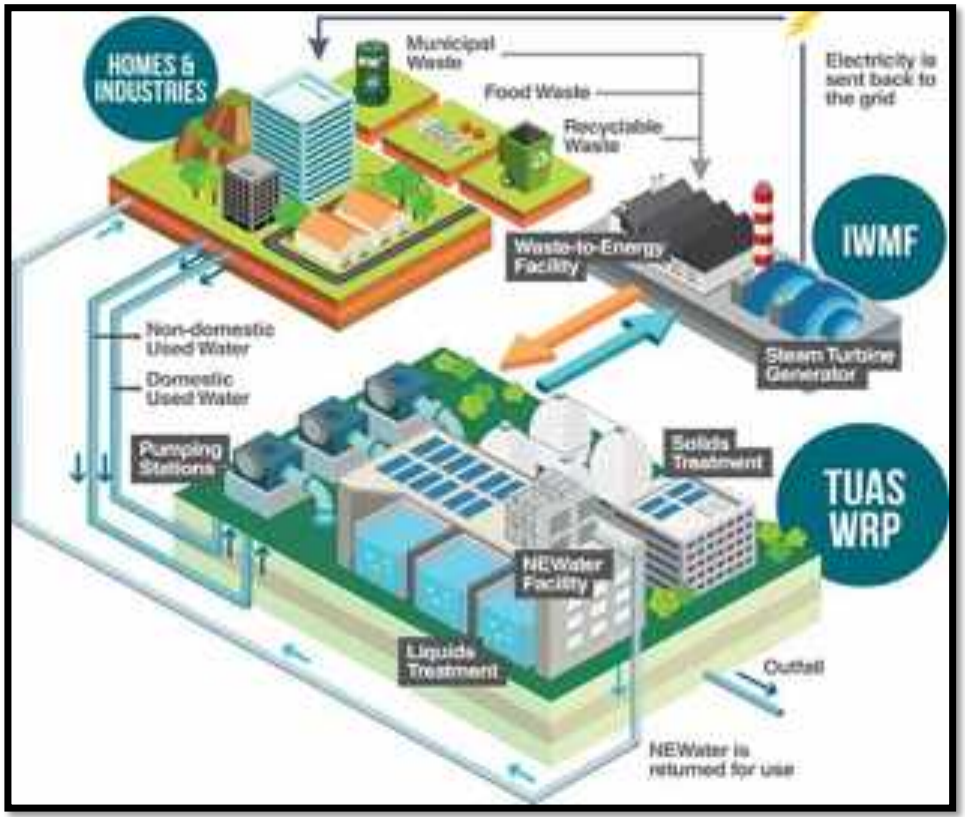
WASTE MANAGEMENT FOR HEALTHY CITIES



Prof. Dr. N. Kamil SALİHOĞLU

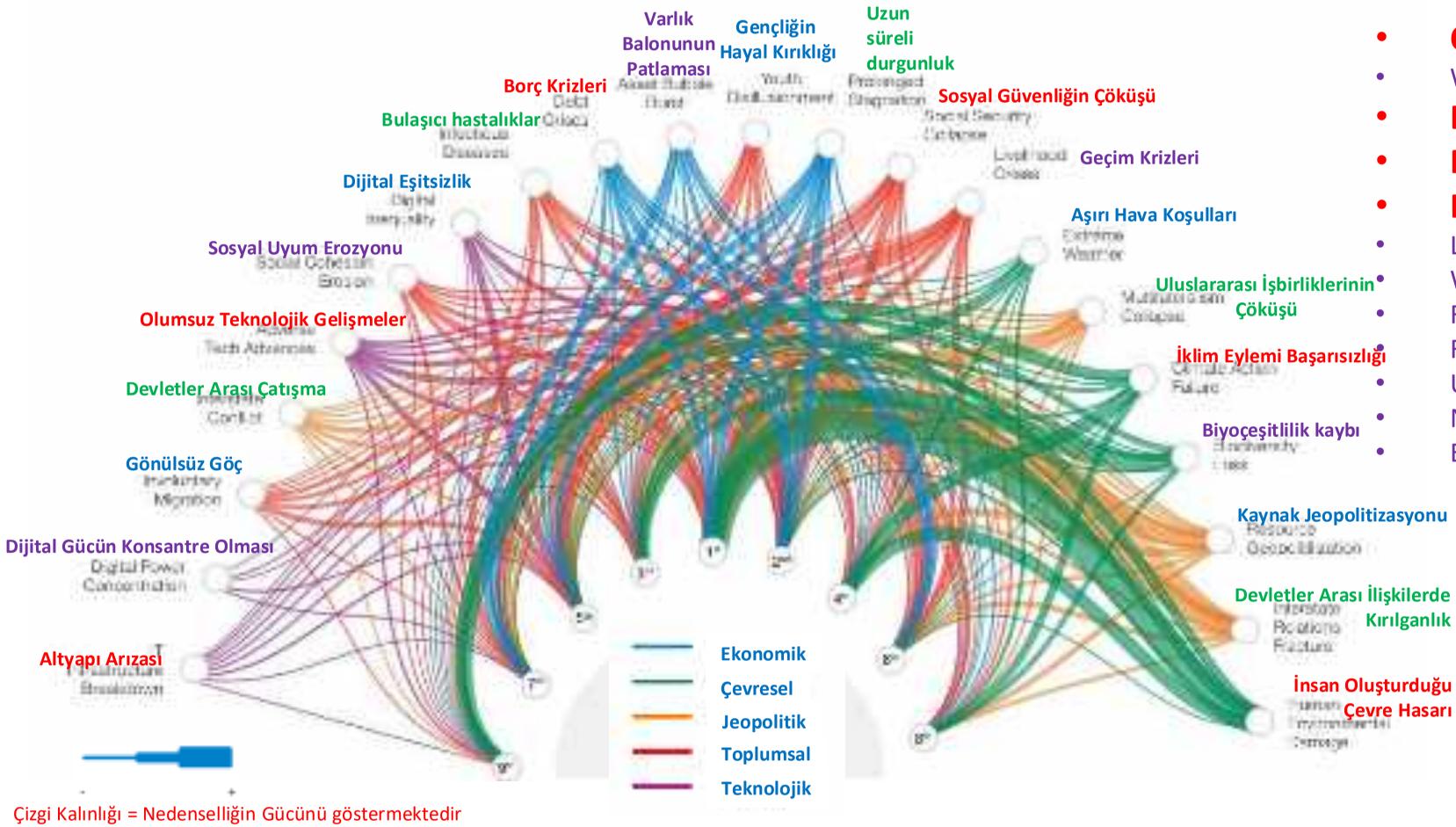
Bursa Uludag University

Faculty of Engineering

Environmental Engineering Department

Bursa, April 2022

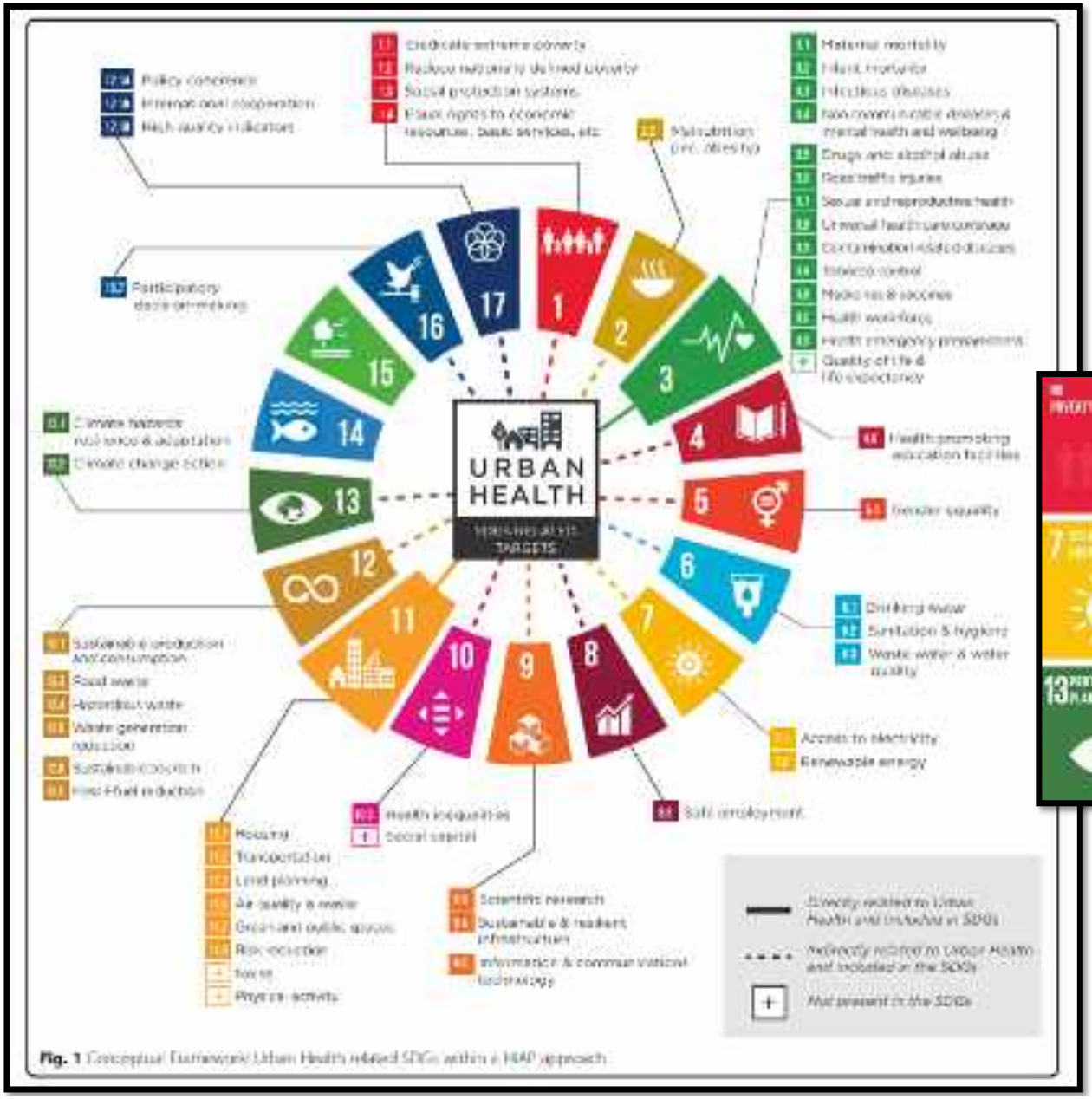
What drives global risks?
Respondents rank the most concerning risks globally and their drivers.



Çizgi Kalınlığı = Nedenselliğin Gücünü göstermektedir

- **Climate Change Failure**
- Weapons of mass destruction
- **Biodiversity loss**
- **Natural resource crises**
- **Human environmental damage**
- Livelihood crisis
- Water crisis
- Fiscal imbalances
- Financial failure
- Unemployment
- Natural disasters
- Energy price shock

WORLD ECONOMIC FORUM 2020
The global risks report 2021
executive summary



Cities are an important driving force to implement the Sustainable Development Goals (SDGs) and the New Urban Agenda.

Ramirez-Rubio et al. Globalization and Health (2019) 15:87
https://doi.org/10.1186/s12992-019-0529-z
https://globalizationandhealth.biomedcentral.com/articles/10.1186/s12992-019-0529-z

What is Waste?

'WASTE' means any substance or object which the holder discards or intends or is required to discard.
(EU Waste Framework Directive)



«Any substance or material that is thrown or released into the environment or has to be disposed of by the manufacturer or the real or legal person who actually holds it.»
(Turkish Waste Management Regulation)

End-of-waste criteria

End-of-waste criteria specify when certain waste ceases to be waste and becomes a product, or a secondary raw material.

DEFINITIONS

Bulk Waste	Objects too large to fit in a garbage bag or wheeled bin, such as furniture and metal appliances, aka white goods. (Designated as a separate stream by DSNY)
Capture Rate	The percentage of materials designated for recycling that is actually set out for separate collection.
Compostables	Biodegradable material that decomposes over a specific set of conditions and time defined by ASTM D6400 and D6868. (Usually requires an industrial composting facility) Biodegradable Products Institute has a certification for compostable products.
Construction and Demolition Waste: C&D	Discarded building materials, packaging, and rubble generated during the construction, renovation and demolition of buildings and structures. Does not include land-clearing and excavation materials that are natural (e.g., rock, soil, stone, vegetation)
Contamination Rate	The percentage of materials set out for separate recycling collection that is not accepted in NYC's recycling program.
Disposal	Final disposition of waste materials through landfilling or an energy-recovery process involving techniques such as combustion, gasification, or pyrolysis.
Diversion, Diversion Rate	From a general waste-management perspective, "diversion" is any combination of reuse, recycling, and composting activities that reduces the volume of waste disposed. "Diversion rate" is the percentage of all material set out for collection that is recycled.
Garbage	Same as 'waste.' A colloquial term.
MGP	Metal, glass, and plastic materials designated by DSNY for mandatory source-separation for recycling. As currently defined by DSNY, the only plastics included in this designation are rigid.
Municipal Solid Waste	The subcategory of solid waste that includes any material discarded by households, businesses, or institutions. Among the waste categories it does not include are industrial wastes, construction and demolition debris, and sanitary wastes.
OCC	Old corrugated cardboard—post-consumer cardboard. Designated by DSNY as part of the "Paper" stream but generally collected separately by private carters.
Organics	As designated by DSNY: food scraps, yard waste and food-soiled paper.
Paper, Mixed Paper	Any clean paper suitable for use as a feedstock in making new paper or cardboard products, i.e., any paper without significant contamination from liquids or soiling from food or other organics.
Recycling	The process of diverting discarded material from disposal, generally through source-separated set-out and collection, intermediate processing at a materials-recovery facility (MRF), and end-use manufacturing that alters the form of the secondary material to make a new product. Composting is a form of recycling.
Refuse	Items or materials that are discarded and disposed.
Reuse	Using an object or material again, either for its original purpose or for a similar purpose, without significantly altering the physical form of the object or material.
Single-Stream Recycling	Source-separated recycling in which all recyclables other than those designated as "organics" may be set out in the same bag or container for collection in a single truck or truck compartment.
Solid Waste	Garbage, refuse, sludges, and other discarded solid materials resulting from residential activities, and industrial and commercial operations.
Source Reduction/ Waste Minimization/ Waste Prevention/ Waste Reduction	Actions or choices taken before waste is generated to reduce the number or volume of discards.
Trash	Portion of waste stream which is not recyclable
Waste	Discarded material, including any sub-streams that may be separated at the source for diversion from disposal by some form of recycling or organics processing.
Waste Generation Rate	The rate at which waste is set out for collection, typically reported in terms of amounts per generator per time period (e.g. pounds per capita per week).

Waste management in urban areas plays a particularly important role, given that waste generated from urban areas are often exported out of the region for processing and treatment, and the impacts of waste disposal activities may pass on to the other jurisdictions, and even to the next generations.

You generate your waste in the city, but
You are trying to dispose of it outside the city.

You are outside the circle or you will be in it.

The Municipal Solid waste (MSW) collection and transportation often account for a significant part of the total management budget, reaching over 70%, depending on the geographical location and fuel price.

David C. Wilson, Waste Manage Res 2007: 25: 198–207

Drivers for waste management over the last millennium (in England)

From 1000 - to 1800

Resources were relatively scarce, so most 'consumer' items were repaired and reused rather than entering the waste stream, and anything saleable in the waste stream was scavenged to provide a source of income (Woodward 1985)

From 1800 - to 1850

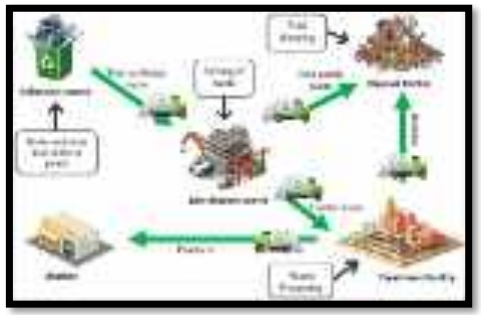
The industrial revolution and rapid urban expansion led to an excess in demand for bricks and 'breeze' for building, for which municipal waste became an important raw material.

From 1850 - to 1900

A Sanitation Commission was appointed in London in 1839, and made the first clear linkages between infectious diseases such as cholera and poor sanitation conditions.

From 1900 - to 1970

Public health (legislation) continued to be a main driver, with the focus on collection – getting the waste 'out from underfoot'. Services were generally provided directly by municipalities.



From 1970 - to …

Waste disposal finally came onto the political agenda in the developed world in the late 1970s with the emergence of environmental protection as a key driver.

Map 1.1 Definition of Income Levels

What a Waste 2.0: A global Snapshot of Solid Waste Management to 2050
https://openknowledge.worldbank.org/handle/10986/30317

Figure B2.1.1 Waste Generation: Actual and Model Prediction

Note: GDP = gross domestic product.

base year and for the projection years, proxy waste generation rates per year were modeled for each country for the base and target years, per equation B2.1.1.

Proxy waste generation per capita

$$= 1647.41 - 419.73 \ln(GDP\ per\ capita) + 29.43 \ln(GDP\ per\ capita)^2 \qquad (B2.1.1)$$

What a Waste 2.0

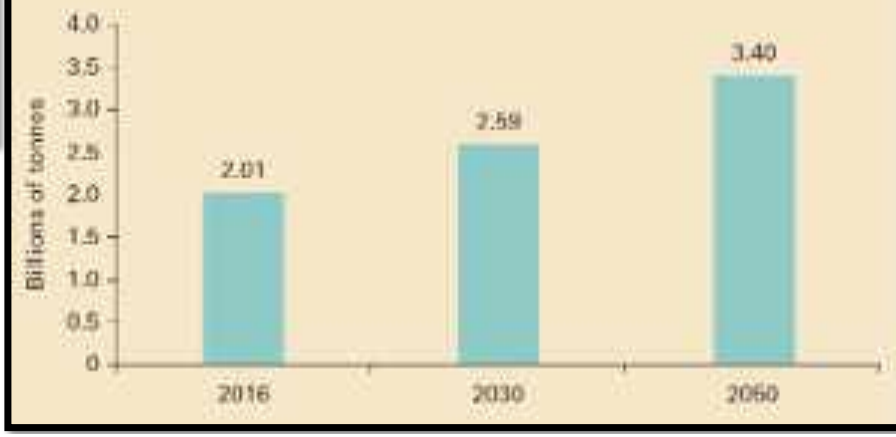
A Global Snapshot of Solid Waste Management to 2050

Silpa Kaza, Lisa Yao, Perinaz Bhada-Tata, and Frank Van Woerden

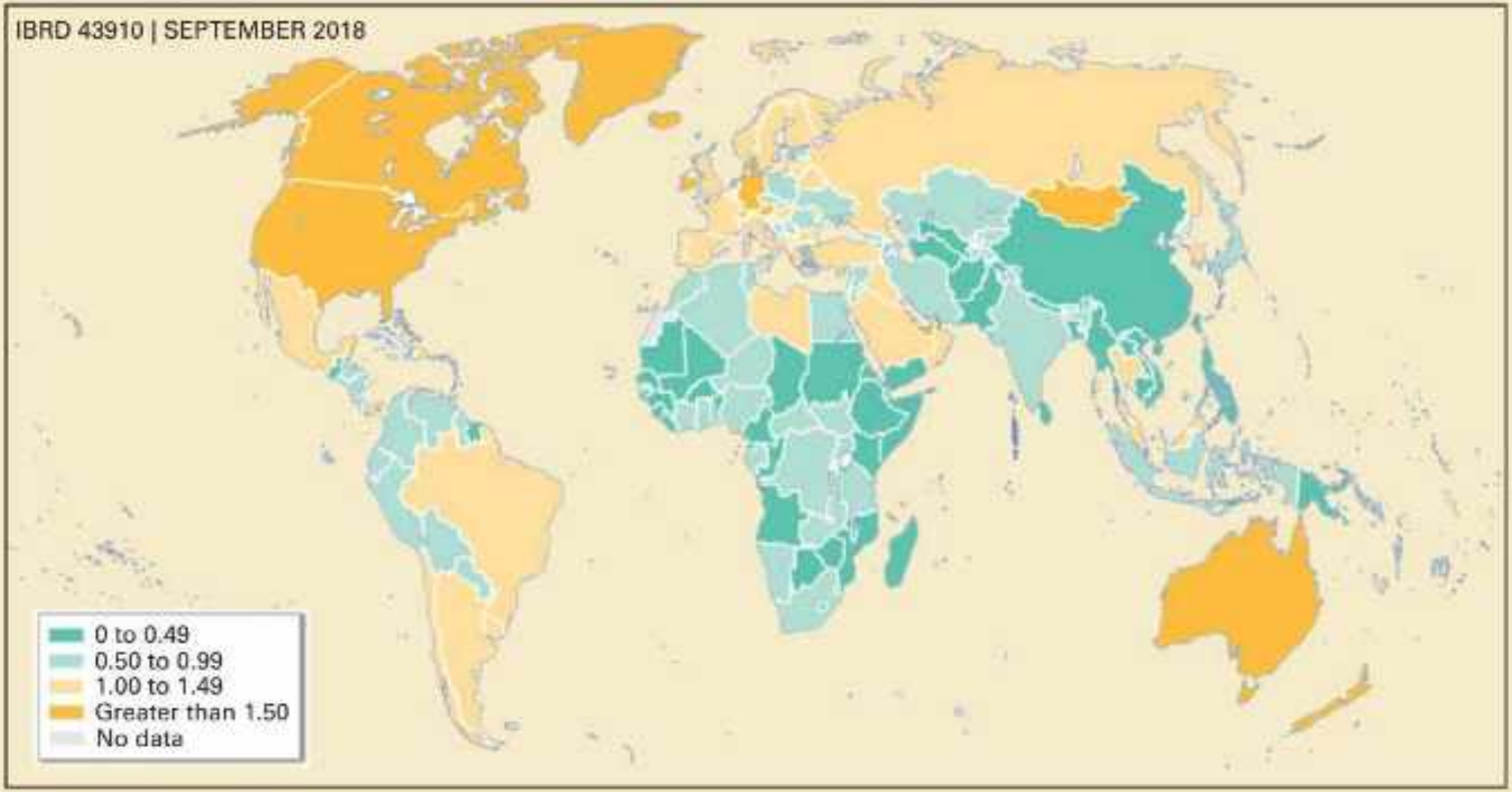
With Kremena Ionkova, John Morton, Renan Alberto Poveda, Maria Sarraf, Fuad Malkawi, A.S. Harinath, Ferouk Benna, Gyongshim An, Haruka Imoto, and Daniel Levine

WORLD BANK GROUP

Figure 2.5 Projected Global Waste Generation



Map 2.1 Waste Generation Per Capita



Note: kg = kilogram.

What a Waste 2.0: Aglobal Snapshot of Solid Waste Management to 2050
https://openknowledge.worldbank.org/handle/10986/30317

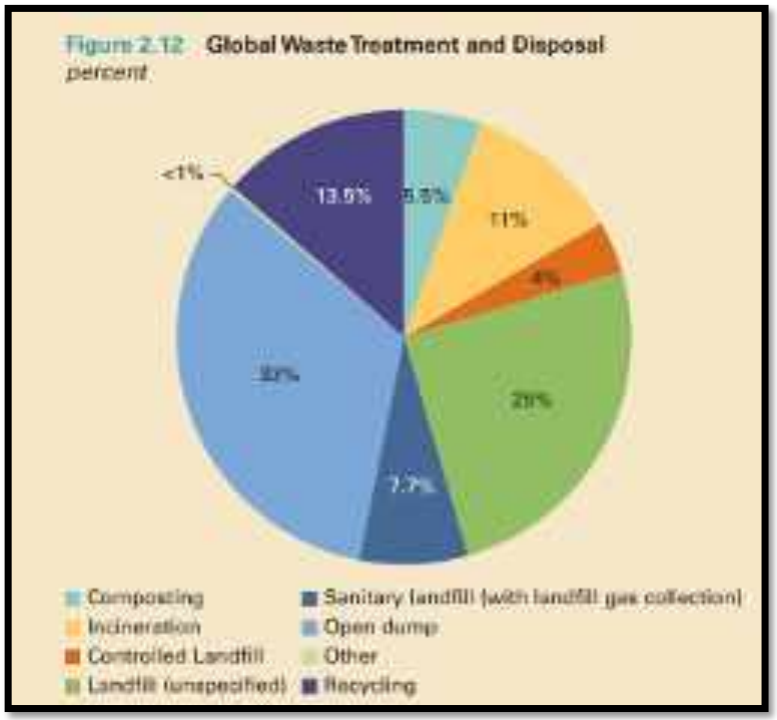


Figure 2.12 Global Waste Treatment and Disposal
percent
<1%
13.5%
5.5%
11%
4%
20%
7.7%
Composting
Incineration
Controlled Landfill
Landfill (unspecified)
Sanitary (landfill (with landfill gas collection)
Open dump
Other
Recycling

?

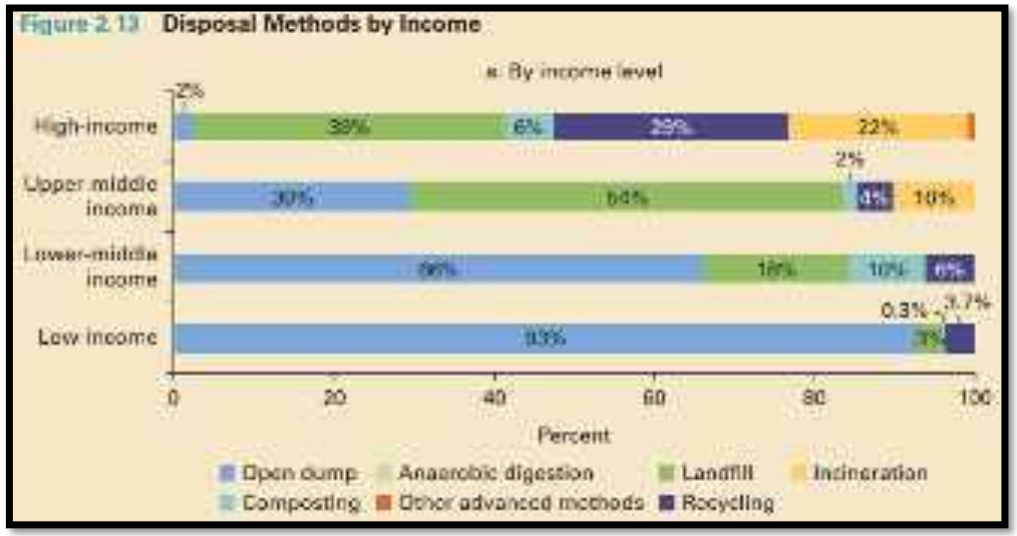


Figure 2.13 Disposal Methods by Income
a. By income level
High-income
Upper middle income
Lower-middle income
Low income
2%
38%
6%
22%
2%
4%
16%
0.3%
3.7%
0
20
40
60
80
100
Percent
Open dump
Composting
Anaerobic digestion
Other advanced methods
Landfill
Recycling
Incineration

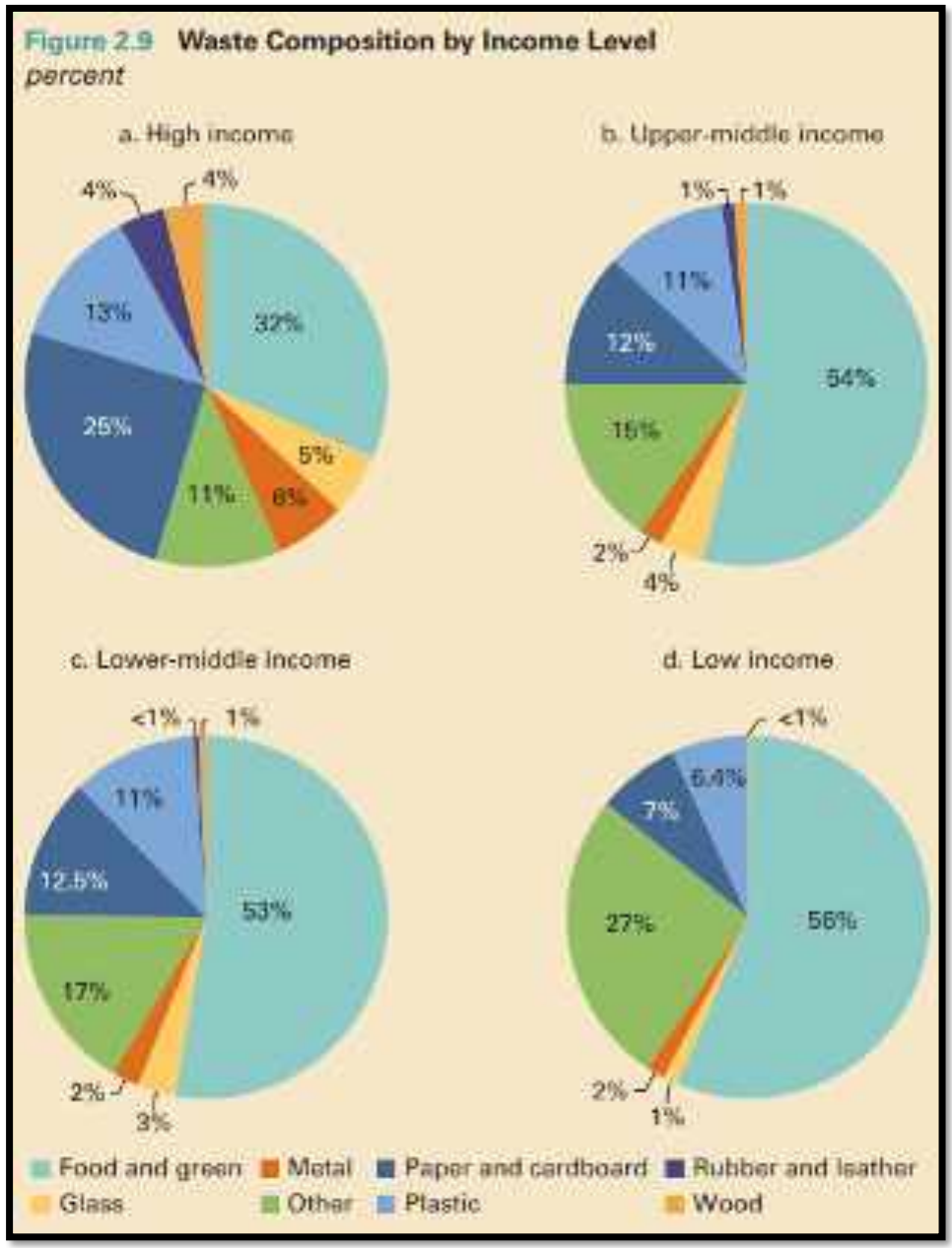
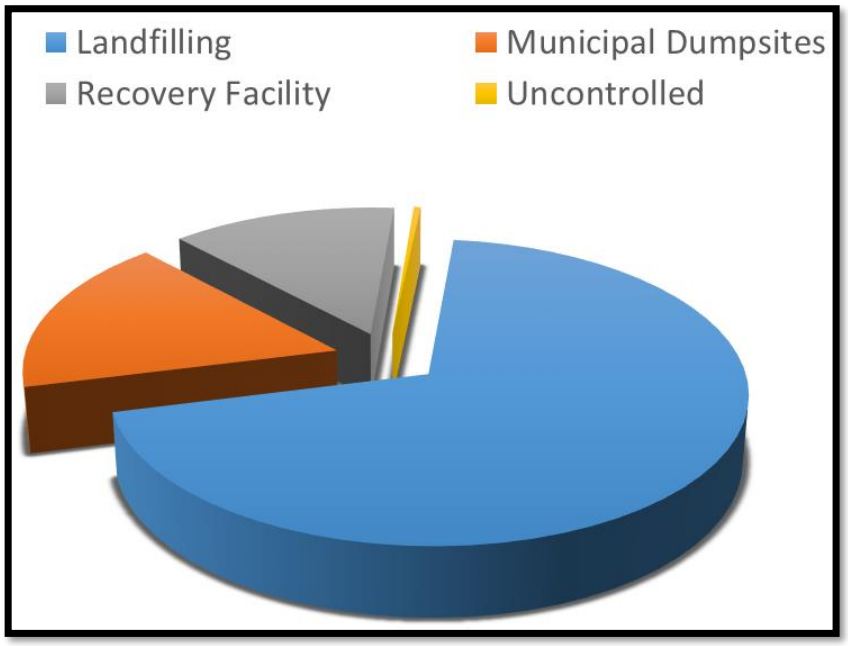


Figure 2.9 Waste Composition by Income Level
percent
a. High income
4%
4%
32%
13%
5%
25%
11%
8%
b. Upper-middle income
1%
1%
11%
12%
54%
15%
2%
4%
c. Lower-middle income
<1%
1%
11%
12.5%
53%
17%
2%
3%
d. Low income
<1%
6.4%
7%
27%
56%
2%
1%
Food and green
Glass
Metal
Other
Paper and cardboard
Plastic
Rubber and leather
Wood

Turkish Statistical Institute / Waste Statistics for 2020

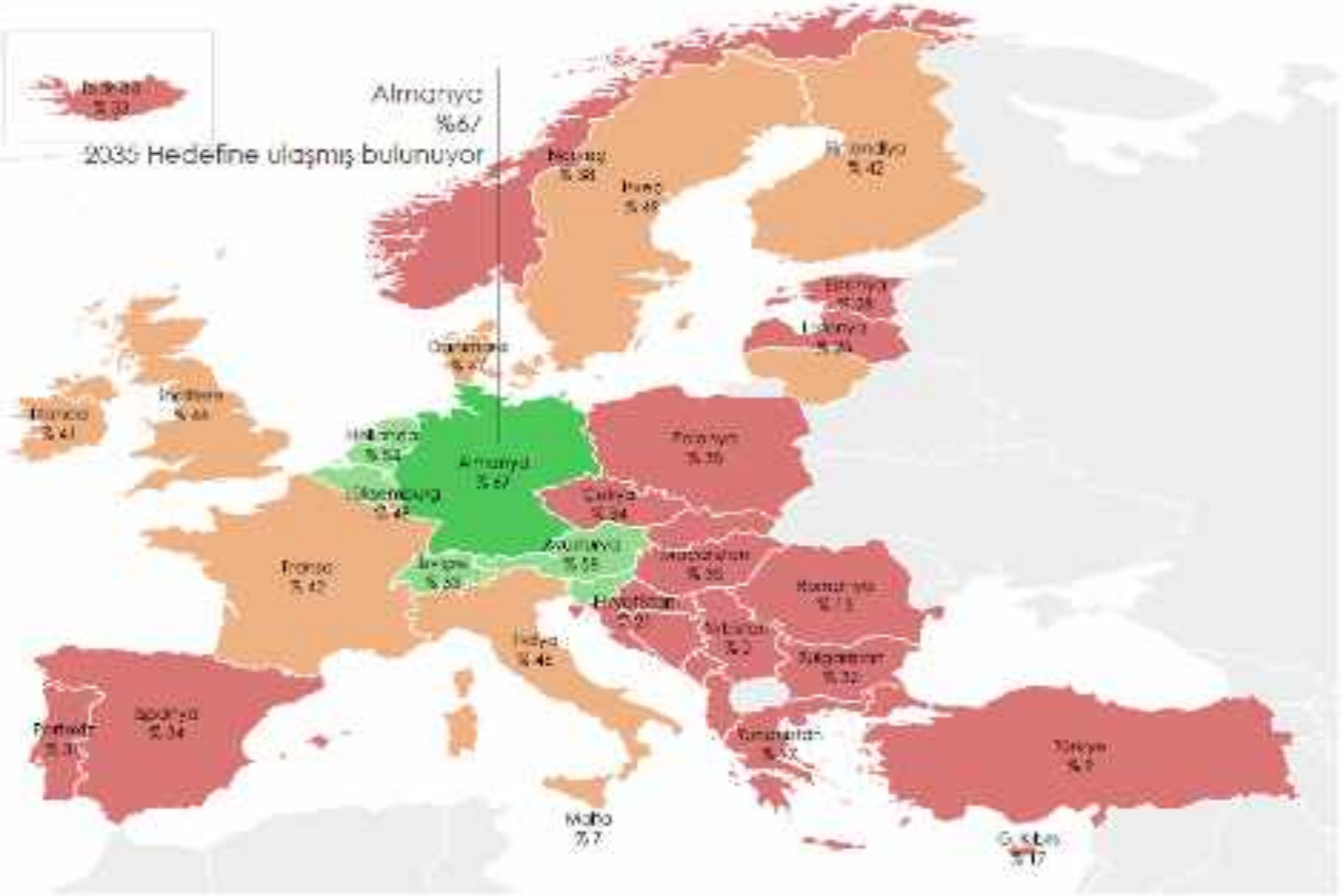
32.3 million tons of waste collected in 1387 municipalities that provide waste services;

The average daily amount of waste per person collected in municipalities was calculated as 1.13 kg.



- 69.4% in landfills,
- 17% in municipal dumps,
- 13.2% in recovery facilities,
- 0.4% was disposed of by burning in the open, burial, dumping into a stream or land.

2020 Evsel Atık Geri Dönüşüm Hedefi (2017)

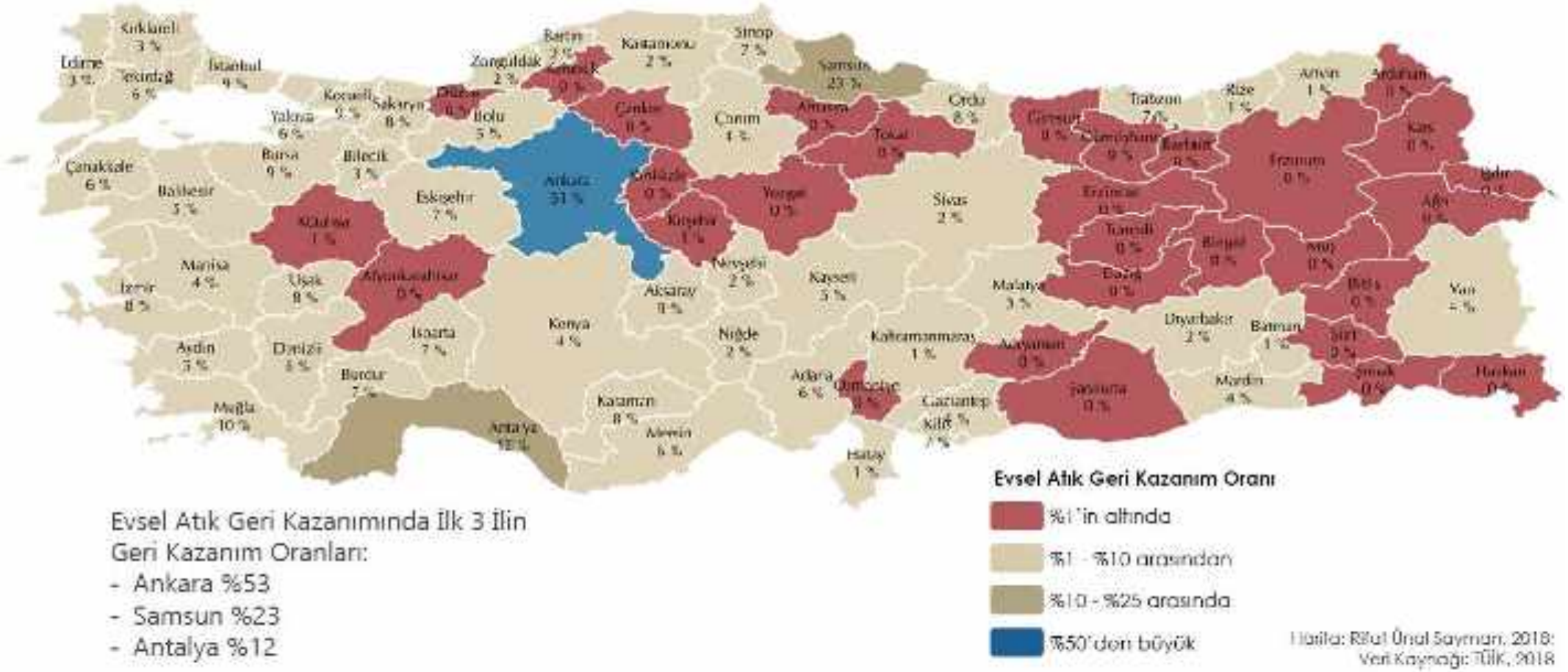


- Avrupa Birliği **2020 yılı için %50 yeniden kullanım ve geri dönüşüm hedefi koydu.**
- Bu hedefe ulaşılması için "Erken Uyarı Sistemi" kuruldu.
- 10 Ülkeye Erken Uyarı Verildi:
  - Bulgaristan
  - Hırvatistan
  - G. Kıbrıs
  - Estonya
  - Hinlandiya
  - Yunanistan
  - Macaristan
  - İtalyanya
  - Malta
  - Polonya
  - Portekiz
  - Romanya
  - Slovakiya
  - İspanya
- Avrupa Birliği 2030 hedefi %60 ve 2035 hedefi %65.
- Almanya 2017 itibariyle 2035 hedefine ulaşmış bulunuyor.

%65 ve Üzeri
%50 - %65
%40 - %50
0 - %40

Harita: Kitat Ünal Sayman, 2019;
Veri Kaynağı: Eurostat, 2019

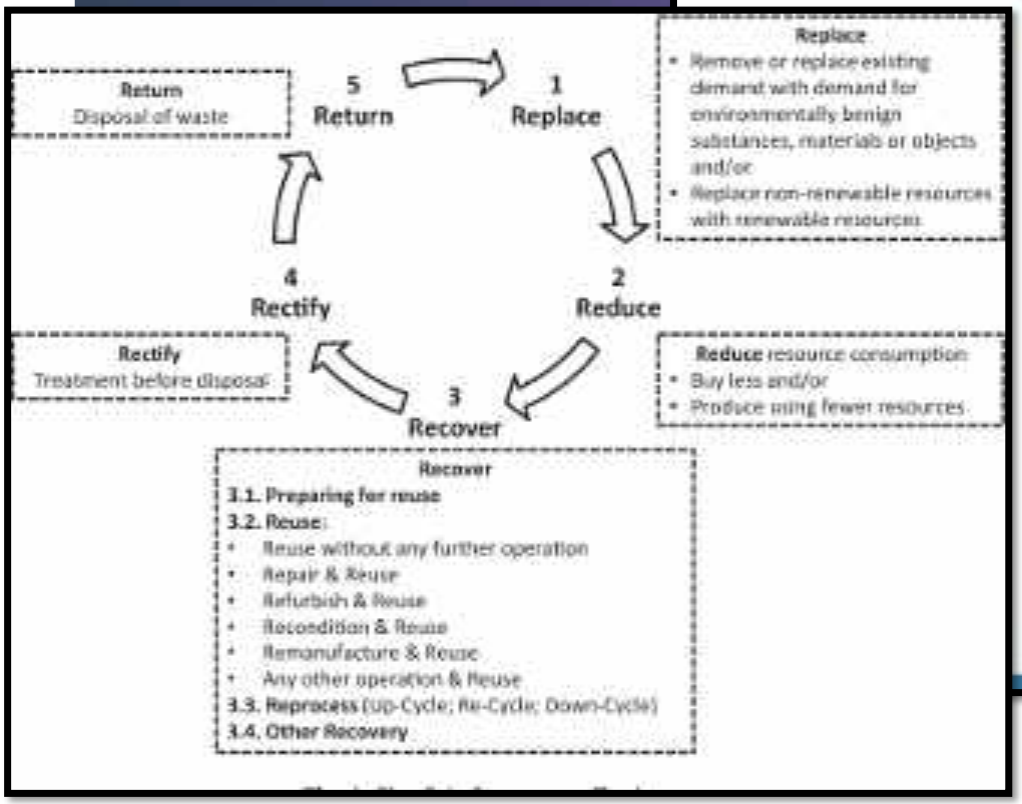
Evsel Atık Geri Kazanım Oranları (2016)



Evsel Atık Geri Kazanımında İlk 3 İlin Geri Kazanım Oranları:

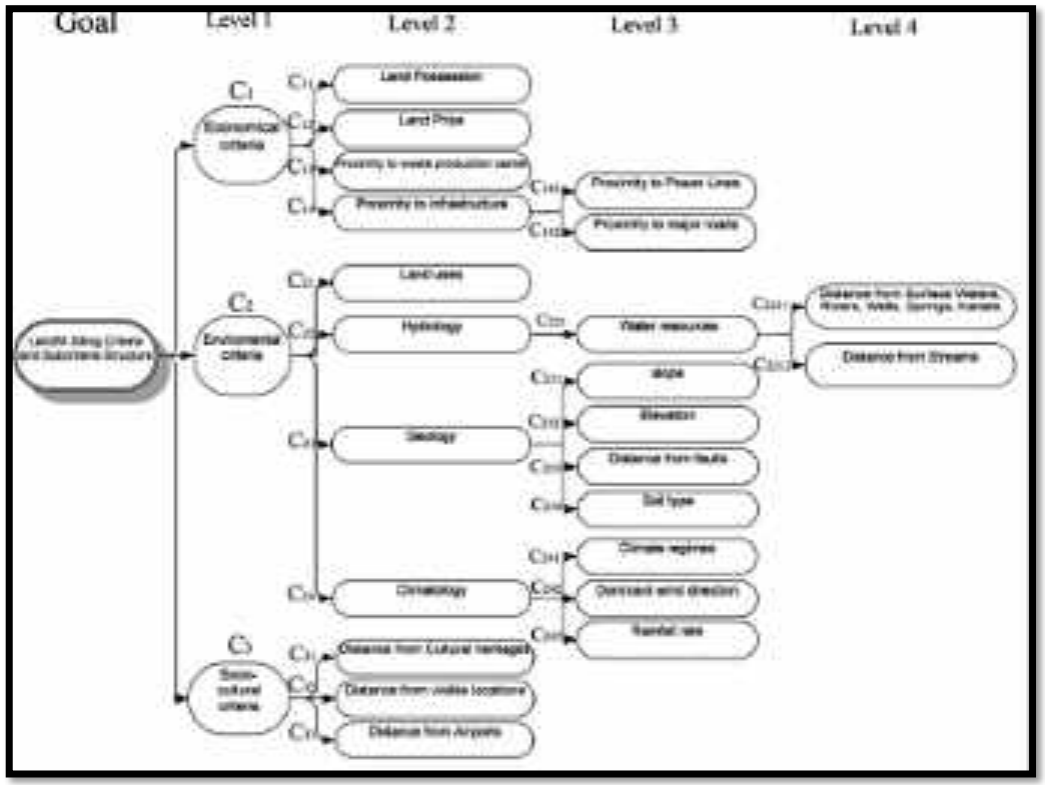
- Ankara %53
- Samsun %23
- Antalya %12

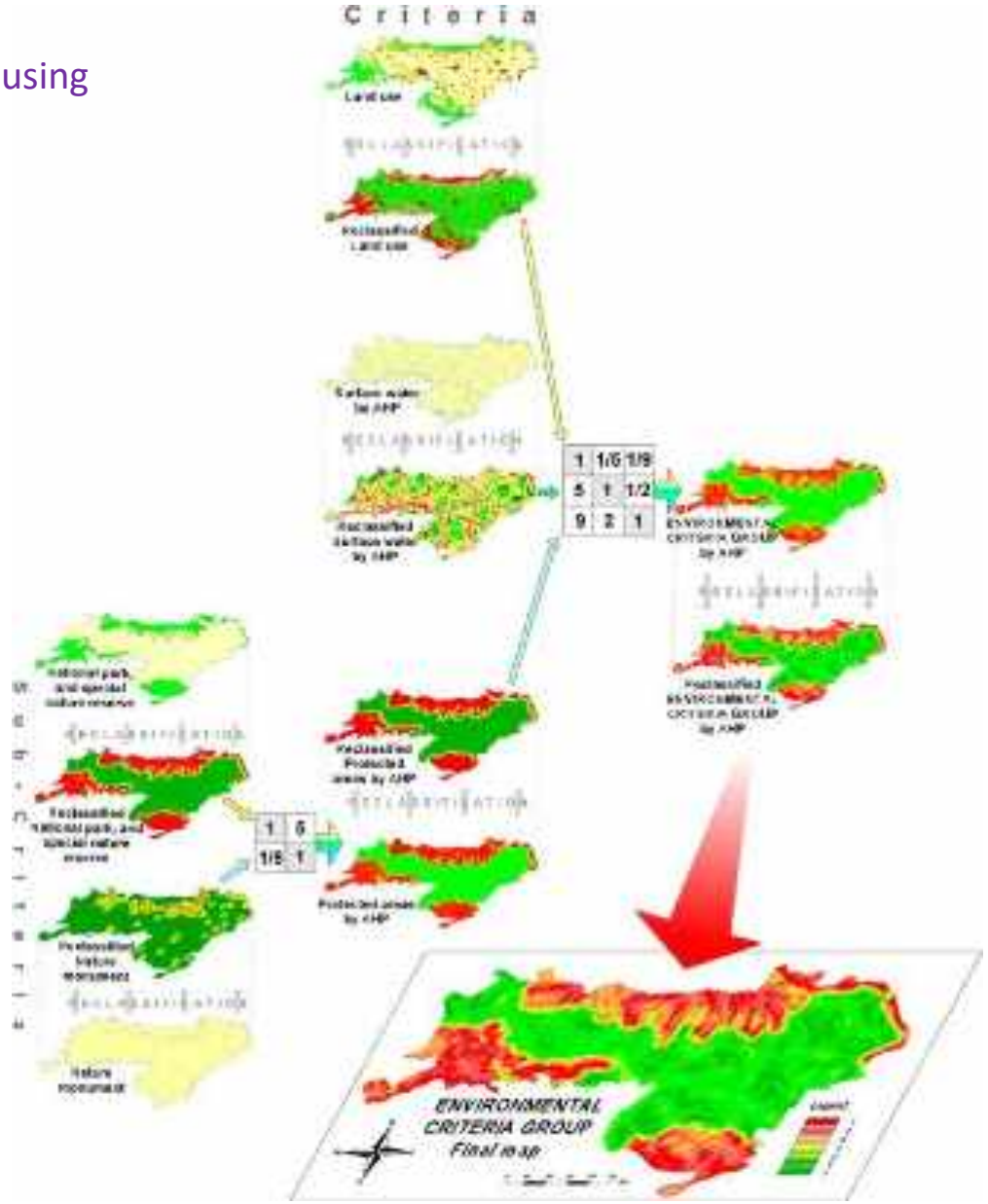
Hasila: Rifat Ünal Sayman, 2018;
Veri Kaynağı: TÜİK, 2018



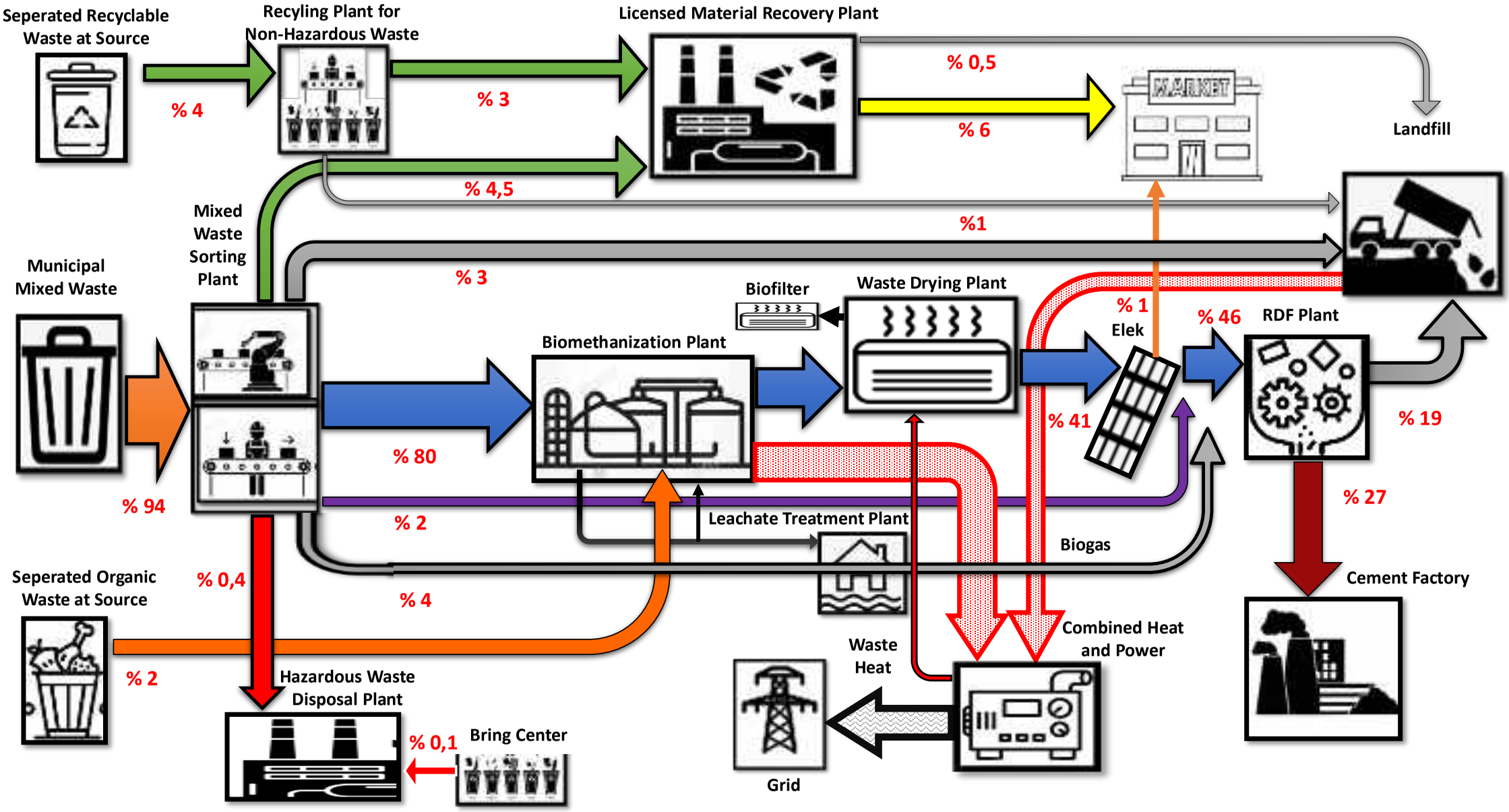
Analysis of waste hierarchy in the European waste directive 2008/98/EC.
Mangesh Gharfalkar, R. Court, Callum Campbell, Zulfiqur Ali, G. Hillier
Waste management 2015

In an urban plan, landfill site selection should be made using multiple criteria decision making procedure and GIS ...



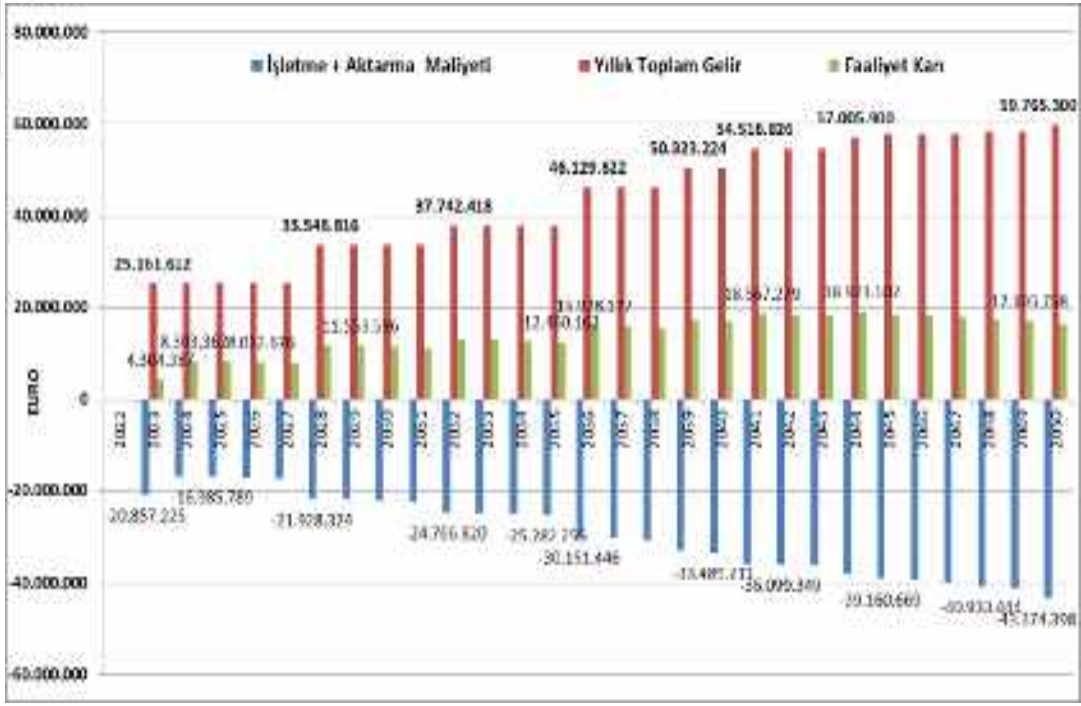


PREPARATION OF WASTE TRANSPORTATION AND DISPOSAL SCENARIOS

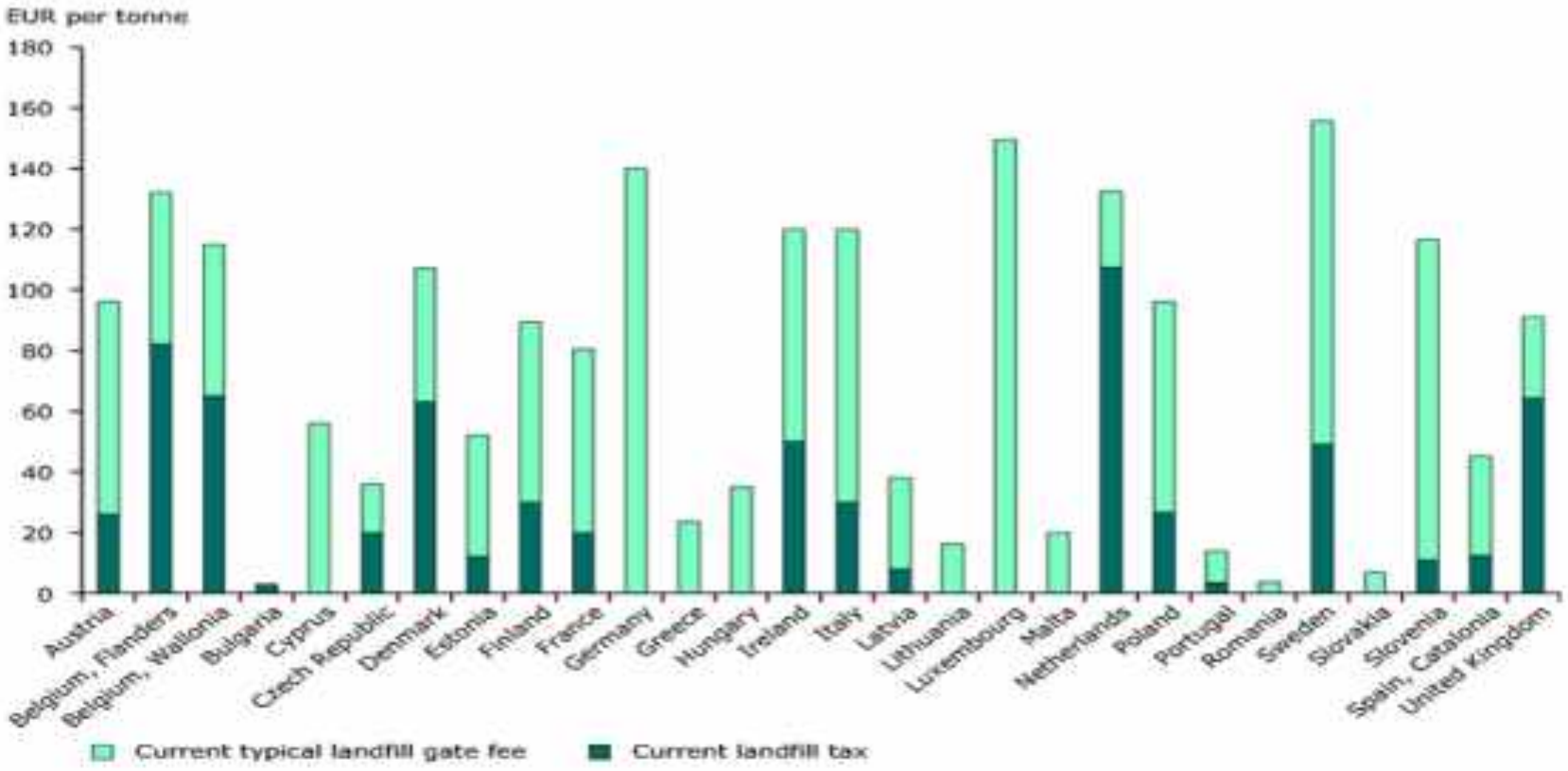


BUILDING OF INTEGRATED WASTE MANAGEMENT FLOW CHART FOR A HEALTHY CITY IN TURKEY- Prof. Dr. N.Kamil SALİHOGLU

Economical Analysis of Integrated Waste Management Plant



Typical charge (gate fee and landfill tax) for legal landfilling of non-hazardous municipal waste in EU Member States and regions



https://www.eea.europa.eu/downloads/dae3e670bcea42c78b8f04f70abe620d/1363680110/typical-charge-gate-fee-and.pdf


Zero Waste
Design Guidelines
Design Strategies and Case Studies for a Zero Waste City
AIA New York
CENTER FOR ARCHITECTURE
CLOSEDLOOPS
With support from
ROCKEFELLER FOUNDATION

What is Zero Waste?

Zero waste is a visionary goal and a plan of action. The Zero Waste International Alliance (ZWIA) defines it as follows :

Zero Waste is a goal that is

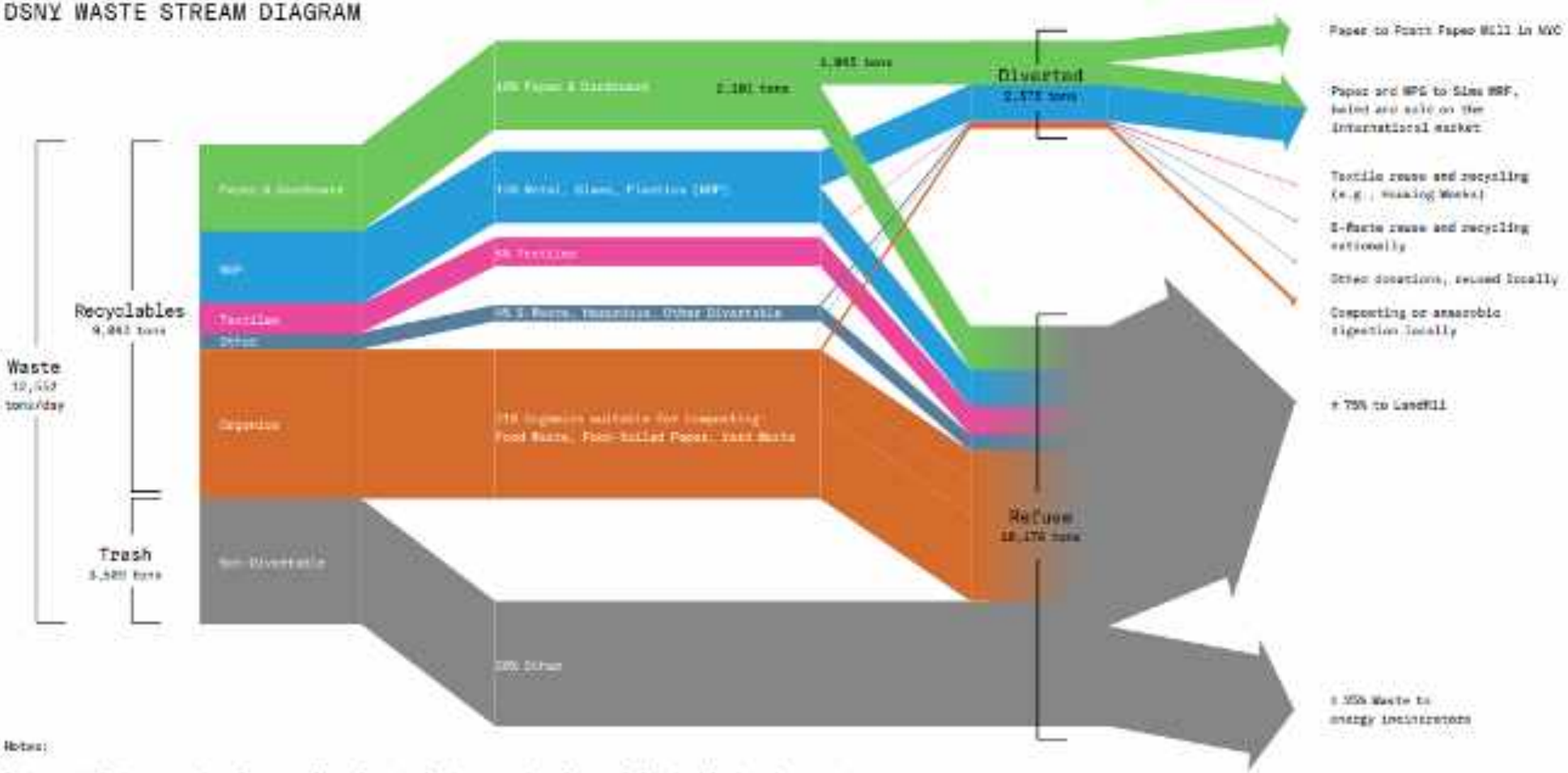
- ethical,
- economical,
- efficient and
- visionary,

to guide people in changing their lifestyles and practices
to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use.

Zero Waste means;

designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them.

DSNY WASTE STREAM DIAGRAM



Notes:

Capture rate is the proportion of recyclables that get diverted, and is measured per waste stream—e.g., for Paper & Cardboard = 1,845/2,181 = 58%

Diversion rate is the proportion of the total waste stream that is diverted from disposal = 3,373/12,553 = 18%

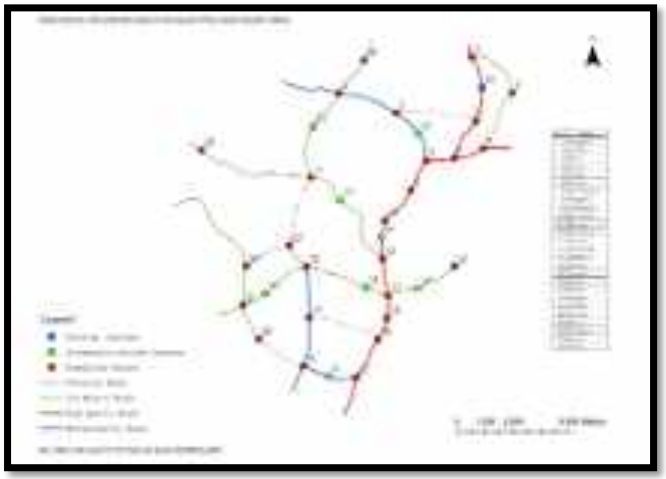
Refuse is defined as the waste stream that gets disposed (is sent to landfill or waste to energy incinerators)

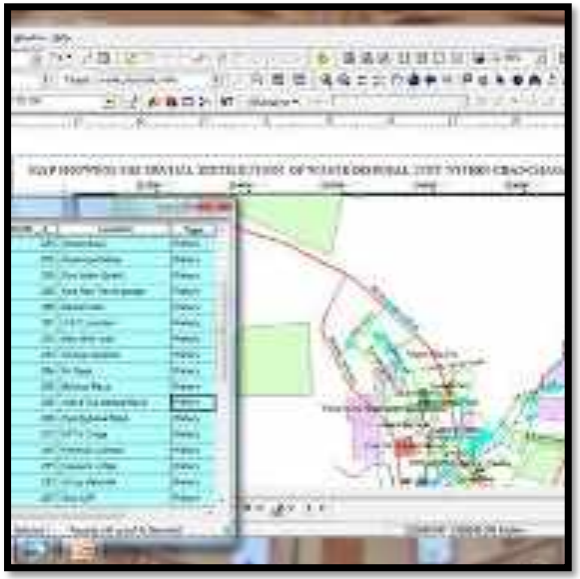
What types of units should be planned and designed to establish an integrated waste management system in a healthy city?

1. WASTE CONTAINERS : DESIGN

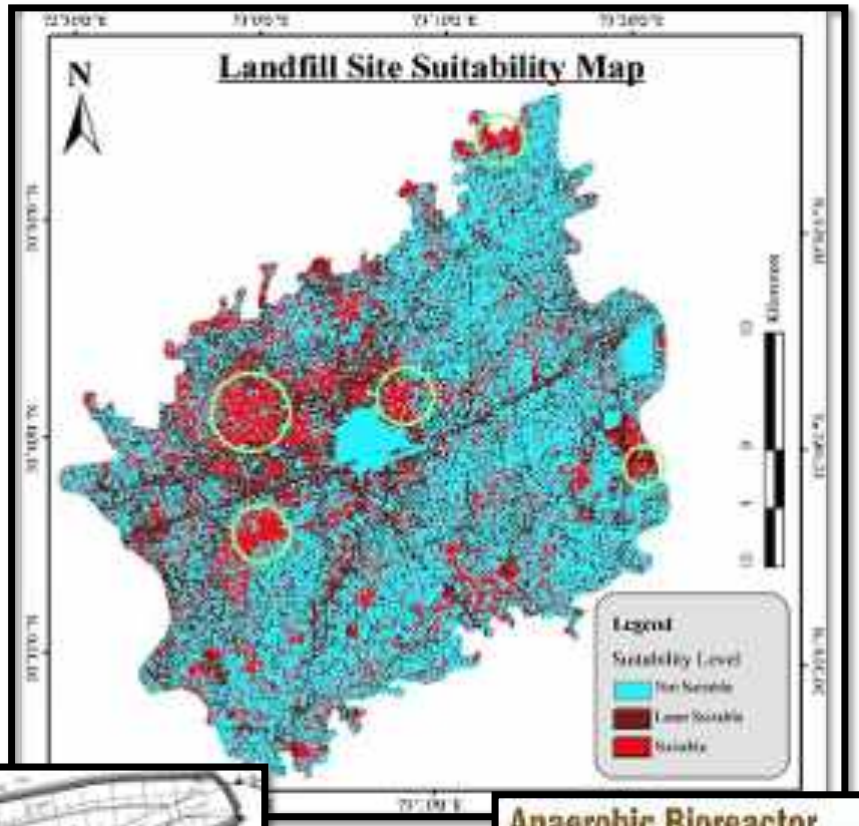
1. WASTE CONTAINERS : LOCATION SELECTION

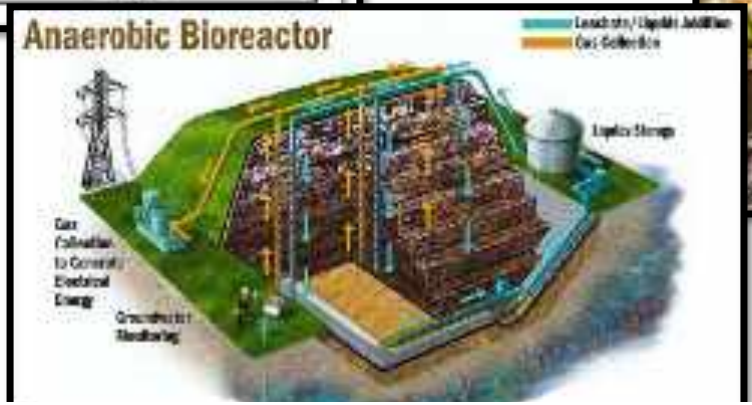
2. TRANSFER STATION: LOCATION SELECTION AND DESIGN

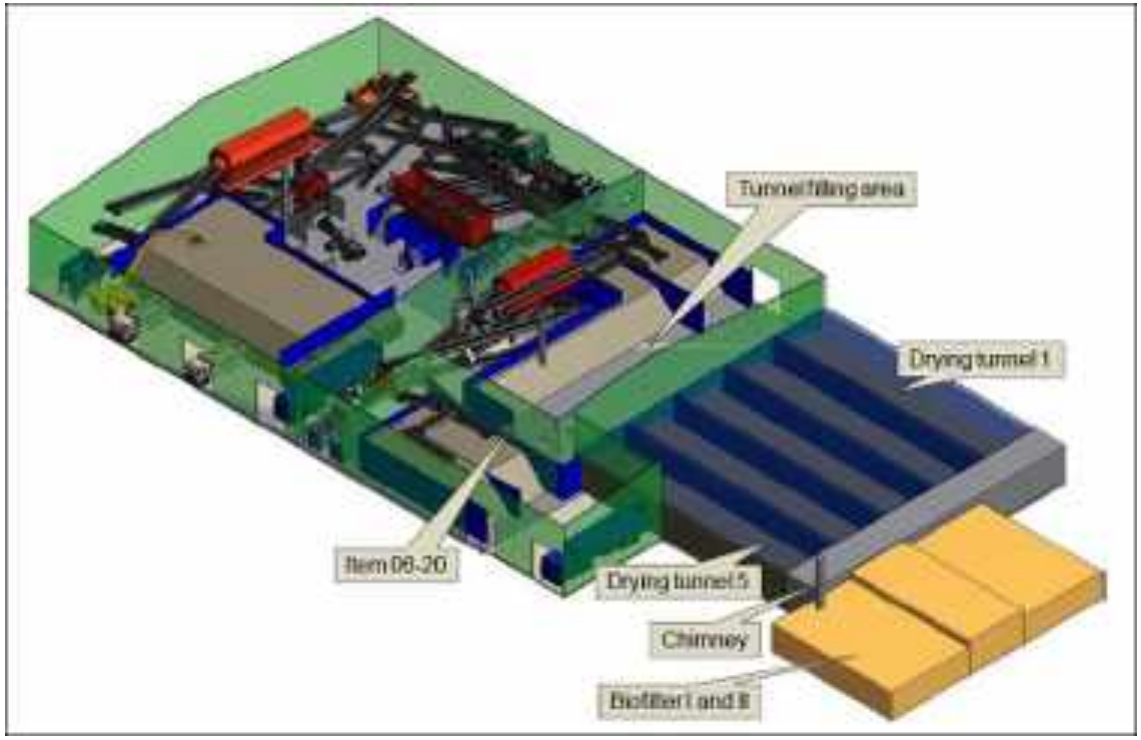




3. INTEGRATED WASTE MANAGEMENT FACILITIES: LOCATION SELECTION AND DESIGN







SOME EXAMPLES OF INTEGRATED WASTE MANAGEMENT FACILITIES

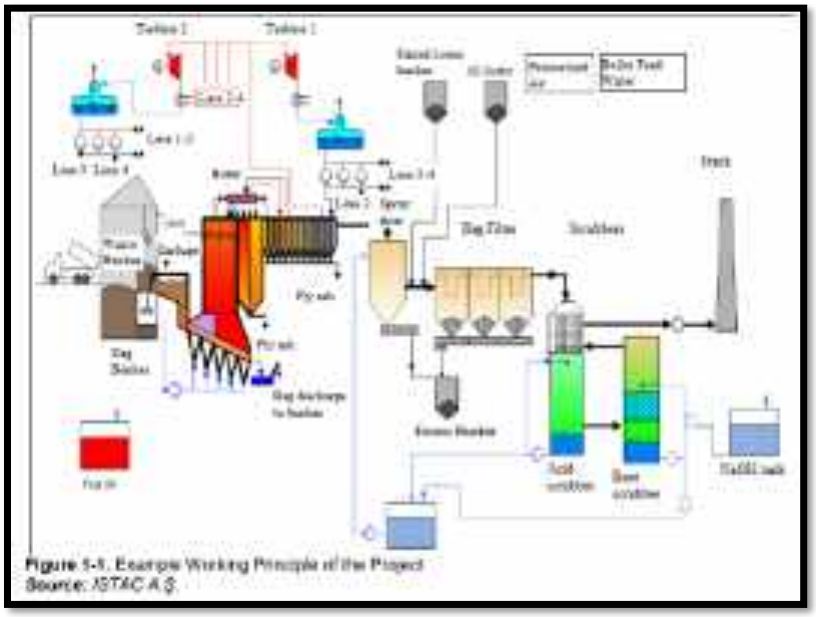
Bow Lake August 27, 2012

Istanbul Metropolitan Municipality Waste Incineration And Energy Generation Plant

is the largest facility in Europe with an annual capacity of

1 million tons (about 15% of Istanbul's waste),

generating 630 GWh of net electricity sufficient for 400,000 households.



Capacity: 3000 Ton/ Day

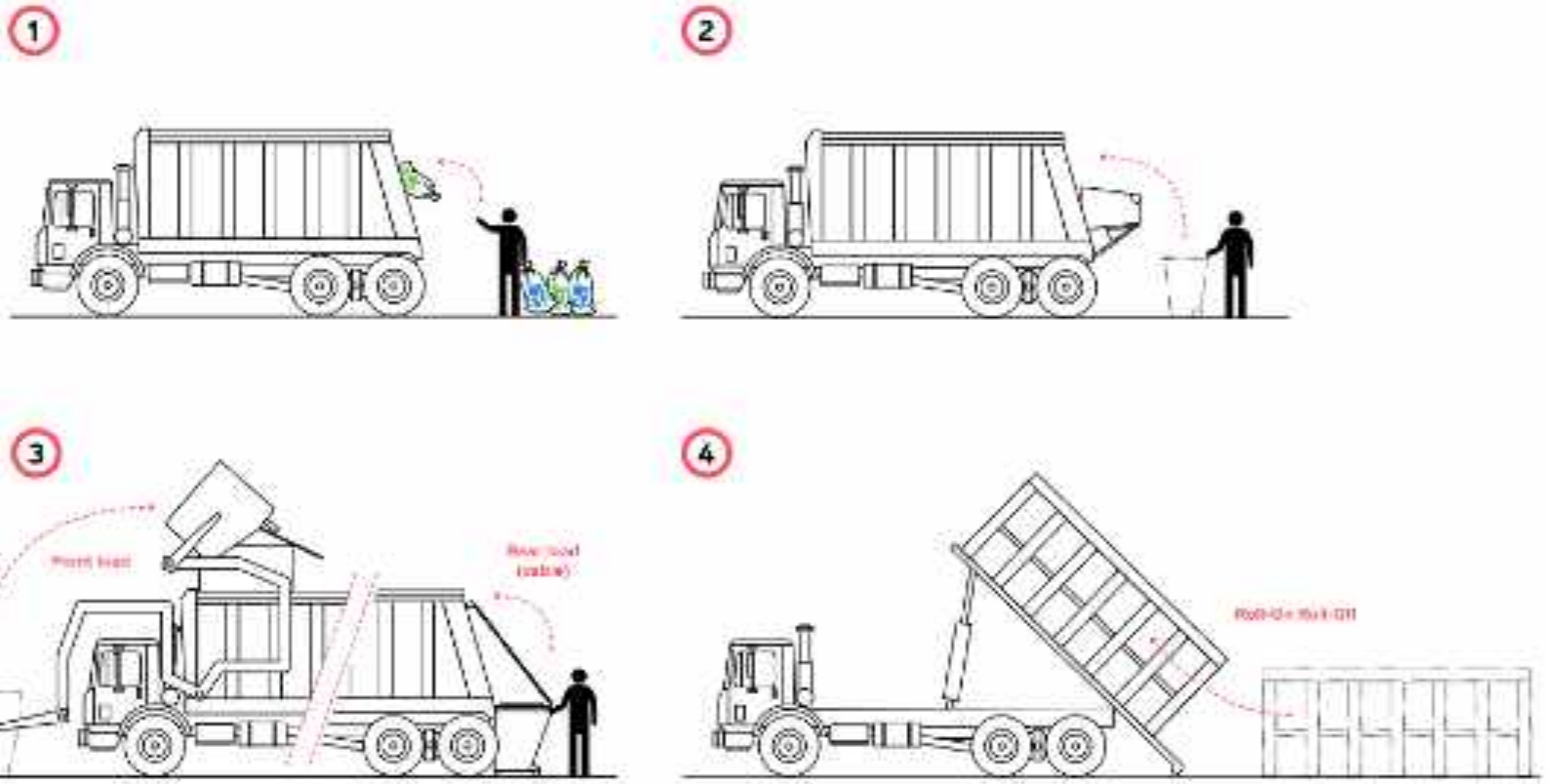
Capital Cost : 300.000.000 Euro

Collection & Urban Design

Best Practice Strategies

TRUCK COLLECTION TYPOLOGIES

1. Bags on Street
2. Wheeled Bins on Street
3. 1-8 Cu Yd Containers
4. 20-40 Cu Yd (RoRo) Containers




BELEDİYE

Neighborhood-Scale Collection

Door-to-door collection, or collection by individual businesses within a building, maximizes the number of truck stops, trips and miles.

Planning Considerations

— Location of centralized facility relative to individual buildings
— Number of streams managed in centralized location
— Network infrastructure, if applicable
— Responsibility for operations and maintenance
— Administrative structure for system management, if multiple stakeholders
— Communication strategy
— Shared costs

- **PROVIDE LOADING AREA AT BASE OF A BUILDING THAT CAN ALSO BE USED BY OTHER BUILDINGS.**
- **PROVIDE CENTRAL COLLECTION FACILITY WITH MULTIPLE COMPACTOR CONTAINERS SHARED BETWEEN BUILDINGS.**

- **PROVIDE A SYSTEM OF PNEUMATIC TUBES CONNECTING BUILDINGS TO A CENTRAL TERMINAL .**

PROVIDE SHARED SURFACE CONTAINERS IN THE PUBLIC REALM OR ON PUBLIC AGENCY PROPERTY

SHARED SUBMERGED CONTAINERS IN THE PUBLIC REALM OR ON PUBLIC-AGENCY PROPERTY

INCORPORATE COMMUNITY INTO COLLECTION OPERATIONS

DESIGN STREETSCAPES THAT ALLOW CURBSIDE ACCESS TO CONTAINERS

Waste Receptacle Units

- Increase the number of waste receptacles and recycling containers in the downtown core to limit the amount of trash in the streets as well as support tourist activity.

- Strategically relocate existing curbside waste receptacles to discourage in-appropriate use.

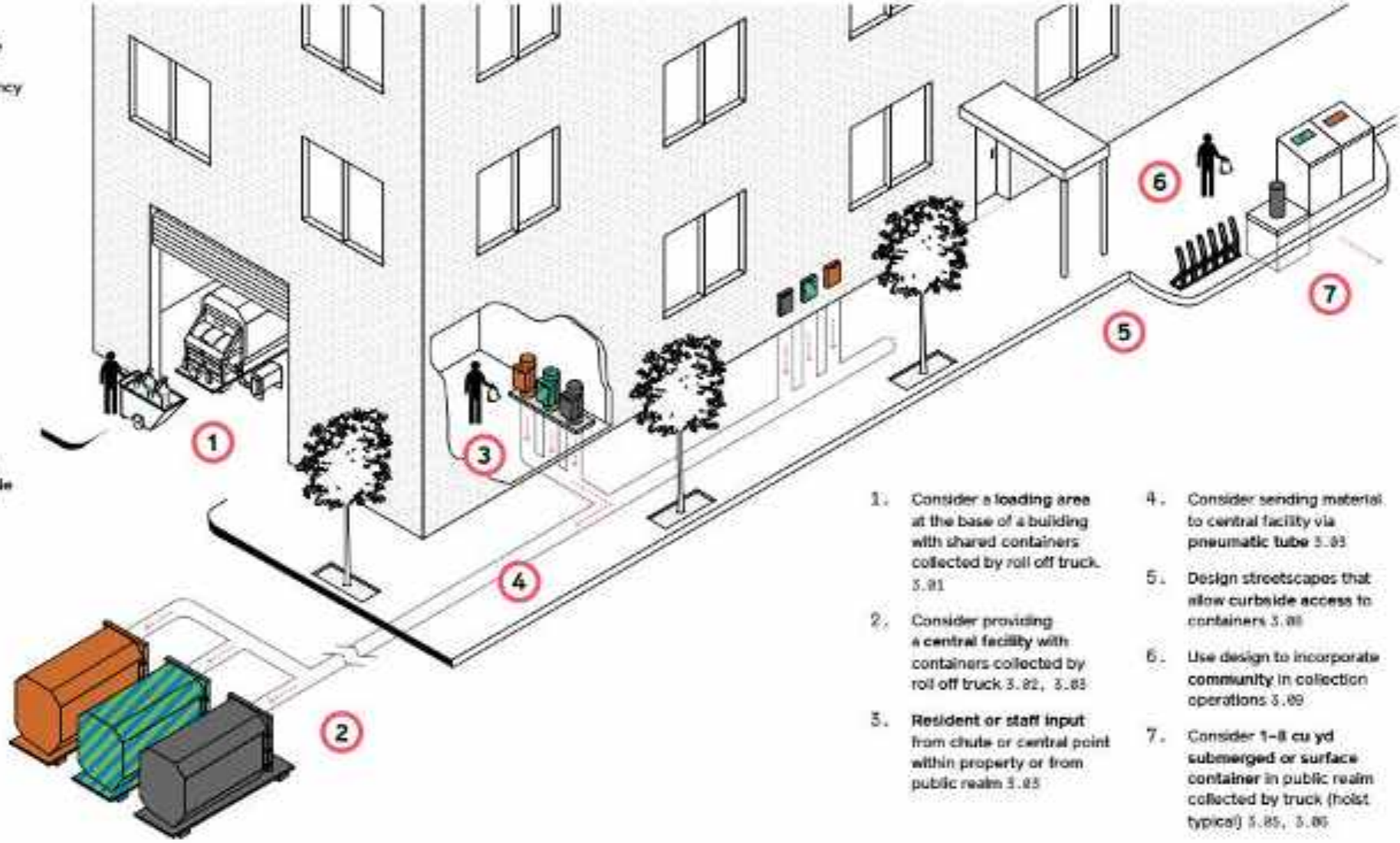
- As existing waste receptacles reach the end of their life-cycles and require replacement or new receptacles are needed, use new specified units.

BEST PRACTICE (SHARED) COLLECTION CONSIDERATIONS

Surface containers
- Least costly and most flexible
- Storage capacity is limited, increasing collection frequency
- Truck access is required

Submerged containers
- More costly and require coordination with below surface conditions
- Free up space at surface
- Truck access is required

Pneumatic networks
- Most costly
- Requires coordination with below surface conditions along entire tube path as well as construction of a collection station
- Capacity is highest because inlets may be emptied multiple times in a day
- No truck access needed, except at collection station



1. Consider a **loading area** at the base of a building with shared containers collected by roll off truck. 5.01
2. Consider providing **a central facility** with containers collected by roll off truck 5.02, 5.03
3. **Resident or staff input** from chute or central point within property or from public realm 5.05
4. Consider sending material to central facility via **pneumatic tube** 5.04
5. Design streetscapes that allow **curbside access** to containers 5.08
6. Use design to incorporate **community** in collection operations 5.09
7. Consider 1–8 cu yd **submerged or surface container** in public realm collected by truck (hoist typical) 5.05, 5.06

Collection & Urban Design Case Studies

Battery Park City, NYC

Building staff bringing waste in tilt trucks to shared compactor managed by The Battery Park City Authority

The Hague, Netherlands

Submerged containers installed in a curb extension; truck removing container

Paris Trilib'

Shared surface container on curb

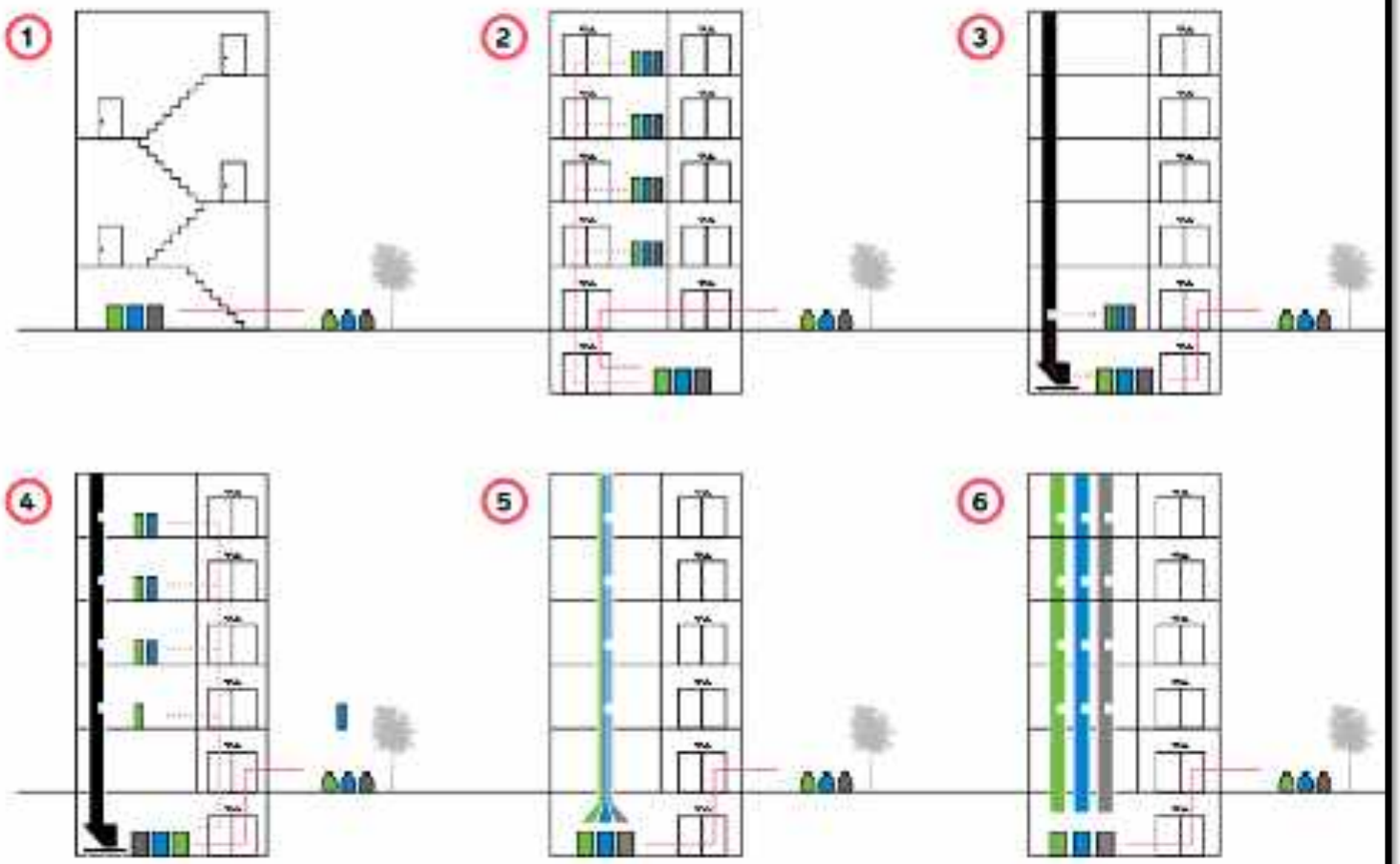
GrowNYC Compost
On-The-Go Program, NYC

Commuter drop off at transit hub

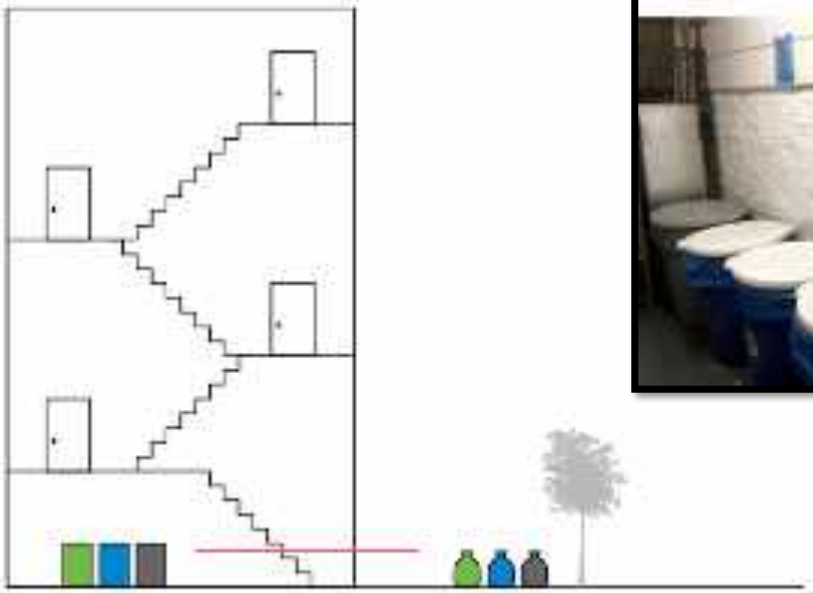
Building Design

RESIDENTIAL TYPOLOGIES

1. Central Location
2. Service Corridor
3. Corridor Chute with Central Recycling
4. Trash Room with Chute and Bins
5. Single Chute with Sorter
6. Multiple Chutes



TYPOLOGY 1: CENTRAL LOCATION

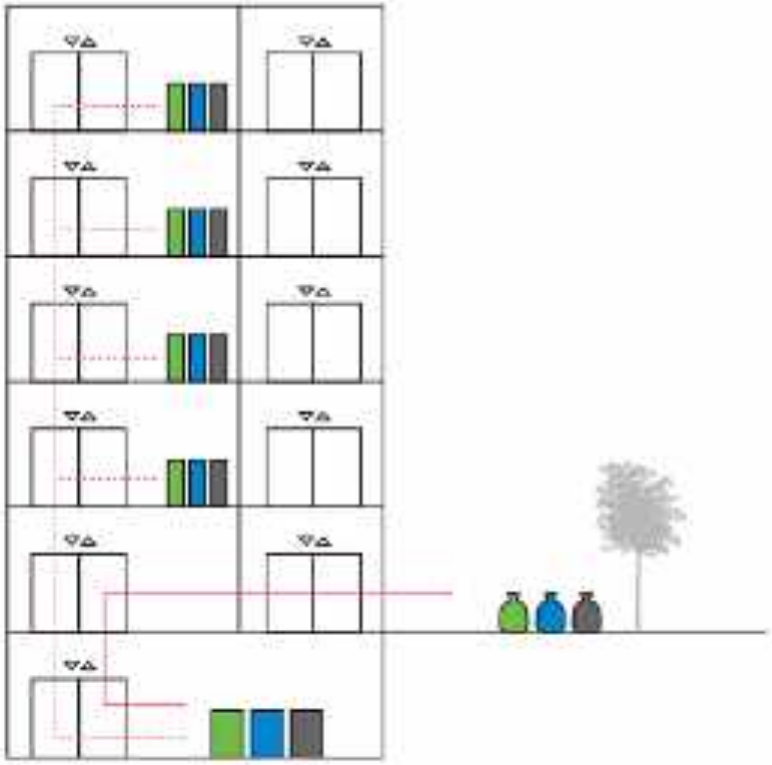


Left:
Limited room for interior and exterior storage in Victorian tenement.

Below:
Central storage in cellar and on street

In the simplest scenario, residents bring waste to a central waste area. The area may be interior (at grade level or in the cellar) or exterior (in front of the building within the property line, on the sidewalk or in a side yard).

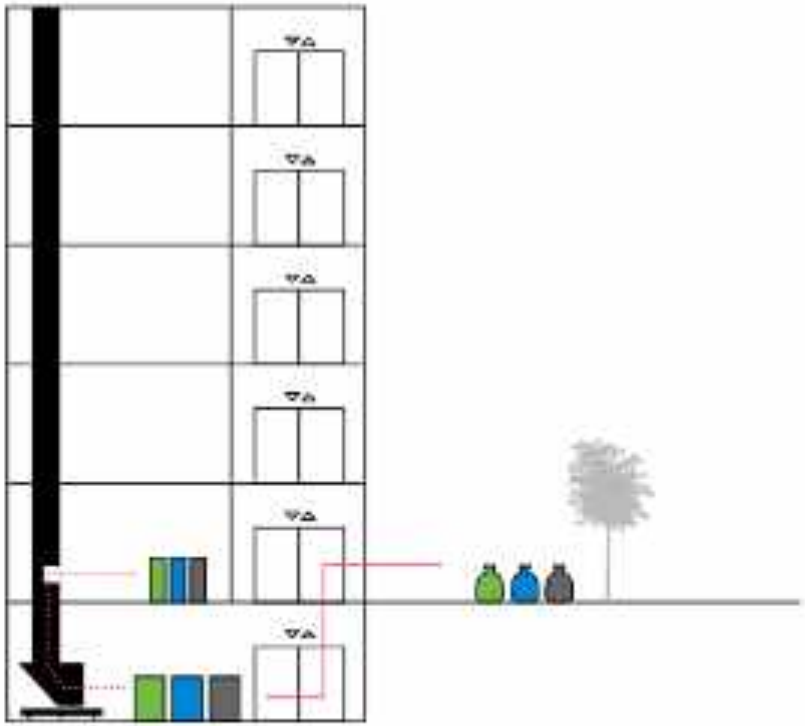
TYPOLOGY 2: SERVICE CORRIDOR



Typically found on the Upper West and East sides of Manhattan, these are large apartment buildings, often cooperatives, with doormen and staff who service the building through its separate service circulation. Residents generally place their waste in bins or bags, as well as bundled

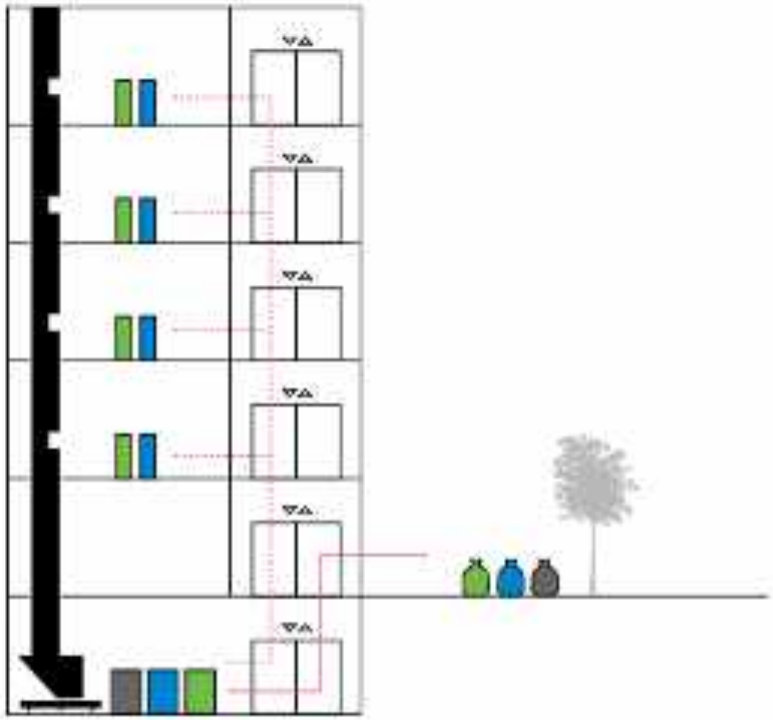
Waste left by residents outside of the apartment service door.

TYPOLOGY 3: CORRIDOR CHUTE WITH CENTRAL RECYCLING



Typically found in larger apartment complexes or New York City Housing Authority (NYCHA) housing, this system often consists of a narrow chute that previously emptied into an incinerator. The chute door is in the egress corridor, or alongside the elevator, making it against code to add co-located bins for recycling or organics. Recycling is located in a central area.

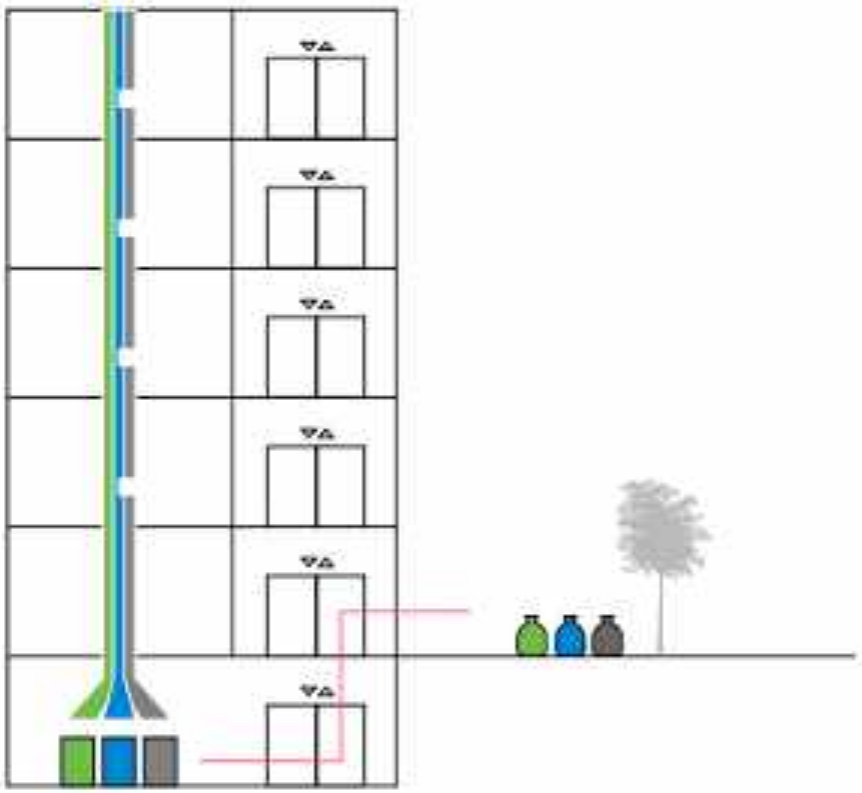
TYPOLOGY 4: TRASH ROOM WITH CHUTE AND BINS



This is the most common provision for NYC's multifamily buildings. Trash goes down the chute to a compactor, and MGP and paper recycling is put in bins in the trash room. Sometimes there is also space for cardboard, or there may be another designated area. The trash room is often small and unventilated with just enough space for small recycling bins.

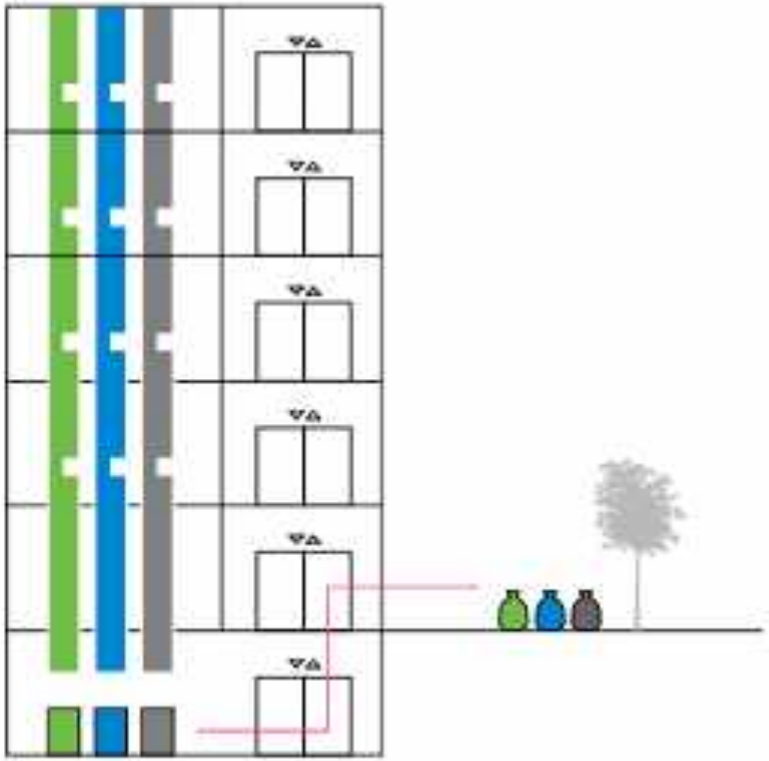
Waste rooms are typically small and unventilated, with chute access and recycling bins; Trash chute connected to compactors with “sausage” bags.

TYPOLOGY 5: SINGLE CHUTE WITH SORTER



Sorter systems allow use of a single chute for multiple waste streams. See Chute Options. Before opening the chute door, residents press a button to choose the waste stream. The sorting equipment directs the trash into a compactor and the recycling streams into containers.

TYPOLOGY 6: MULTIPLE CHUTES



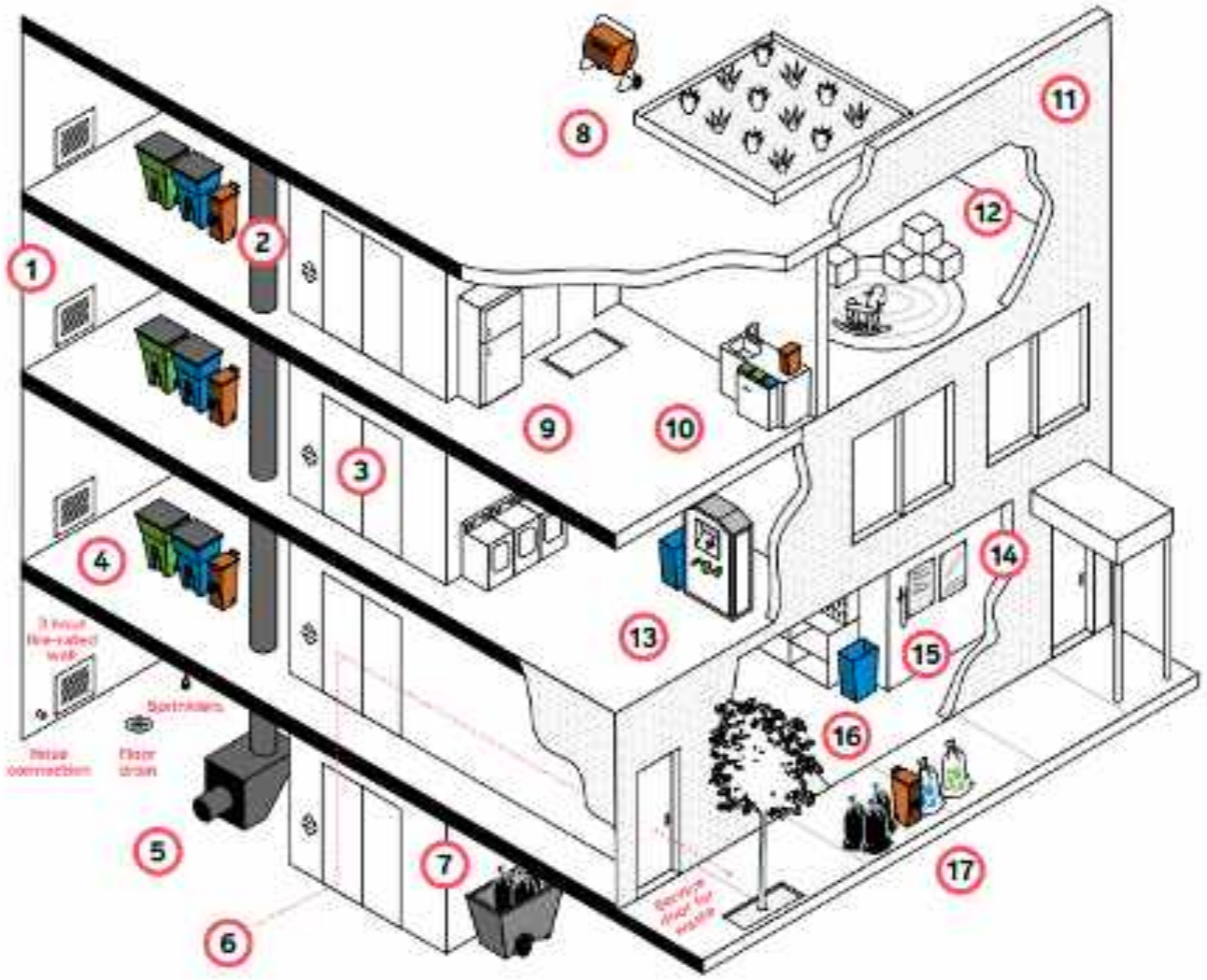
Multiple chutes allow for co-located disposal of multiple waste streams without mechanized sorting systems. (See Chute Options.) Typically residents enter a trash room with three chutes: one leading to a compactor, one for MGP and another for paper. Cardboard must be left in the trash room or taken to a central location. There are

Three separate chute doors for trash, MGP and paper

Trash chute empties into a compactor, MGP and paper chutes empty into 111 trucks

RESIDENTIAL BUILDING DESIGN CONSIDERATIONS

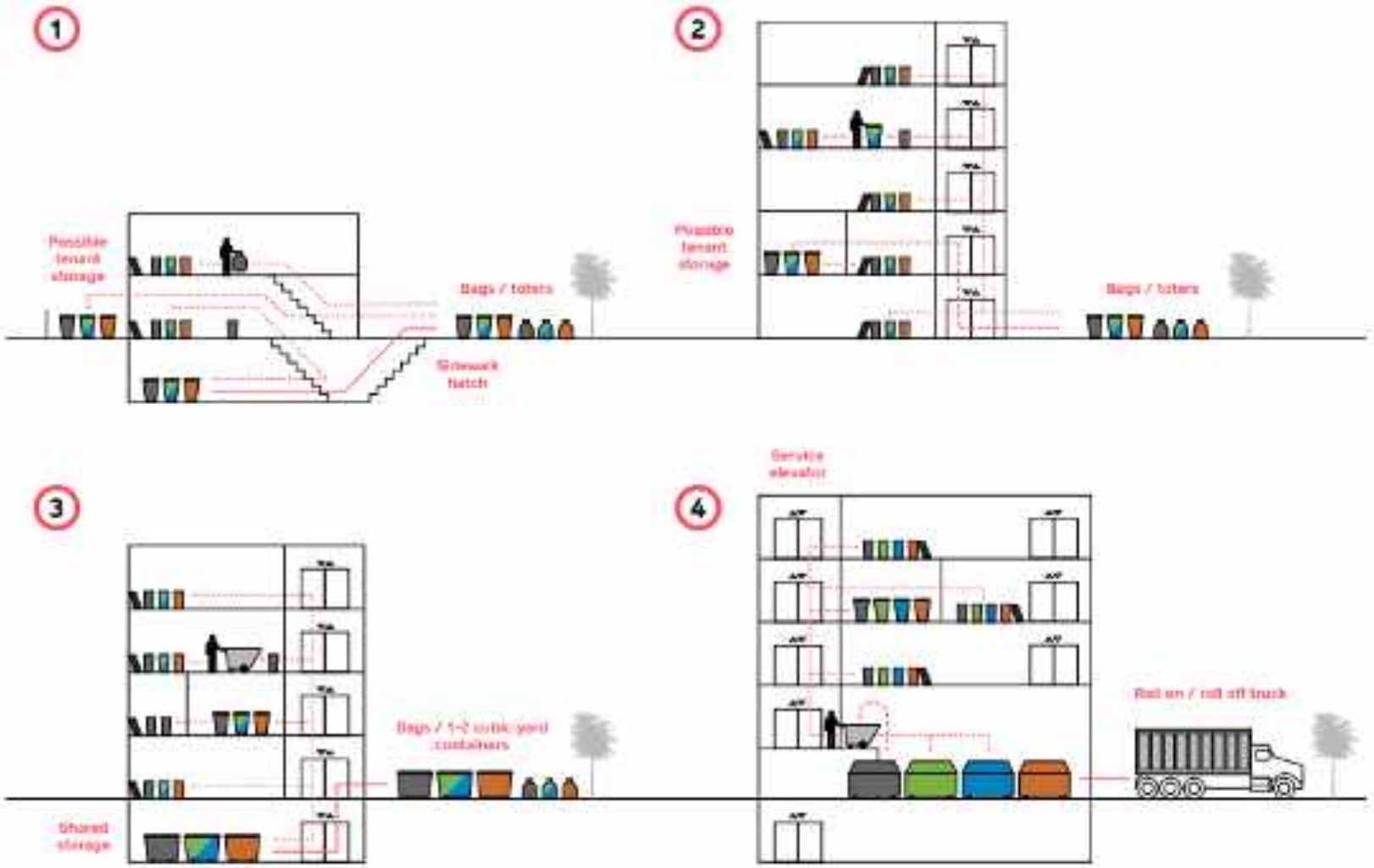
1. Waste room: consider area, ventilation, lighting, signage. 2.03, 2.18
2. Chute and disposal of recycling on every floor required by BC 1213.3 (≥ 5 stories and ≥ 9units)
3. Consider how waste travels vertically (by chute, by residents or by building staff in regular/service elevator). 2.02
4. Provide co-location disposal for all waste streams including organics. Consider other waste streams that may block chutes, e.g., cardboard, textiles, hangers. 2.03
5. Trash compactor required by BC 1213.2 for ≥4 stories and ≥12 units
6. Consider path of waste to curb and staff time required. 2.02, 2.06
7. Waste storage room per BC 1213.1 or BC 707.13.4. Use containers unless room is ratproof and fireproof room per HMC 27-2021. Consider area required, ventilation, and washing of containers. 2.01, 2.03
8. Compost can be made and used on-site in gardens. 2.21



9. Shallow refrigerators and shelves to reduce "lost food," or smart refrigerators. 2.17
10. Pull-out cabinet with bins (all waste streams) and countertop organics bin. 2.09
11. Consider impacts of building materials selection and construction process. Optimize material usage, consider end of life. 2.27–2.35
12. Consider amenities that reduce material consumption (e.g., children's play areas with toys, shared goods library, cleaning service with vacuums). 2.15
13. Provide textile recycling and plastics recycling in laundry room. 2.15
14. Consider possibilities for reuse such as online bulletin boards and donation refrigerators. 2.16
15. Provide feedback on waste generation to residents and staff to change behavior. Consider how to incorporate SAYT back to resident. 2.11
16. Provide paper recycling in mail room and cardboard collection in parcel room. 2.15
17. Provide set out area, coordinate with street, trees, furniture, curb cuts and entrance. See NYC Rules for setout. 2.04

COMMERCIAL TYPOLOGIES

1. Stairs or Ramp to Sidewalk
2. Elevator to Sidewalk
3. Elevator to Shared Storage
4. Service Elevator to Shared Compactor Containers (Loading Dock / Exterior)



Transport

By hand, bags	
Toter / Bin on dolly	
Tilt truck	

CHUTE OPTIONS

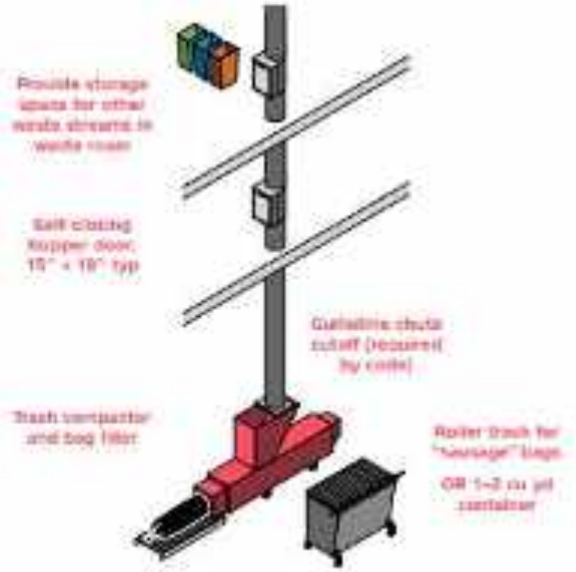
1 Single Chute

Pros:

- Multiple chute doors may be open at one time

Cons:

- Only transports trash (recycling and organics need to be transported by building staff)



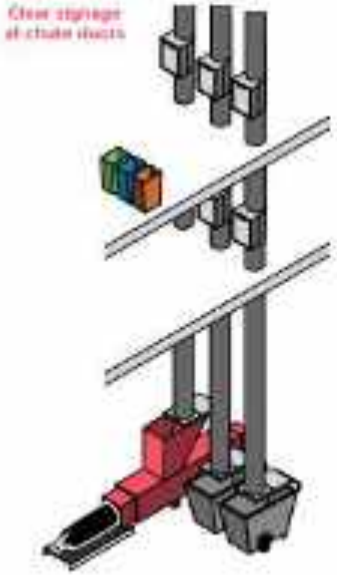
2 Multiple Chutes

Pros:

- Multiple chute doors may be open at one time

Cons:

- Higher cost



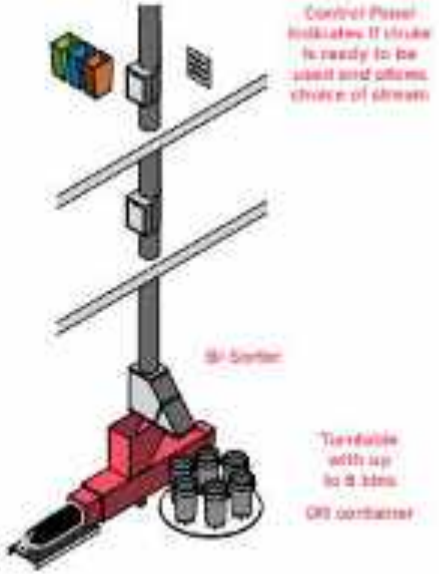
3 Chute with Bi-Sorter/Turntable

Pros:

- Flexibility to add other waste streams with turntable
- Requires less floor area

Cons:

- May be a time delay—only one chute door can be used at a time
- Maintenance required
- Higher cost



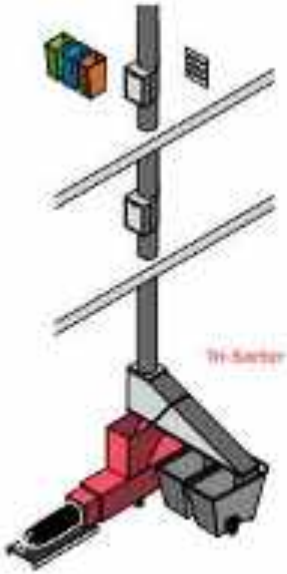
4 Chute with Tri-sorter

Pros:

- Requires less floor area

Cons:

- May be a time delay—only one chute door can be used at a time
- Maintenance required
- Higher cost



Bottom of chute container options (see DSNY Rules and BC Requirements):

- **Trash chute:** vertical compactor to sausage bag or 1-2 cu yd container
- **Recycling chutes:** Wheeled bins or tilt trucks or 1-2 cu yd containers (or turntable for Bi-Sorter only)

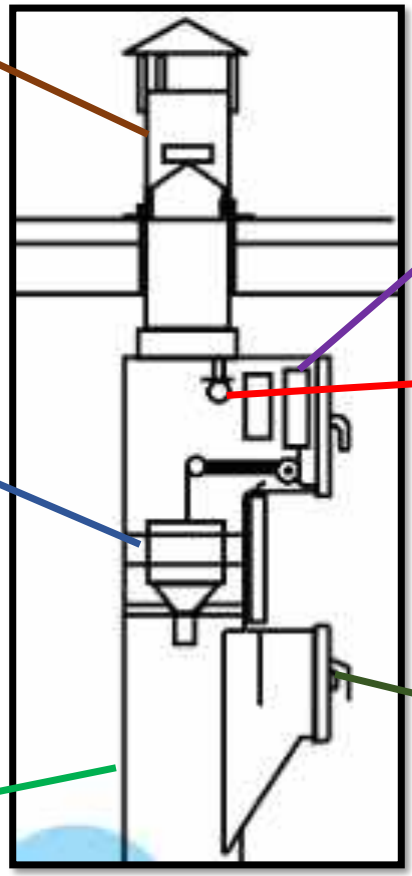
REQUIREMENTS FOR WASTE CHUTE

1. Ventilation
2. Brush Cleaning System
3. Keyed Access/Maintenance Door
4. Sprinklers for Fire Security and Flushing System
5. Chute Support Frames
6. Sanitizing Unit
7. Fire Rated Interlocking Doors
8. Clamp Rings
9. Chute Duct
10. Chute Intake
11. Offset
12. Bi-Sorter/Tri-sorter
13. Fire Shutter Door
14. Control Panel
15. HDG/HDPE Trolleys

Automatic Foul Air Exhaust Fan

Brush Cleaning System

Chute Tube& Sound Damping



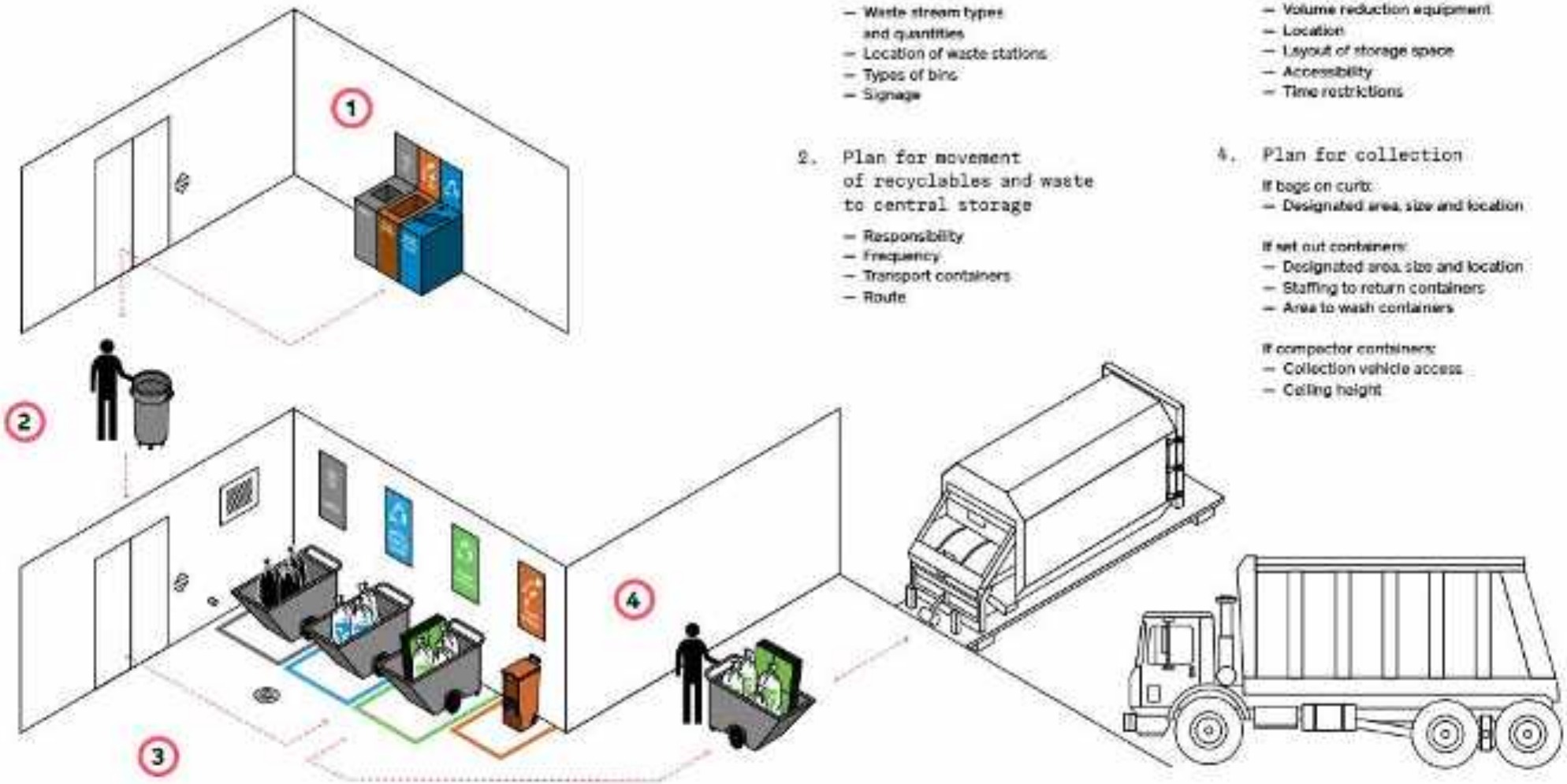
SOME DETAILS OF WASTE CHUTE

Disinfection Unit

Fire Sprinkler

Keyed Access

WASTE MANAGEMENT PLAN



1. Plan for tenant disposal and separation
   - Waste stream types and quantities
   - Location of waste stations
   - Types of bins
   - Signage

2. Plan for movement of recyclables and waste to central storage
   - Responsibility
   - Frequency
   - Transport containers
   - Route

3. Plan for waste storage
   - Calculate area required
   - Volume reduction equipment
   - Location
   - Layout of storage space
   - Accessibility
   - Time restrictions

4. Plan for collection

   If bags on curb:
   - Designated area, size and location

   If set out containers:
   - Designated area, size and location
   - Staffing to return containers
   - Area to wash containers

   If compactor containers:
   - Collection vehicle access
   - Ceiling height

Waste Reduction Strategies

VOLUME REDUCTION EQUIPMENT:
RESIDENTIAL COMPACTORS AND BALERS

Commonly used for cardboard, compactors and balers can also be used for metal and plastic recycling (cans and bottles) and plastic film, although each stream should be baled separately to retain the commodity's value.

ORGANIC WASTE PRETREATMENT (RESIDENTIAL)

Indoor Bins: Bokashi and Worm Bins

In-sink Food Waste Grinders

ORGANIC WASTE PRETREATMENT (COMMERCIAL)

Composting Equipment

Anaerobic Digesters

ORGANIC WASTE PRETREATMENT (COMMERCIAL)

Shredders/Pulpers/Grinders

Dehydrators/Dewaterers

BUILDING STANDARDS & CERTIFICATIONS

LEED V4 WASTE MANAGEMENT CREDITS

The US Green Building Council (USGBC) website states that one benefit of LEED v4 is “an expanded focus on materials—in addition to considering the usage of materials in buildings, it integrates a comprehensive approach to evaluate the impact of materials on human health and the environment.”

TRUE defines “zero waste” as the international Zero Waste International Alliance does:
“**no waste to landfill, incineration and the environment**.”

LEED V4 FOR BUILDING OPERATIONS AND MAINTENANCE (O+M)

SUSTAINABLE SITES		
Prerequisite	SITE MANAGEMENT POLICY	Required
	Organic waste management (returned to the site or diverted from landfills)	
Credit	SITE MANAGEMENT	1
	Divert from landfills 100% of plant material waste via low-impact means.	
MATERIALS AND RESOURCES		
Prerequisite	ONGOING PURCHASING AND WASTE POLICY	Required
	Environmentally preferable purchasing	
	Solid waste management	
Prerequisite	FACILITY MAINTENANCE AND RENOVATIONS POLICY	Required
	Waste management policy for maintenance and renovations	
Credit	PURCHASING - ONGOING	1
	Postconsumer recycled content	
	Extended use	
Credit	PURCHASING - FACILITY MANAGEMENT AND RENOVATION	2
	Use products with recycled content.	
	Reuse materials salvaged, refurbished or reused products.	
	End-use products are Cradle to Cradle certified.	
Credit	SOLID WASTE MANAGEMENT - ONGOING	2
	Maintain a waste reduction and recycling program that reuses, recycles or composts at least 50% of the ongoing waste and at least 75% of the durable goods waste.	
	Safely dispose of all discarded batteries and all mercury-containing lamps.	
Credit	SOLID WASTE MANAGEMENT - FACILITY MANAGEMENT AND RENOVATION	2
	Divert at least 70% of the waste generated by facility maintenance and renovation activities from disposal in landfills and incinerators.	
	Total Possible Points	6

LEED V4 FOR INTERIOR DESIGN AND CONSTRUCTION (ID+C)

MATERIALS AND RESOURCES		
Prerequisite	STORAGE AND COLLECTION OF RECYCLABLES	Required
	Provide dedicated area accessible to waste haulers and building occupants for the collection and storage of recyclable materials for the entire building.	
	Collection and storage areas can be separate locations.	
	Recyclable materials must include mixed paper, corrugated cardboard, glass, plastics and metals.	
	Take appropriate measures for the safe collection, storage and disposal of two of the following: batteries, mercury-containing lamps and e-waste.	
Prerequisite	CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLANNING	Required
	Identify waste diversion goals.	
	Select collection and diversion methods.	
	Draft a construction waste management plan.	
	Produce a waste report.	
Credit	INTERIORS LIFE-CYCLE IMPACT REDUCTION	4
	Reuse or salvage interior nonstructural elements for at least 50% of the surface area.	
	Reuse, salvage or refurbish furniture and furnishings for at least 30% of the total furniture and furnishings cost.	
	Conduct an integrative planning process to increase the useful life of the project space.	
Credit	BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION: SOURCING OF RAW MATERIALS	2
	Materials reuse	
	Recycled content	
Credit	BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION: MATERIAL INGREDIENTS	2
	End-use products are Cradle to Cradle certified.	
Credit	CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT	2
	Divert at least 50% of the total construction and demolition material or, for one point, at least 75% of the total construction and demolition material.	
	Generate no more than 2.5 pounds of construction waste per square foot of the building's floor area.	
	Total Possible Points:	10

LEED V4 FOR NEIGHBORHOOD DEVELOPMENT (ND)

GREEN INFRASTRUCTURE AND BUILDINGS		
Credit	BUILDING REUSE	1
	Five buildings or fewer: Reuse 50% of one such building, based on surface area.	
	More than five buildings: Reuse 20% of the total surface area of such buildings.	
	Do not demolish any historic buildings or contributing buildings in a historic district, or portions thereof, or alter any cultural landscapes as part of the project.	
Credit	RECYCLED AND REUSED INFRASTRUCTURE	1
	Use materials for new infrastructure such that the sum of the postconsumer recycled content, on-site reused materials and one-half of the preconsumer recycled content constitutes at least 50% of the total mass of infrastructure materials.	
Credit	SOLID WASTE MANAGEMENT	1
	Include one recycling or reuse station dedicated to the separation, collection and storage of materials for recycling, or locate the project in a local government jurisdiction that provides recycling services.	
	or Include at least one drop-off point for potentially hazardous office or household wastes and establish a plan for postcollection disposal or use, or locate the project in a local government jurisdiction that provides collection services.	
	or Include at least one compost station or location and establish a plan for postcollection use, or locate the project in a local government jurisdiction that provides composting services.	
	or On every mixed-use or nonresidential block, or at least every 800 feet, include recycling containers either adjacent to or integrated into the design of other receptacles.	
	or Recycle, reuse or salvage at least 50% of nonhazardous construction, demolition and renovation debris.	
	Total Possible Points	3


Thank You
For Your
Attention