Communities Moving Towards Circular Materials Management

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GLOBAL PLASTIC PRODUCED

Humans have created about 8.3 billion metric tons of plastics, outgrowing all man-made materials other than steel and cement.

2M METRIC TONS

8.3B METRIC TONS

2017

34B PROJECTED METRIC TONS

1950 *2000* *2050*

PLASTIC WASTE

Plastic waste can be recycled, incinerated or discarded where it accumulates in landfills and the natural environment.

2015

6.3B METRIC TONS

12B PROJECTED METRIC TONS

9% Recycled

12% Incinerated

79% Accumulated in landfills & natural environment

Geyer, Jambeck and Law, Science Advances 2017

HOW HEAVY IS 8.3 BILLION METRIC TONS?

1 million metric tons (Mt) = 1.1 million tons

1,000,000,000 X
ELEPHANTS
(7.5 tons)

80,000,000 X
BLUE WHALE
(104.5 tons)

800,000 X
THE EIFFEL TOWER
(20,000 tons)

25,000 X
EMPIRE STATE BUILDING
(331,000 tons)

Global Initiatives

G7 (declarations, plastics charter)**, G20, APEC & other regional partnerships**

Conventions: Abidjan, Nairobi, Basel

Intl platforms: World Bank, McKinsey, WEF, GPML, GPAP, OPLN

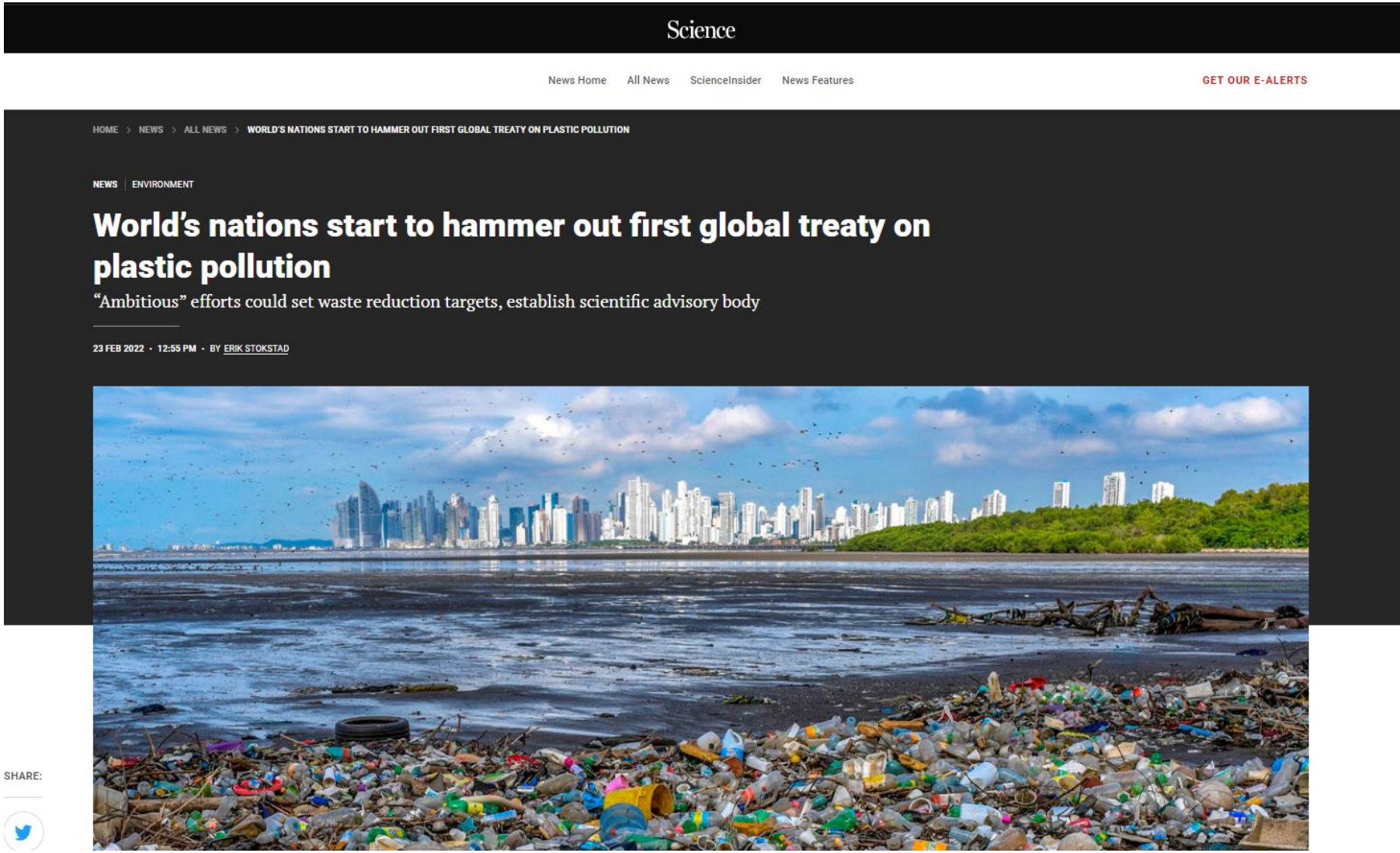
NGOs: Ocean Conservancy, WWF, CI, IUCN, EMF

UN Environment: Global Plastics Treaty, UNEA, Clean Seas, SDGs

Gov't's: Our Ocean, RECYCLE Act, Save our Seas, USAID

Prizes: EMF Design Competition, Think Beyond Plastic Innovation Prize, NatGeo Innovation prize

Global Investment Strategies: Sea of Opportunity: Supply Chain Investment Opportunities to Address Marine Plastic Pollution, Circulate Capital, Closed Loop Fund



Strategic Intervention Framework to Reduce Plastic Pollution

1 **REDUCE PLASTIC PRODUCTION**

Industry led or reduce demand

2 **INNOVATIVE MATERIALS & PRODUCT DESIGN**

Green engineering, circular economy

3 **REDUCE WASTE GENERATION**

Reusable items, sharing / collaborative economy

4 **IMPROVE GLOBAL WASTE MANAGEMENT**

Context-sensitive Solid Waste management infrastructure

5 **IMPROVE LITTER CAPTURE**

Litter capture and clean-up

6 **REDUCE INPUT CONCENTRATIONS (ZERO GOAL)**

Circularity Assessment Protocol

The

Circularity Assessment Protocol (CAP)

The Circularity Assessment Protocol (CAP) is a hub and spoke model that provides a snapshot of a city's circularity that can provide data for local, regional, or national decision-making to reduce leakage of waste into the environment and increase circular materials management.

To date, the CAP has been conducted in 37 cities across 10 countries.

www.circularityinformatics.org

INFORMATION SHARING

The local community's knowledge and expertise is honored. Partners and teams build capacity through learning methods and collaboration. **Debris Tracker** is an important tool that is used by researchers and the community alike. Open data is important to the process.

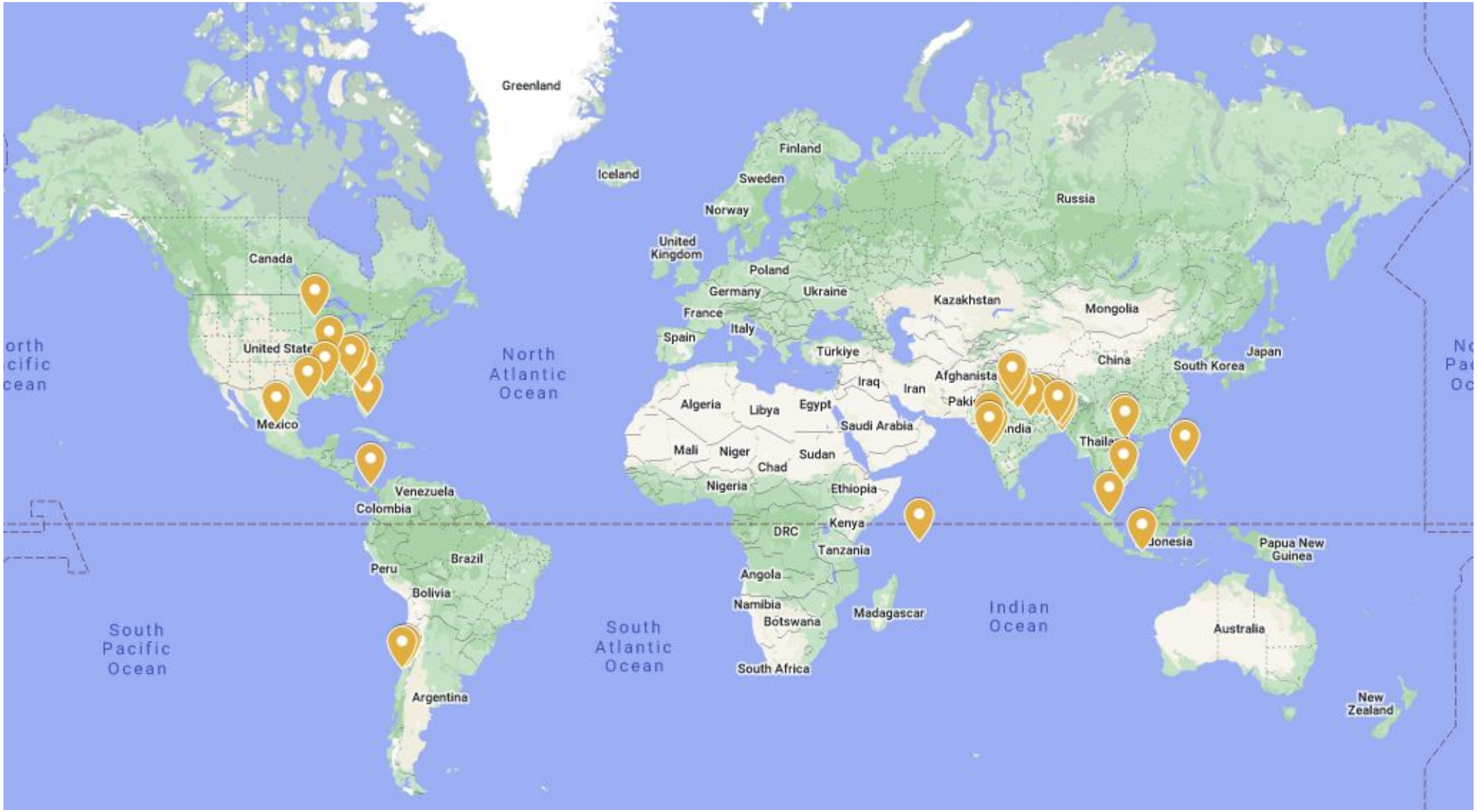
DATA ANALYTICS

Data for each city's CAP is analyzed and co-owned by the researchers, city and sponsors. Trends across cities, countries and regions can illuminate global narratives and influencing factors.

EMPOWERING COMMUNITIES

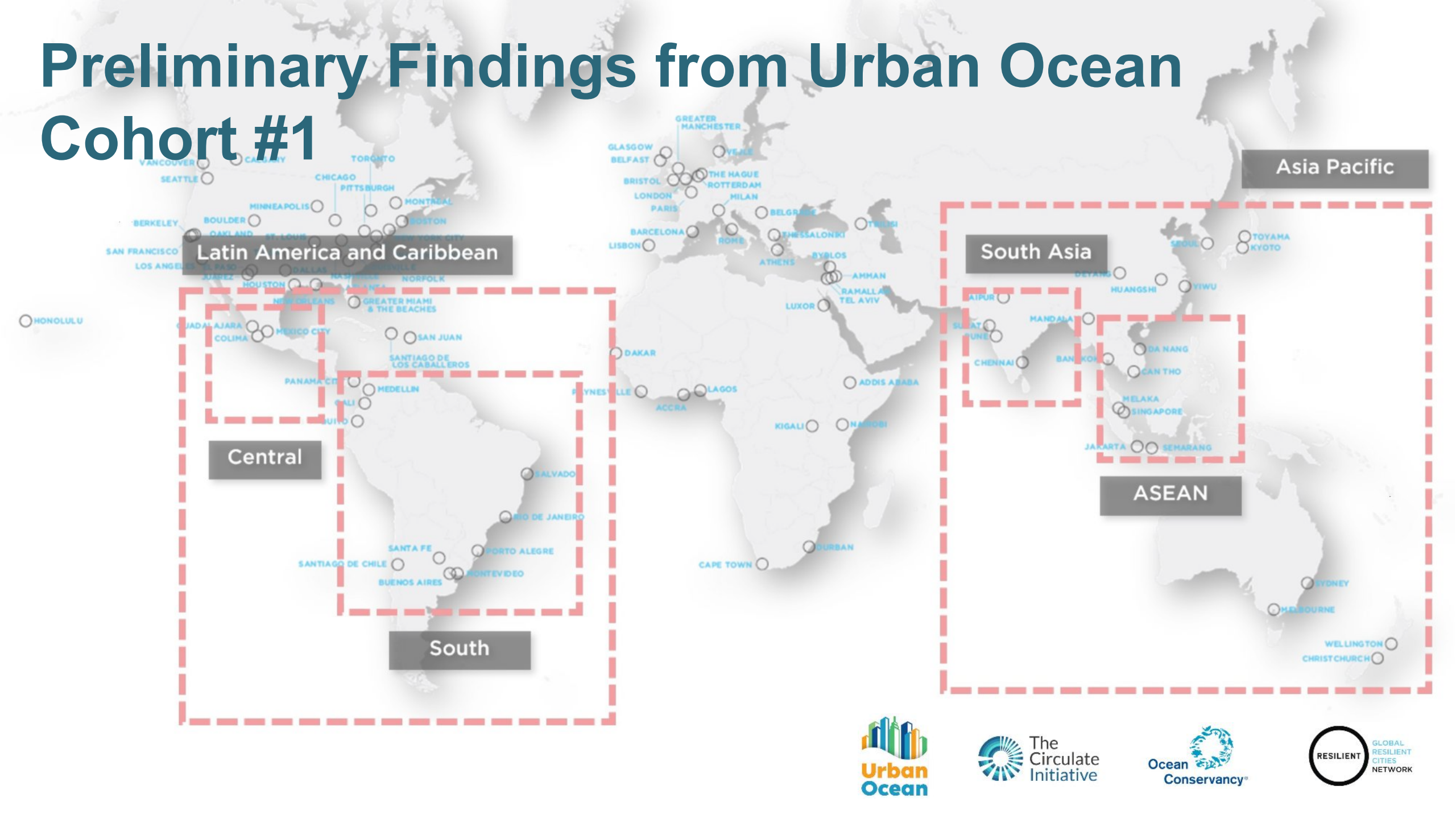
Communities are empowered by local and global CAP data to inform their decisions about what is working - or where and how to intervene to increase circularity. Communities that participate in CAP can better define resource needs and participate in knowledge exchange.

SYSTEMS CHANGE


Greenland
Iceland
Finland
Sweden
Norway
Russia
United Kingdom
Canada
Poland
Germany
Ukraine
Kazakhstan
Mongolia
France
Italy
Spain
Türkiye
China
Japan
South Korea
Afghanista
Iraq
Iran
Algeria
Libya
Egypt
Saudi Arabia
Mexico
Mali
Niger
Sudan
Chad
Nigeria
Ethiopia
Venezuela
Colombia
Kenya
DRC
Tanzania
Brazil
Peru
Bolivia
Angola
Namibia
Botswana
Madagascar
South Africa
Papua New Guinea
Australia
New Zealand
Argentina
North Atlantic Ocean
South Atlantic Ocean
Indian Ocean
South Pacific Ocean

Case Study: Urban Ocean

Preliminary Findings from Urban Ocean Cohort #1



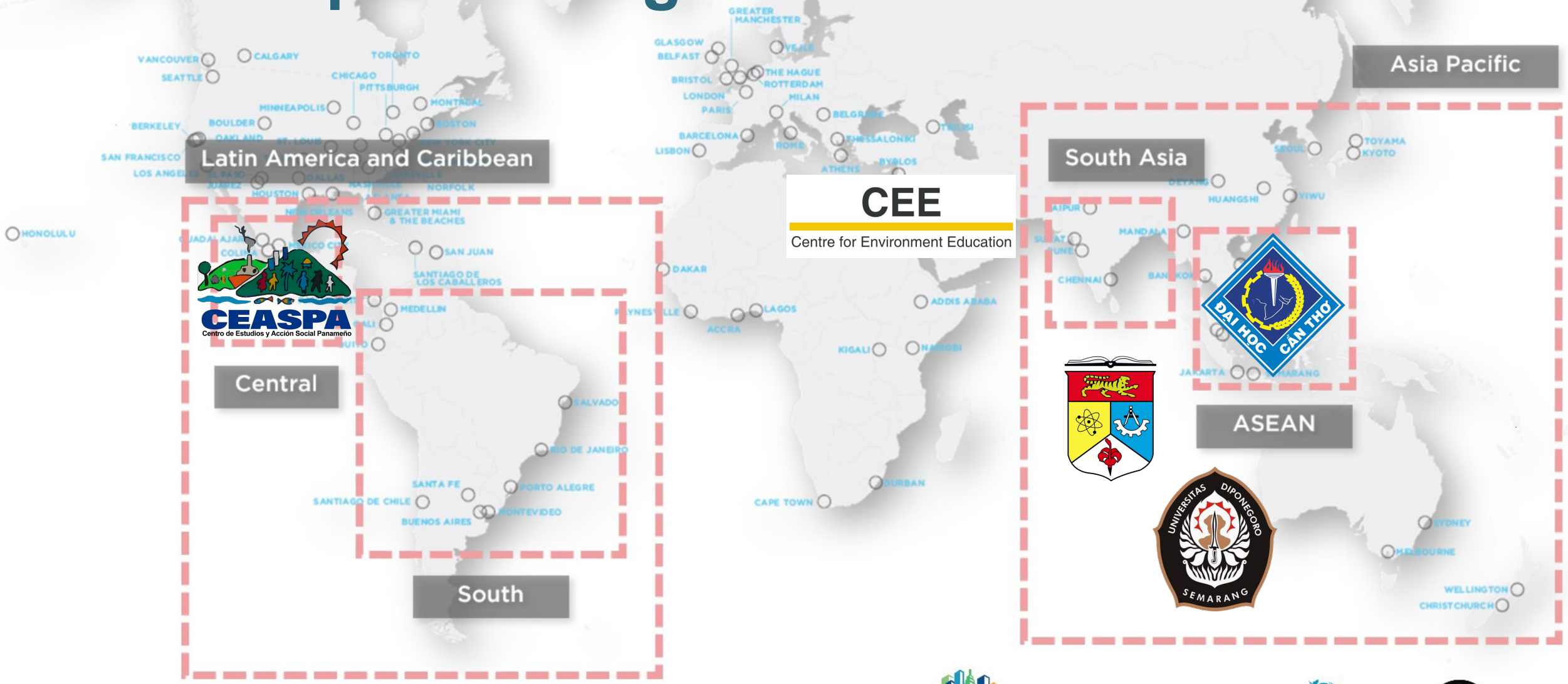
Urban Ocean

The Circulate Initiative

Ocean Conservancy

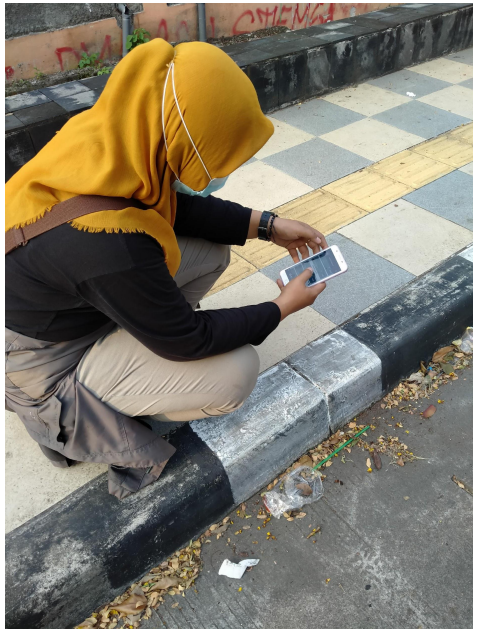
RESILIENT GLOBAL RESILIENT CITIES NETWORK

Local Implementing Partners

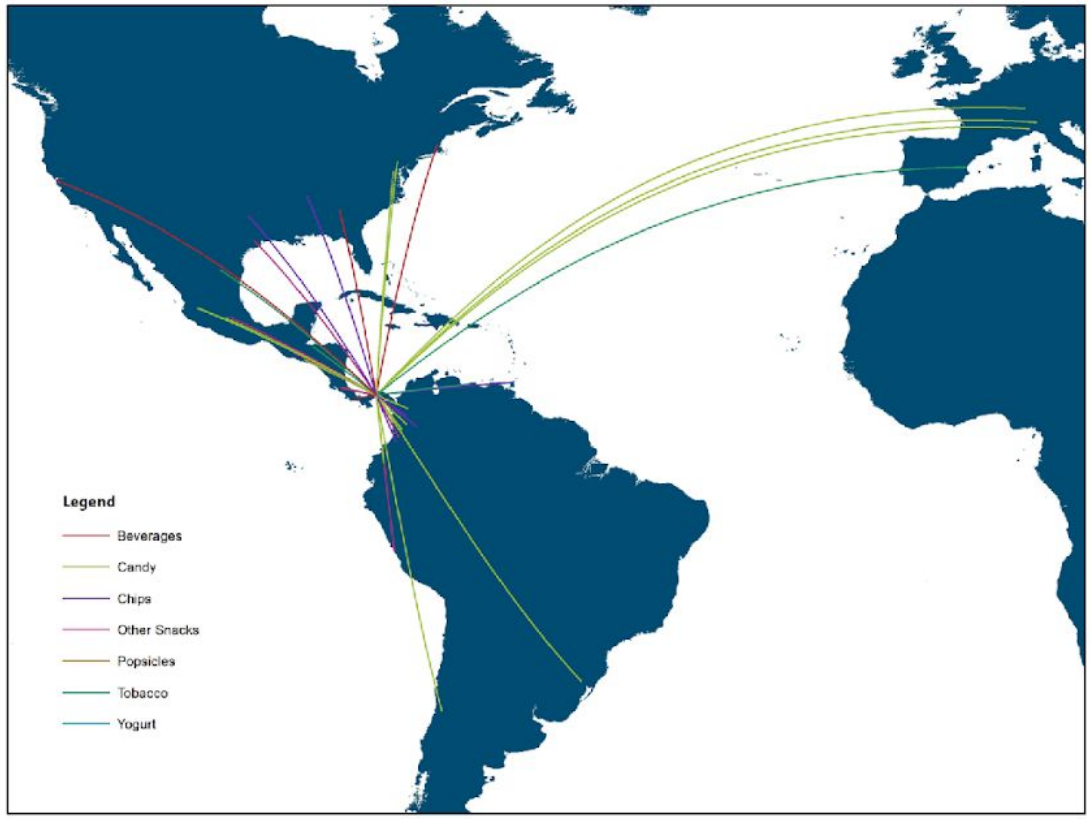


By The Numbers

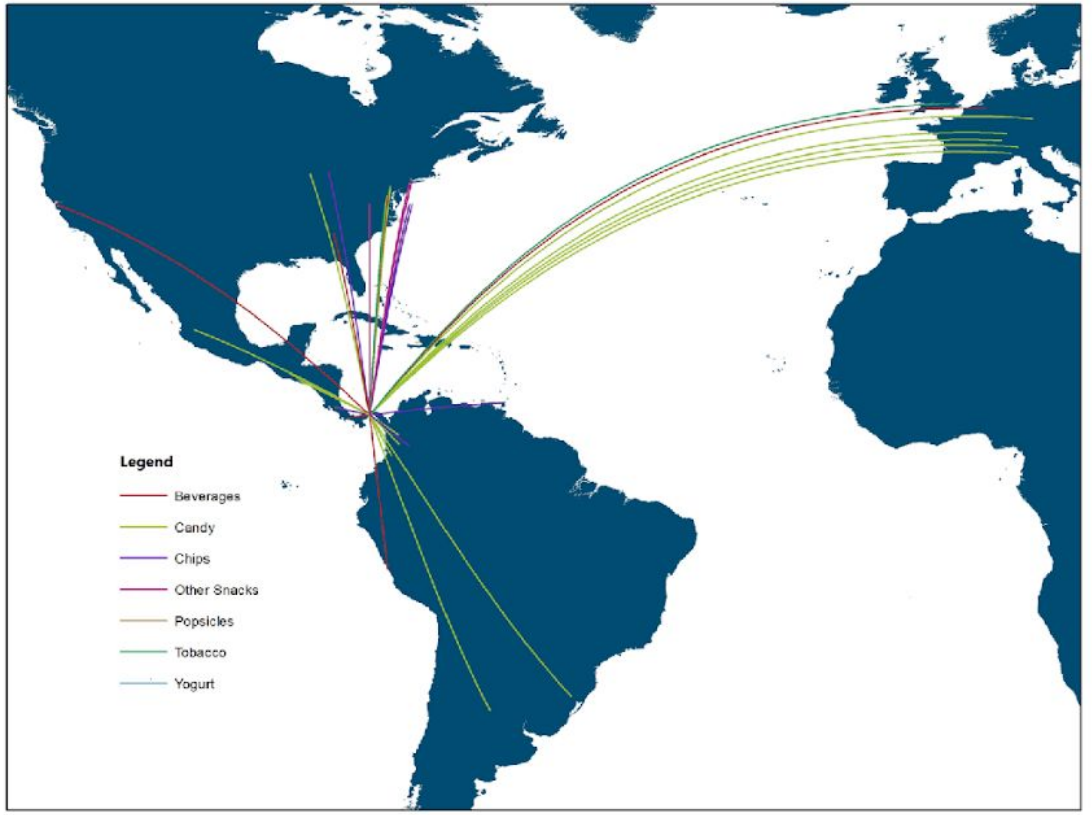
- **6** cities and **6** local implementing partners
- **27,000+** litter items documented
- **1,300** convenience products sampled
- **470** to-go items sampled
- **140** stakeholder interviews conducted
- **150** restaurants and food vendors sampled



Input

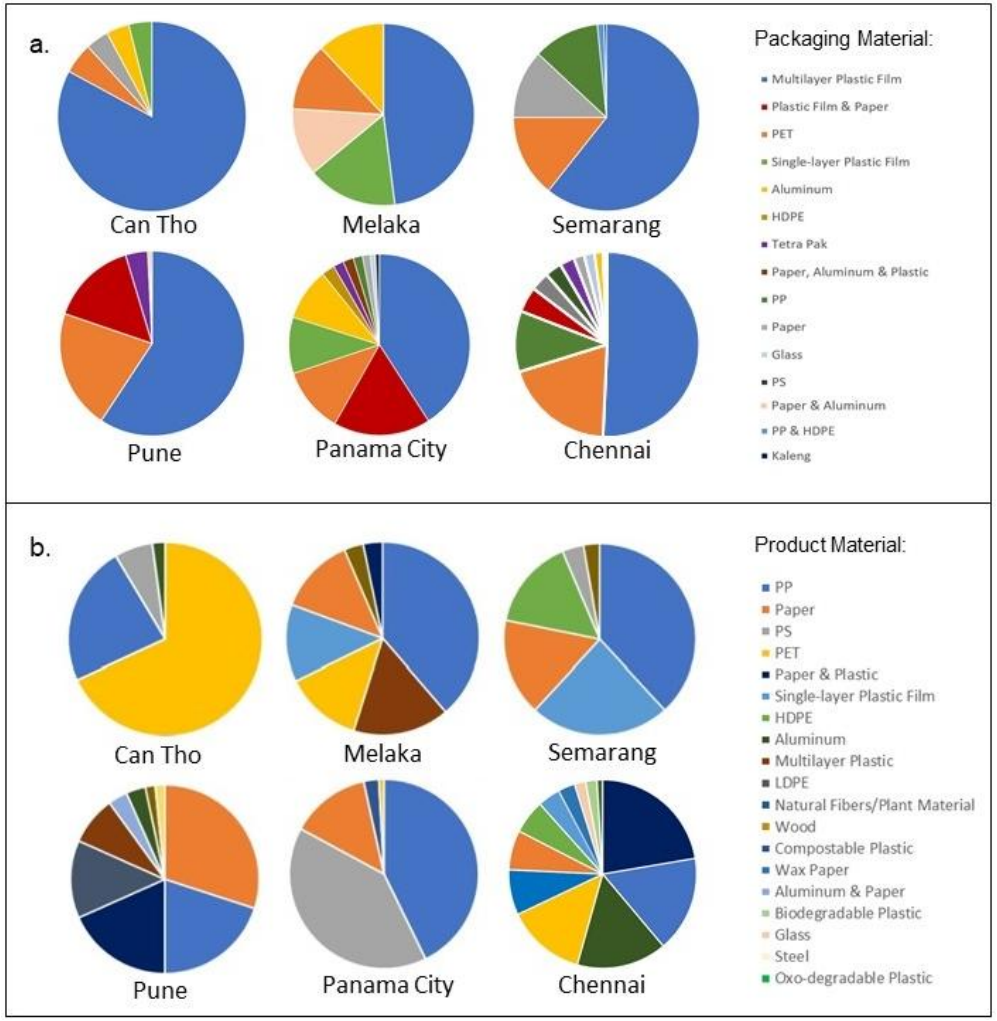


Locations of Manufacturers for Common Convenience Brands



Locations of Parent Companies for Common Convenience Brands

Product Design and Use



Materials Collection and Management

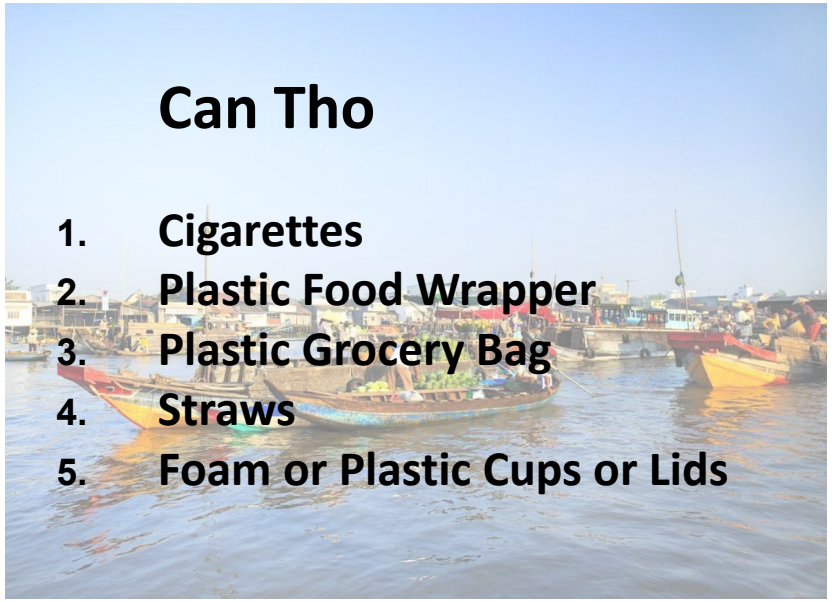
Can Tho

Melaka

Semarang

Pune

Panama City



Can Tho

1. Cigarettes
2. Plastic Food Wrapper
3. Plastic Grocery Bag
4. Straws
5. Foam or Plastic Cups or Lids

Chennai

1. Plastic Food Wrapper
2. Cigarettes
3. Film Fragments
4. Plastic Bottle Cap
5. Other Organic Waste

Melaka

1. Cigarettes
2. Plastic Food Wrapper
3. Hard Plastic Fragments
4. Straws
5. Other Fragments

Pune

1. Tobacco Sachets
2. Paper
3. Glass or Ceramic Fragments
4. Plastic Food Wrapper
5. Cigarettes

Panama City

1. Film Fragments
2. Foam Fragments
3. Plastic Food Wrapper
4. Cigarettes
5. Plastic Bottles

Semarang

1. Cigarettes
2. Plastic Food Wrapper
3. Other Organic Waste
4. Straws
5. Other Food-Related Plastic

PRODUCT DESIGN

Findings: The majority of product packaging in both stores and food vendors are plastic, largely made of material that is difficult to recycle, such as film/ multi-layer film plastic and PP utensils. While some stores offer paper bag alternatives, most offer single-layer film plastic bags. However, 20% of the products sampled from food vendors were made of biodegradable material such as paper or wood.

Opportunities

- Vendors using biodegradable material such as paper or wood could provide case studies for paper or wood as economical and viable alternatives for vendors.

USE

Findings: The majority of product packaging in both stores and food vendors are single-use. Those stores who do offer reusable cloth bags charge 3800 IDR extra on average compared to free plastic bags. No other evidence of significant reuse programs were found through interviews or observation.

Opportunities

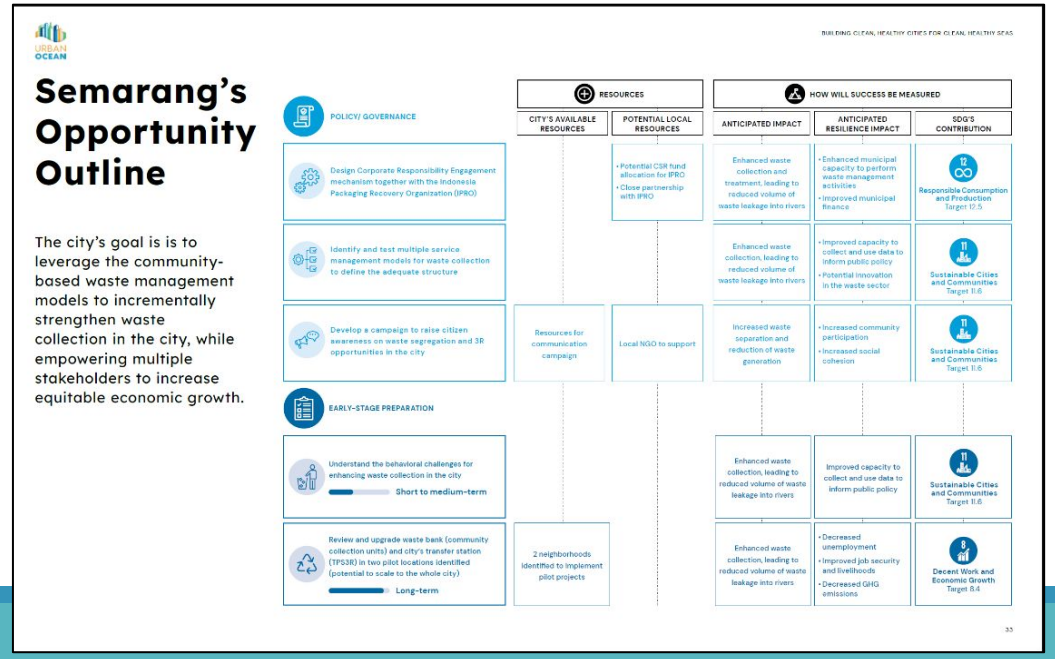
- Reuse programs and/or bulk stores are a potential opportunity in Semarang as they do not exist at scale currently.

COLLECTION

Findings: Waste collection is reportedly fragmented, irregular and may not be evenly distributed across population areas, but a fee structure does exist to fund waste management. Village-level Waste Banks show promise in increasing the collection and capture of waste in the waste stream, however, their economic situation remains challenging. The informal sector plays a role in collection and processing of materials, particularly in contributing to recycling rates. Interviewees report a disconnect in communication and trust across the waste supply chain and uneven impacts of fluctuations in the market.

Opportunities

- The fact that transportation of waste is funded by a fee structure means that there is a mechanism to provide resources for waste management. But this does not appear equal for recycling, which requires community/citizen transport. It is unclear if the system of having neighborhoods transport waste is working effectively.
- Source separation is critical to enhance the value of recyclable materials, and composting of organic materials should be explored.
- Explore why the formal and informal sectors are "in competition" and if there could be more way to be inclusive or utilize the informal sector's networks and expertise to expand collection and management of materials.
- Expand the protection of health, safety, and the environment with current waste collection and management practices.



Compare Data

Filtering by: Overall Litter Characterization x | Can Tho, Vietnam x | Semarang, Indonesia x

Clear Filters

Select Graph Type

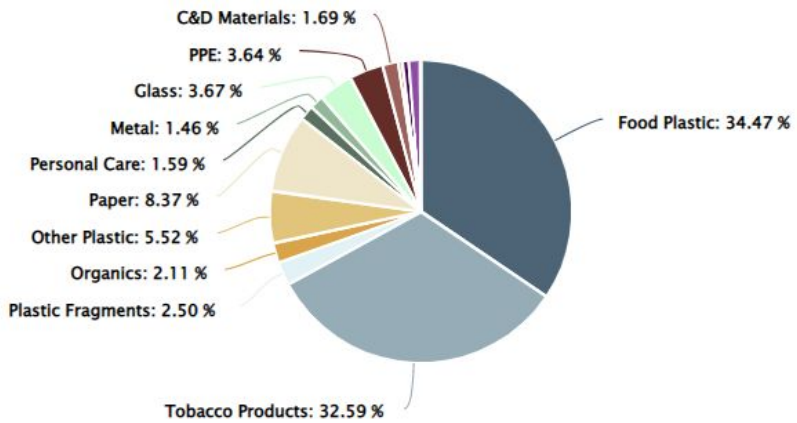
Overall Litter Characte

Select Cities

- [x] Can Tho, Vietnam
- [ ] Chennai, India
- [ ] Hanoi, Vietnam
- [ ] Melaka, Malaysia
- [ ] Miami, Florida
- [ ] Nam Dinh, Vietnam
- [ ] Panama City
- [ ] Pune, India
- [x] Semarang, Indonesia

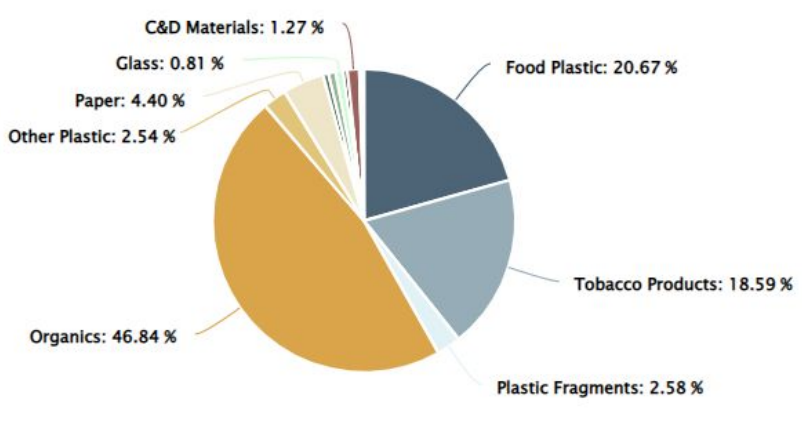
Can Tho, Vietnam Download csv data

Litter Material Breakdown

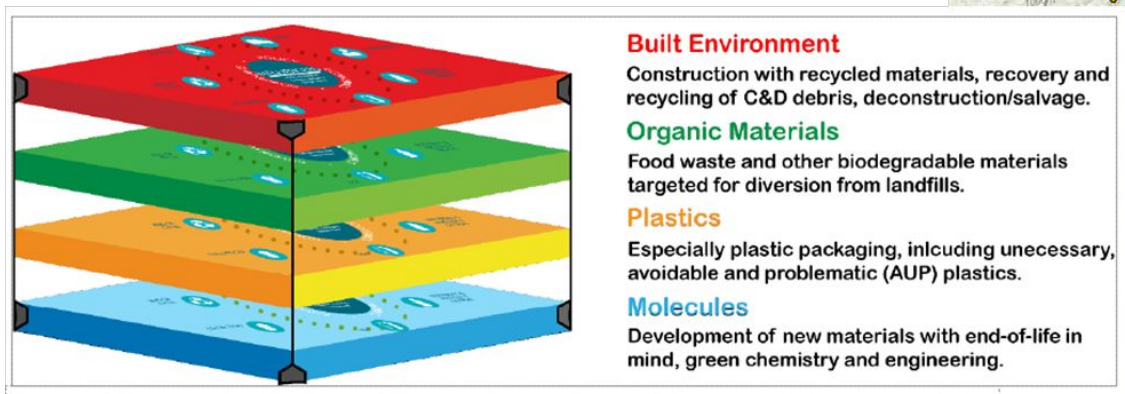


Semarang, Indonesia Download csv data

Litter Material Breakdown



A Tale of Two Cities: Optimizing Circularity from Molecules to the Built Environment in Atlanta, GA and Pittsburgh, PA



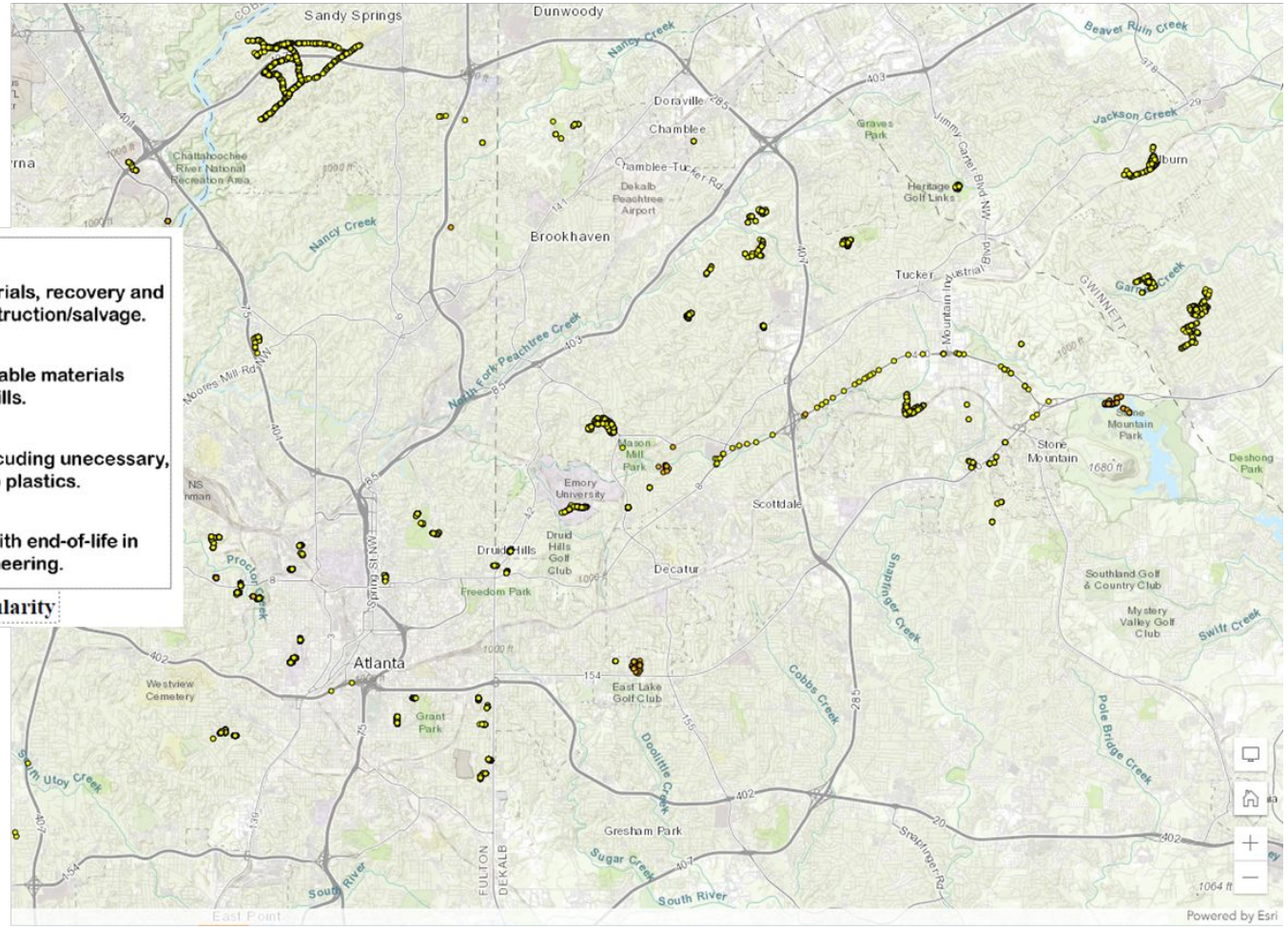
Built Environment
Construction with recycled materials, recovery and recycling of C&D debris, deconstruction/salvage.

Organic Materials
Food waste and other biodegradable materials targeted for diversion from landfills.

Plastics
Especially plastic packaging, inlcuding unecessary, avoidable and problematic (AUP) plastics.

Molecules
Development of new materials with end-of-life in mind, green chemistry and engineering.

Figure 2. The targeted convergence of Layers of material use and flows to optimize city circularity



NSF's Convergence Accelerator

THANK YOU!

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