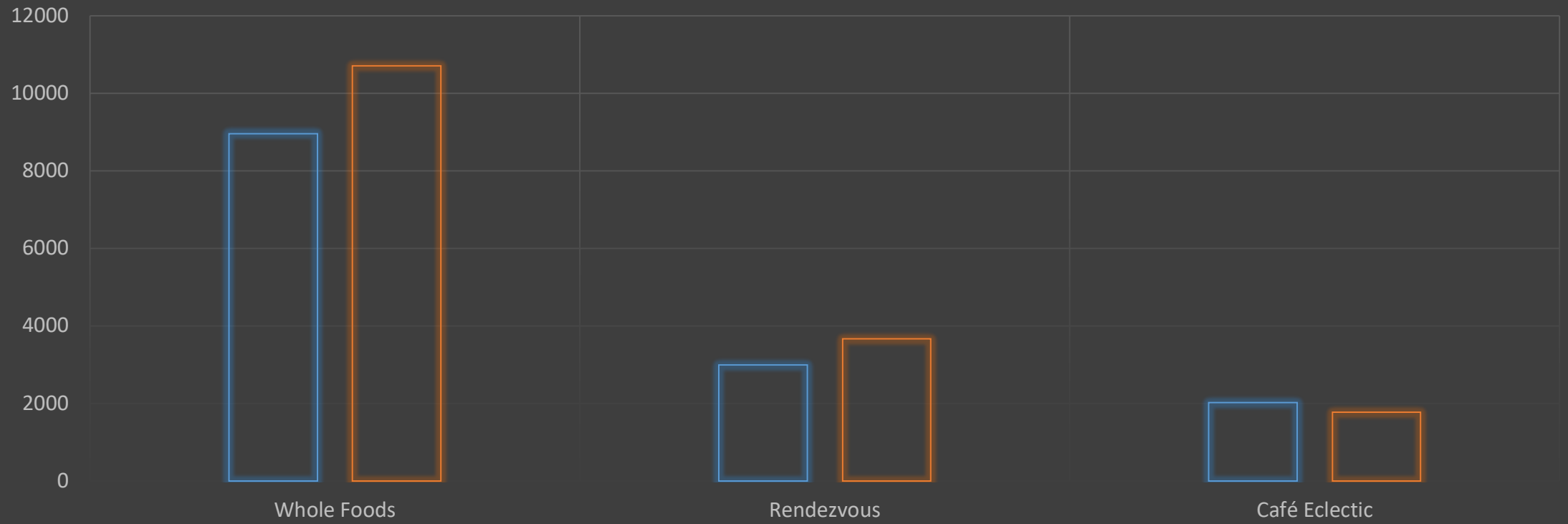
Mixed Recycling	January	July
Whole Foods	8950	10700
Rendezvous	2989	3666
Cafe Eclectic	2020	1778

Cardboard	January	July	
Miss Cordelia's	5830	5080	
Booksellers	2760	Rendezvous	2610
Huey's Midtown	2220	Booksellers	2550

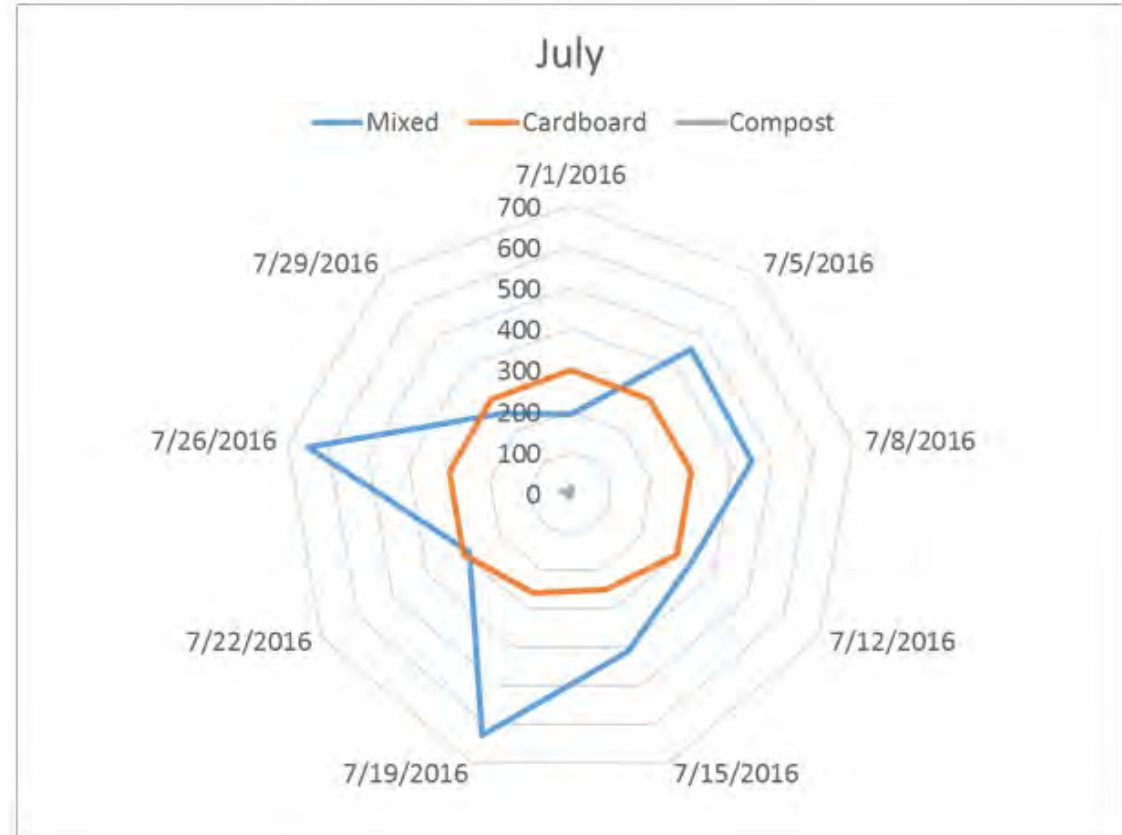
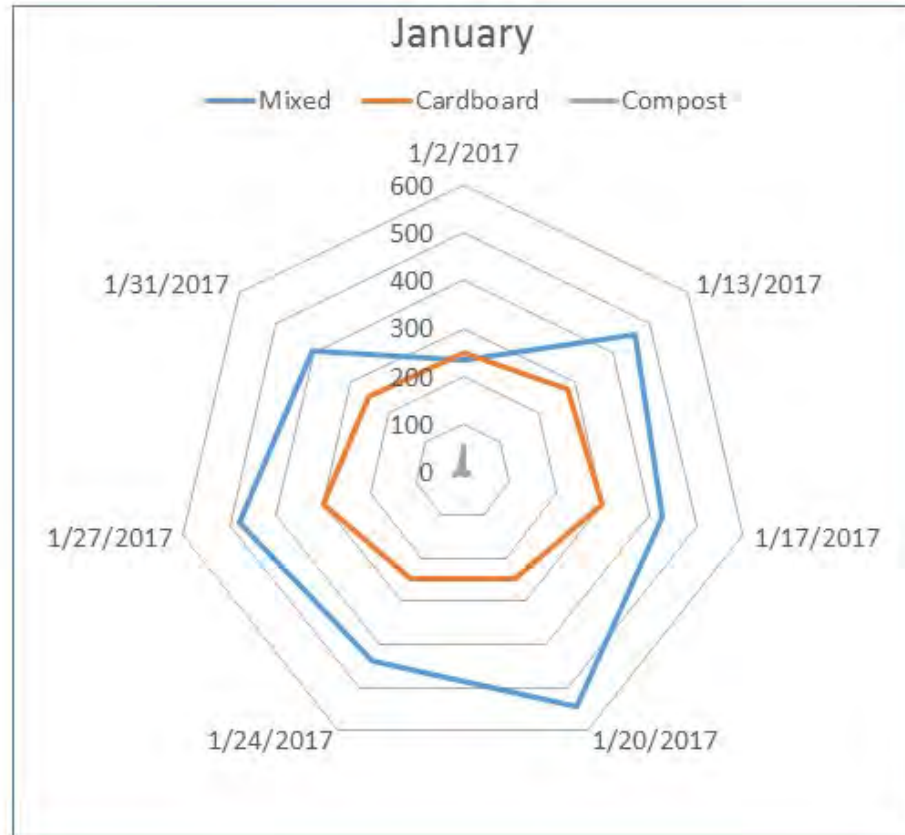
Compost	January	July	
The Juice Bar	825	Miss Cordelia's	1110
Cafe Eclectic	800	Café Eclectic	1050
Miss Cordelia's	730	The Juice Bar	810

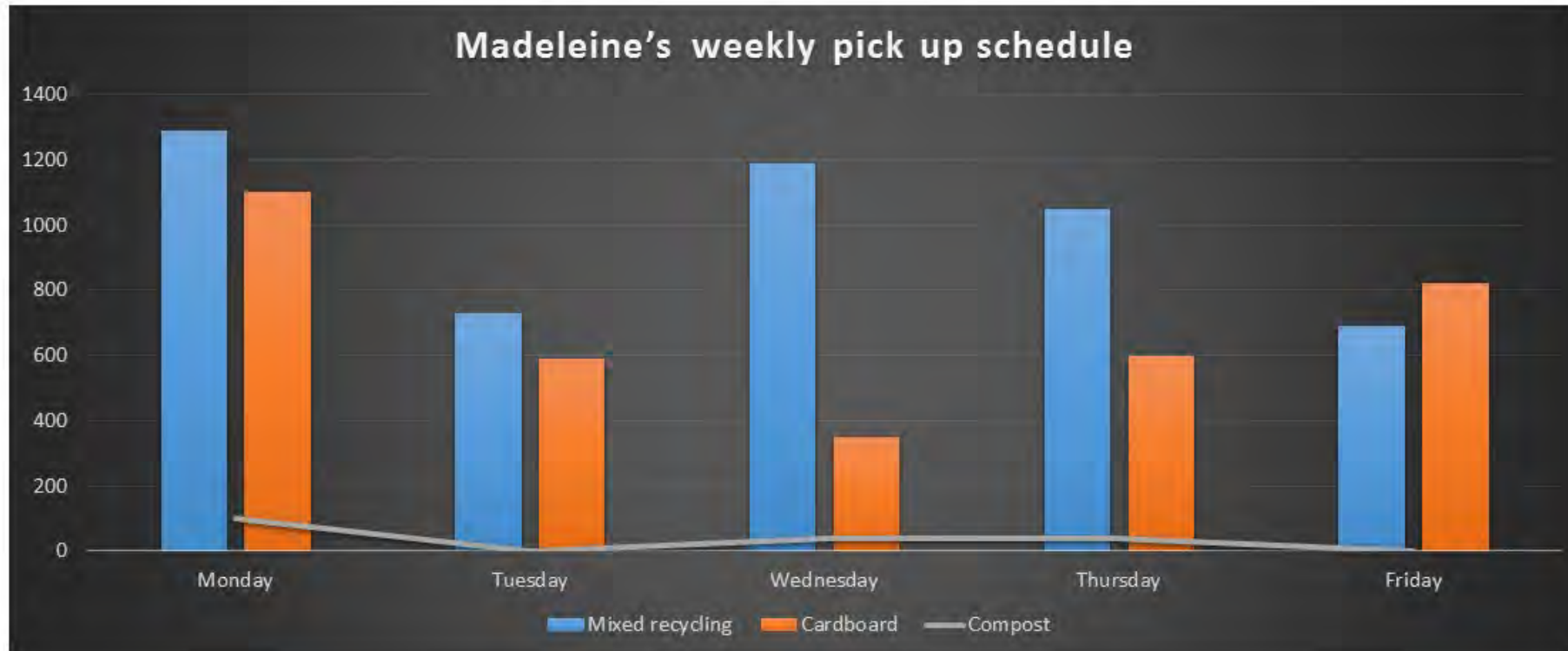
Mixed Recycling

January July



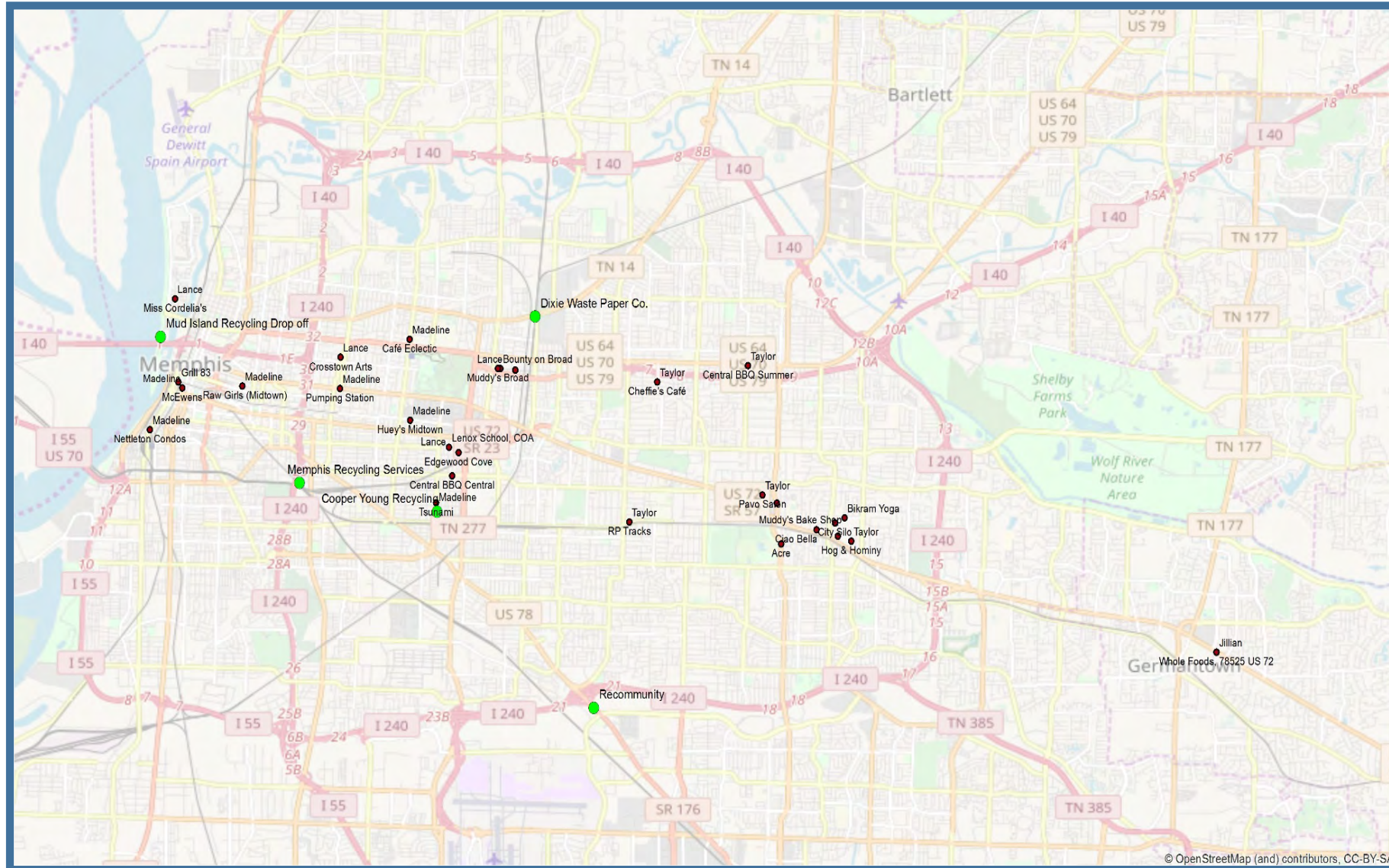
Rendezvous' monthly comparison





	Monday	Tuesday	Wednesday	Thursday	Friday
Mixed	1452	904	1290	778	554
Cardboard	1100	590	350	450	720
Compost	100		40	40	

Monday Pick ups – 29 restaurants, 15 Green Fork certified and Drop off facilities

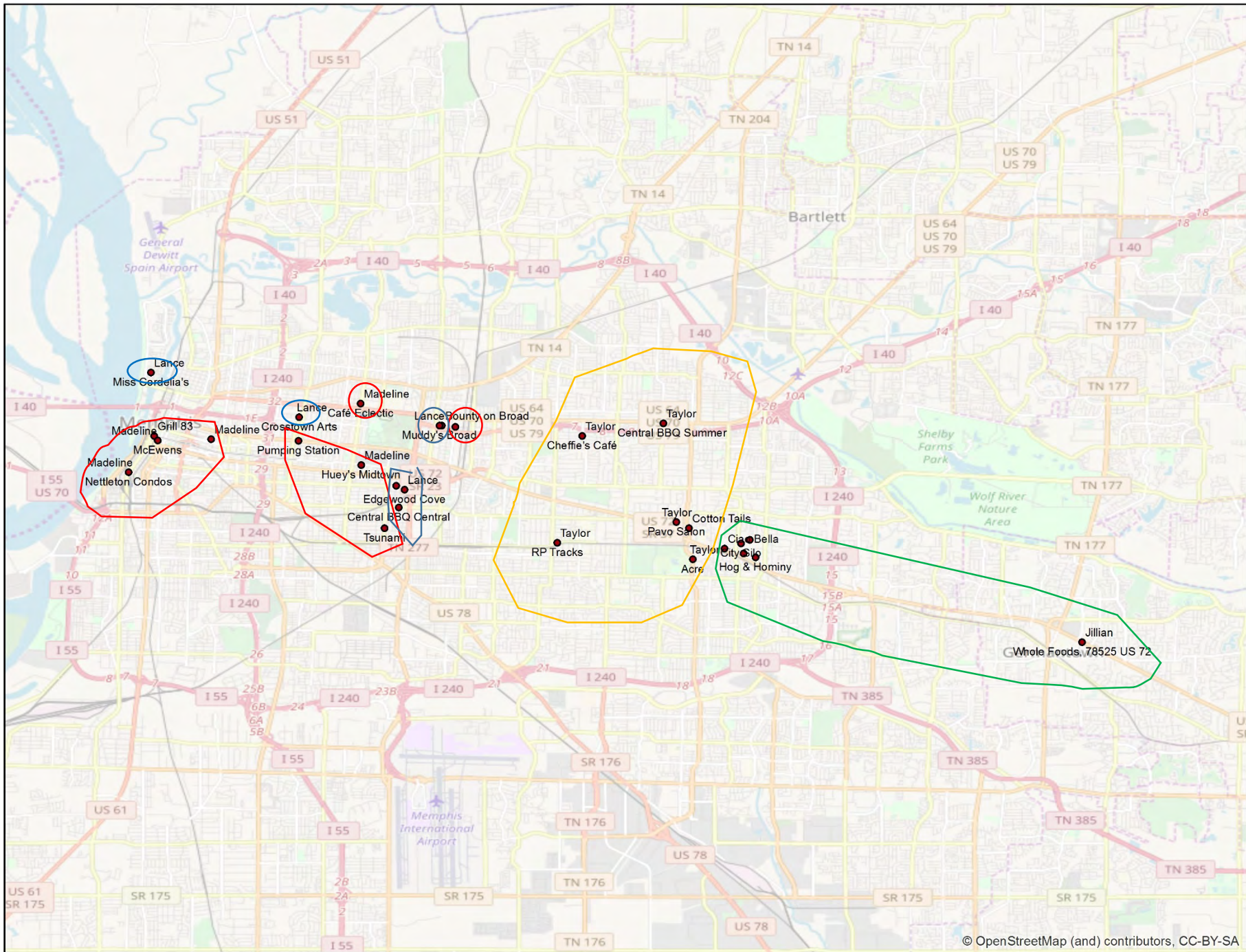


Memphis Recycling Services
cardboard and paper
1131 Agnes Place

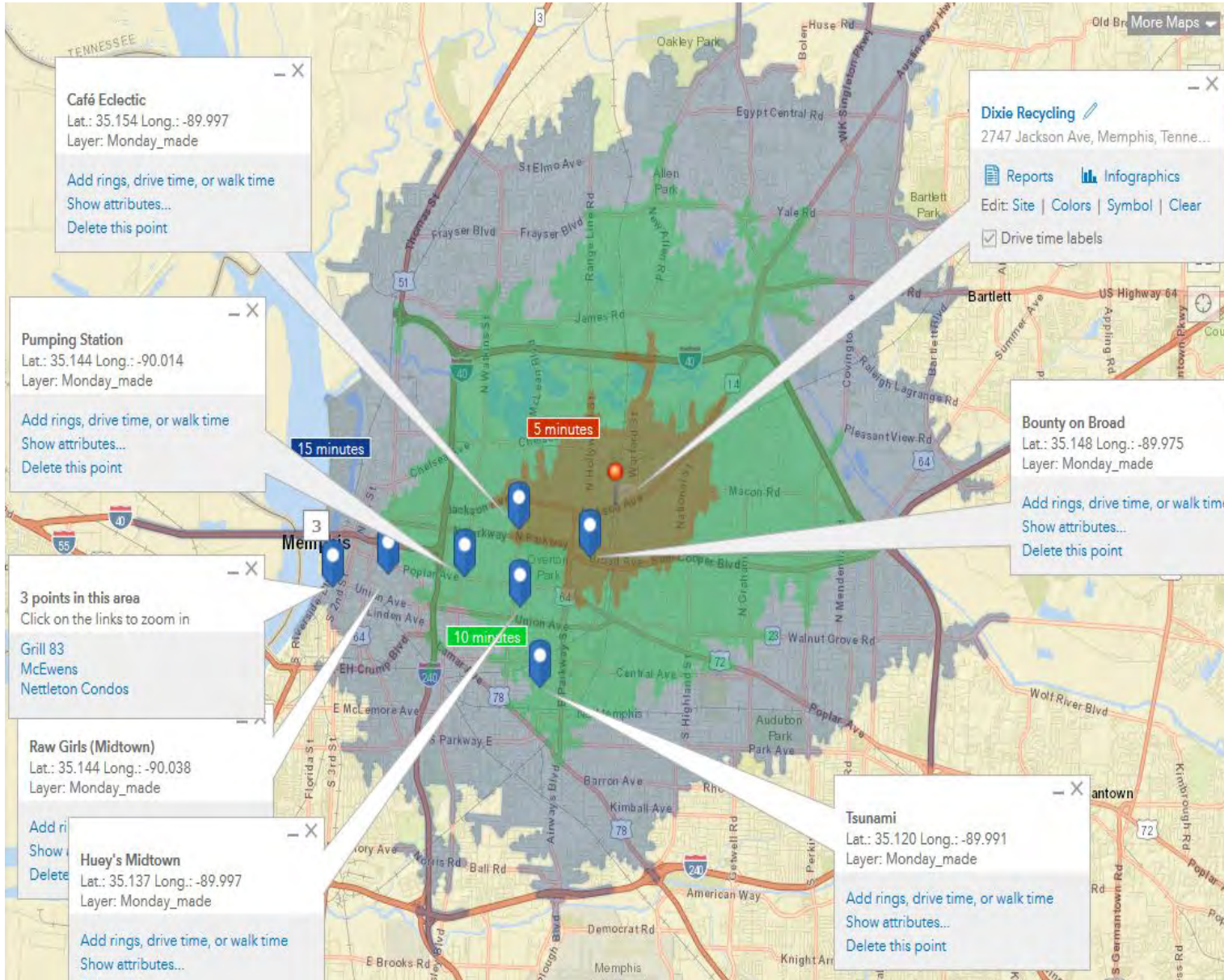
Dixie Waste Paper Co.
cardboard, paper, aluminum,
scrap metal
2747 Jackson Ave

Recommunity
3197 Farrisview Blvd.

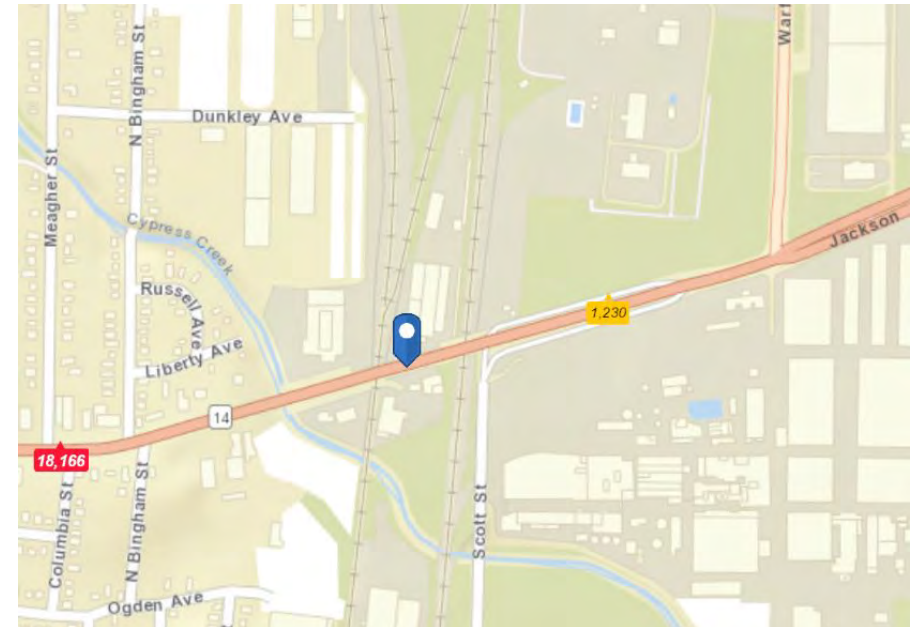
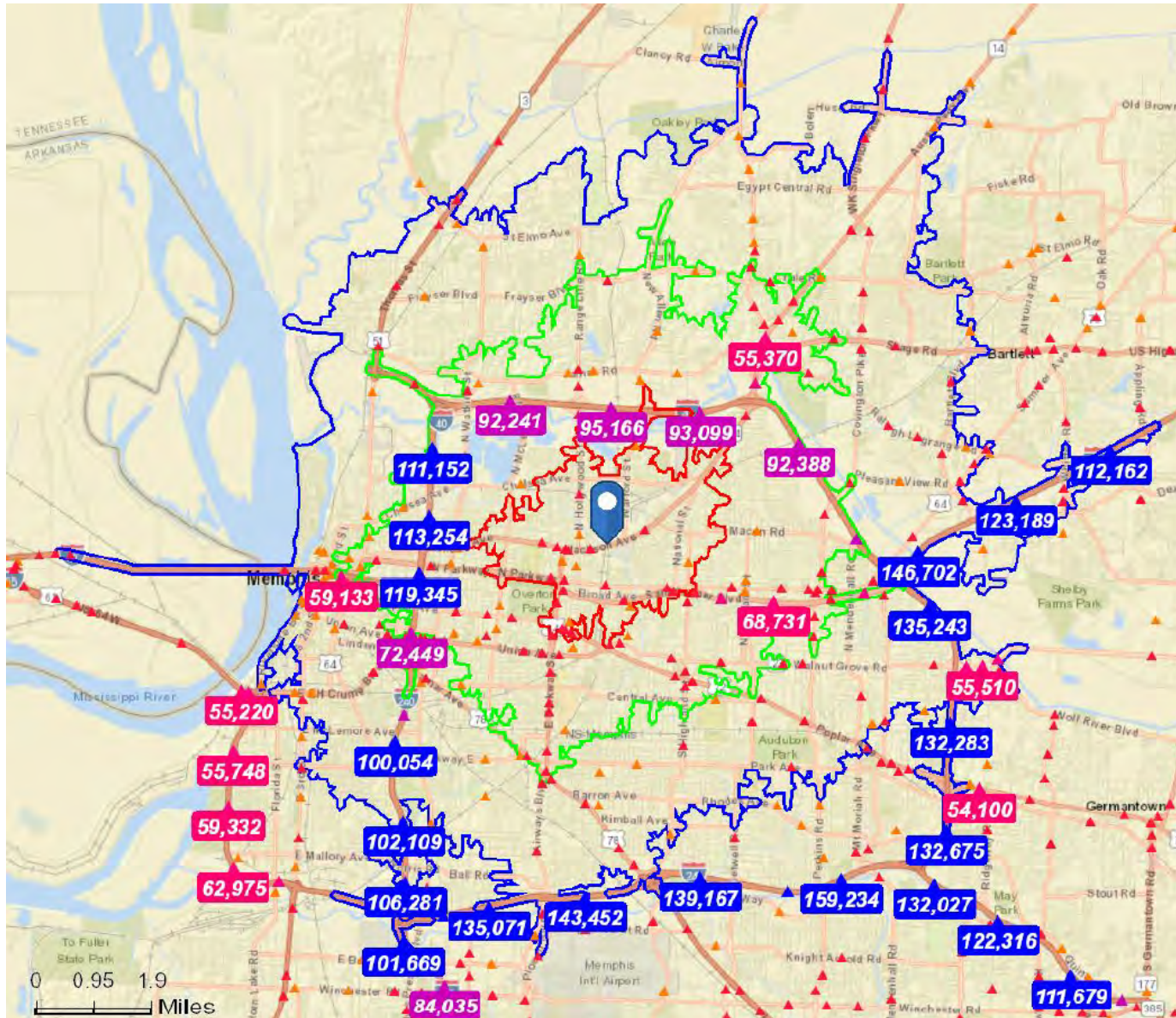
Mud Island Recycling Drop off
Parking lot off Mud Island Drive
near the north entrance to
Mud Island Park



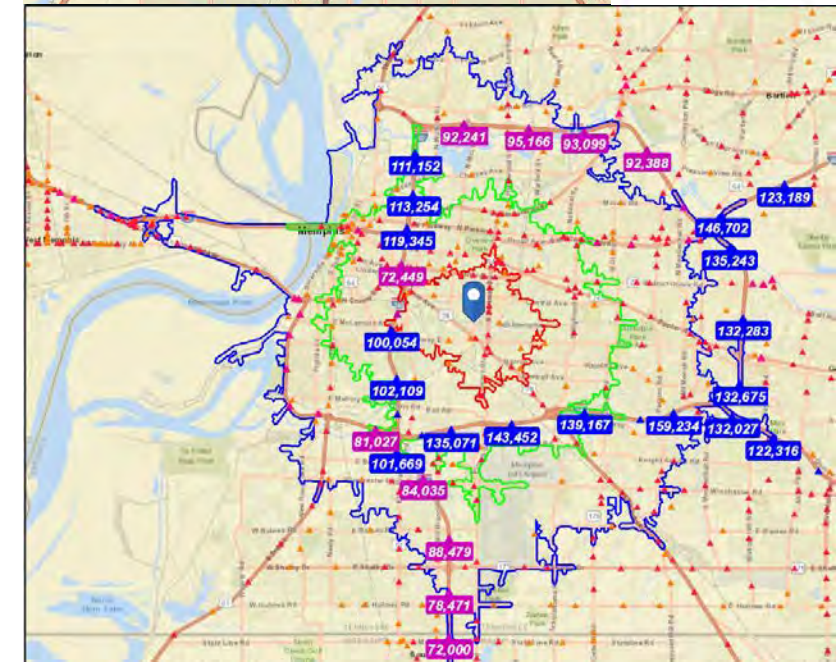
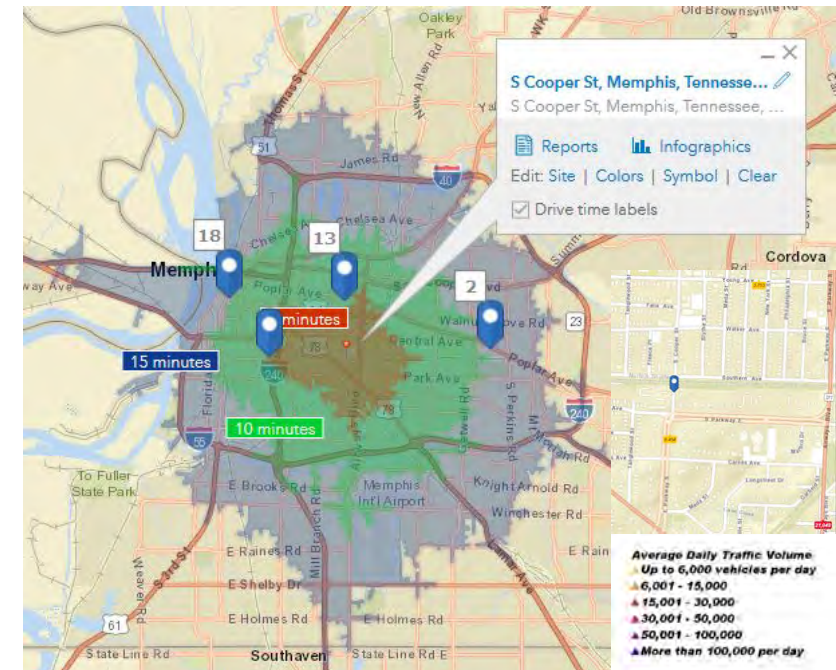
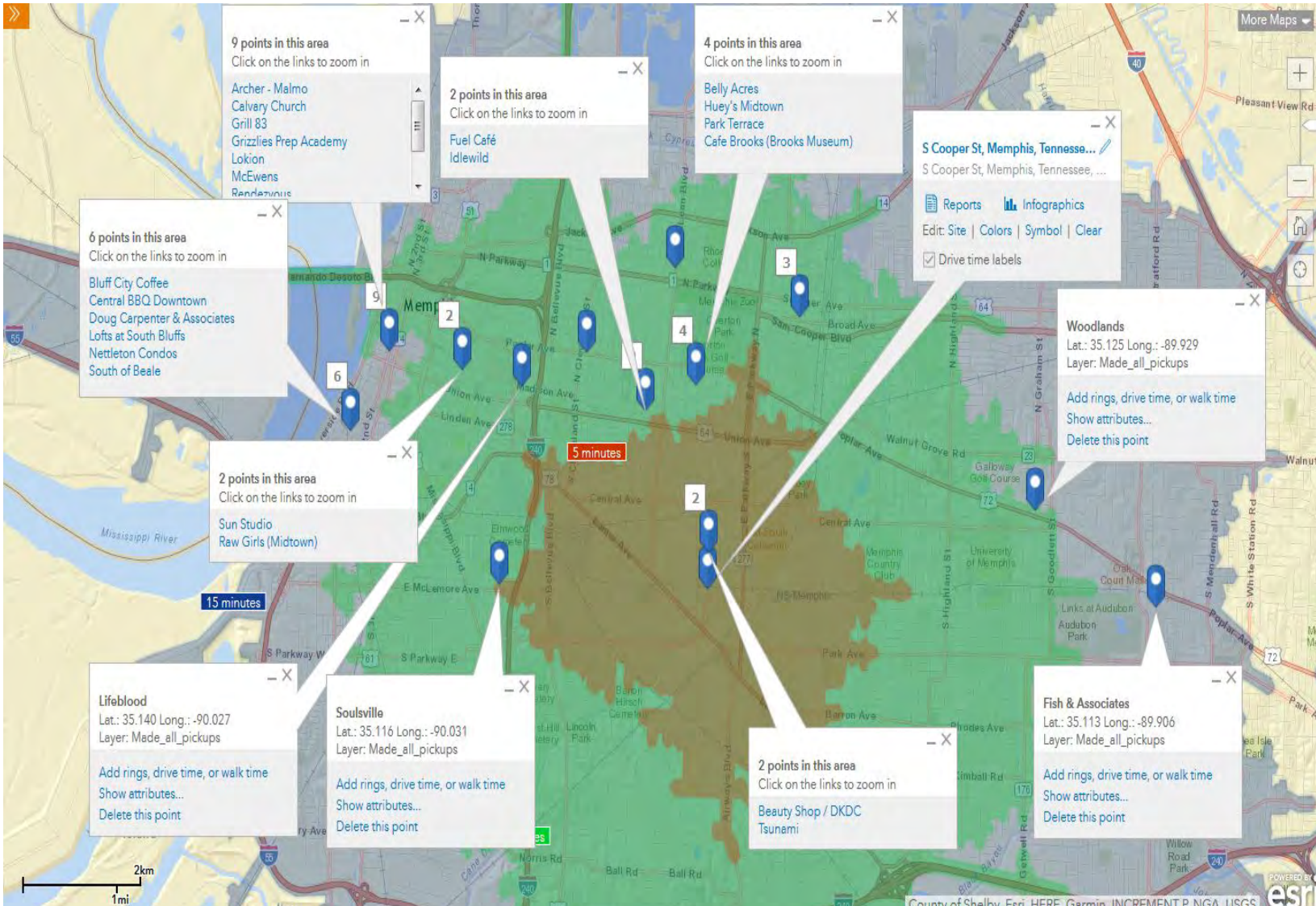
5, 10, 15 minute drive time analysis: Towards Dixie Recycling for Madeleine's Monday Pickups at 9:00 am traffic



5 minutes	Mixed	Cardboard	Restrictions
Café Eclectic	240	150	Alley way
Bounty on Board	160	200	Key lock
10 minutes			
Pumping Station	160	20	Busy street, combo lock
Tsunami	148	50	Small parking lot
Huey's	64	280	
15 minutes			
Grill 83	64	150	
McEwens	316	200	
Nettleton	200	50	Low clearance, parking garage, clicker
Raw girls	100(compost)	50	Compost only
Total 5/10/15	400/372/580	350/350/400	
Total	1352+100 (comp)	1100	



5, 10, 15 minute drive time analysis: Towards Cooper Young Recycling for Madeleine's All Pickups



Conclusions....

-Fewer locations to recycle and redeem for private collectors.

- That means additional containers from commercial sector are littered or put in the landfill ! Open land is expensive near cities. Corporations moving in, opening huge facilities that might serve populations, typically in a rural area with few neighbors. It's a prudent environmental strategy and it provides jobs for rural communities, which is why some of them have been competing to attract new landfills!
- Become cheaper to ship garbage than to bury it locally!
- Glass recycling is an economic challenge for most cities. Would state subsidize the costs of materials like plastic and glass that generally do not pay for themselves?

-Most pick ups are done in the 10 minute drive time and average traffic volume is 6,000-15,000 vehicles per day.

- No need to travel farther to existing recycling centers, no more than 10 minutes.
- 10 minute drive-time area means that the number of trips the trucks can potentially do will increase, increasing efficiency. It means that trucks aren't stuck in traffic, or travelling for as long as they would be otherwise. So that saves the commercial sector money, gives them a better service, and also potentially cuts down on litter.
- Some states such as California requires that supermarkets must have a recycling center within a half-mile radius of the store. Otherwise they must redeem the containers in the store or pay a daily fine.
- Rural recycling centers DO not exist.

Conclusions....

- Rendezvous, Whole Foods and Café Eclectic lead Memphis in recycling.
- Composting is not common among restaurants. This is a complex task for restaurants. Finding ways to fit more bins, more staff time, more expense into their daily routine is a struggle. Maybe a pilot program for mandatory composting could be established.
- Mixed Recycling materials are consistently picked up more in winter months than summer months. Could this be related to Thanksgiving to New Year's holiday period?
- Cardboard is consistently picked up around 300 gallons with no seasonal change, even though it is a high-commodity, numbers are less.

- Recycling in multifamily dwellings such as townhouse, condominium, and garden-style apartment complexes, schools, churches is challenging for private collectors.
- Access to multifamily dwellings present a challenge for private collectors such as low clearance, parking garage, clicker use...
- Ordinances should clarify landlord responsibilities and provide the city with increased enforcement capabilities.

- More data collection and establishing baseline metrics are needed to create blueprint for all sectors _ private, public and non-profit in the recycling domain in Memphis.
- Smart devise solutions should be used so GIS maps and apps could monitor and reveal assets in real time.
- Initiative should be taken towards a smarter, healthier, and more sustainable city by focusing on business and consumer education efforts, raising local business and community awareness of the economic development opportunities associated with recycling and recycling-related manufacturing.

This project complements city's in-house GIS, and provides data on commercial sector recycling efforts in the city. GIS has far-reaching potential as an analytical tool, particularly in the recycling domain.

As more data becomes available, the number of GIS applications will grow indefinitely, hindered mainly by the user's imagination.

However, there are limits to what can be accomplished through GIS since certain information is difficult to represent spatially and may not be available. Such as public's attitude towards recycling is an information can be derived from mixed methods approach and coupled with GIS to be visualized.

Thank you !

