

Findings and Policy Opportunities from Circularity Assessment Protocols across APEC Economies



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Introduction, Scope, and Purpose

In alignment with the Asia-Pacific Economic Cooperation (APEC) goal to support sustainable economic growth and prosperity in the Asia-Pacific region, APEC has partnered with the Circularity Informatics Lab (CIL) to conduct a synthesis report and policy toolkit based upon the CIL's Circularity Assessment Protocol (CAP) across 25 different APEC cities in 7 different APEC economies. Developed by the Circularity Informatics Lab at the University of Georgia, the Circularity Assessment Protocol (CAP) is a standardized assessment protocol to inform decision-makers through collecting community-level data on plastic usage.

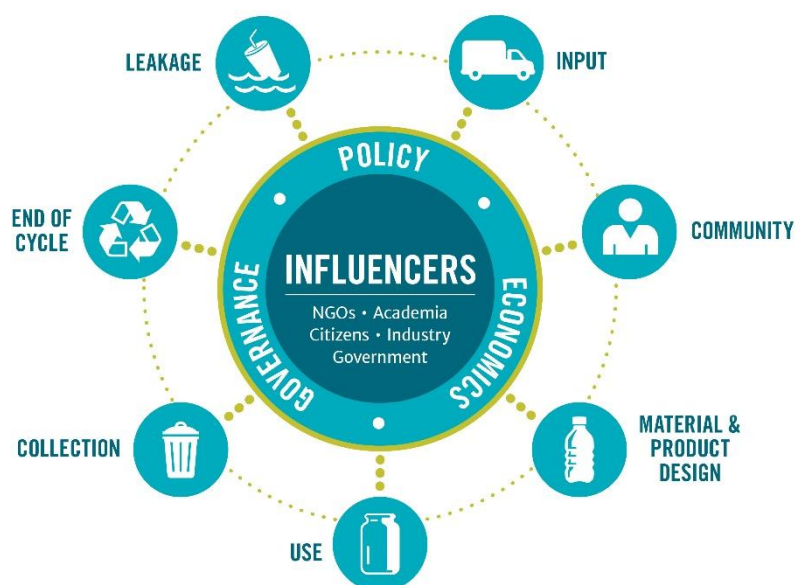


Figure 1. CAP hub-and-spoke model

Grounded in materials flow and systems thinking concepts, the CAP uses a hub-and-spoke model to holistically characterize how consumer plastic flows into a community, is consumed, and flows out, either through waste management systems or leakage into the environment. The model, shown in Figure 1, is comprised of seven spokes: **input, community, material and product design, use, collection, end of cycle, and leakage**. At the center, the system is driven by policy, economics and governance with key influencers including non-governmental organizations, industry, and government.

These CAP datasets in APEC economies include information on material inputs into a community (e.g., what is sold in stores); community awareness through semi-structured interviews on waste management; product design (e.g., type and style of

packaging); use (e.g., single-use versus reuse systems); collection of materials and waste; end-of-cycle management (e.g., recycling, disposal); and plastic leakage into the environment (e.g., litter). The scope of this report includes CAP datasets from cities in seven APEC economies including Chile; Indonesia; Malaysia; the Philippines; Thailand; the United States; and Viet Nam (Table 1).

To randomly sample various locations in a city for CAP, typically a 10 x 10km area over the city (with the center of the city in the center of the area) is identified. In this area, the ambient population is sectioned into tertiles (three groups). Ambient population count can be described as “where people go” and “societal activity” — it is not population density of where people live. These three areas typically form samples of different land uses, etc. Following the established method, three 1 x 1 km areas for surveying were randomly selected within each population tertile using NOAA’s Sampling Design Tool, resulting in a total of nine 1km² areas for surveying. In total, 9 sites were surveyed, three each in the high, mid, and low population count tertiles.

Table 1. APEC Economy City Names

APEC Economy	Cities (n)	City Names
<i>Viet Nam</i>	3	Can Tho; Ha Noi; Nam Dinh
<i>Indonesia</i>	1	Semarang
<i>Malaysia</i>	1	Melaka
<i>Thailand</i>	1	Bangkok
<i>The Philippines</i>	1	Metro Manila
<i>Chile</i>	2	Santiago; San Antonio
<i>USA</i>	11	Atlanta, GA; Athens, GA; Blytheville, AR; Cape Girardeau, MO; Minneapolis, MN; Georgetown County, SC; Cherokee County, NC; Ann Arbor, MI; Hilo, HI; Miami, FL; Orlando, FL
Total	20	

Product Inputs

To better understand the types of products that are sold in a community, as well as where they originate, the CAP team sampled common fast-moving consumer goods (FMCGs) brands in stores. FMCG packaging refers to products that are meant to be purchased and consumed quickly, such as food or beverages. CAP FMCG surveys focus on commonly littered items including beverages, chips, and candies packaged in single-use plastic (SUP). Typically, for SUP FMCG packaging, beverages tend to be packaged in hard plastics like PET, candies tend to be packaged in multilayer or single-layer film and hard plastic, and chips tend to be packaged in multilayer film plastic. Across the APEC economies examined in this report, there were 4,438 instances of FMCG brands recorded, including 1,437 beverages, 1,758 candies, and 1,003 chips.

Within each APEC economy, parent companies tend to be dominated by domestic brands, (Figure 2 – Figure 8) yet companies headquartered in the USA have a strong presence in Chile; Malaysia; the Philippines; and Viet Nam. In Indonesia; the Philippines; Thailand; and the USA, the majority of parent companies are located domestically, with fewer parent companies being situated abroad. In contrast, Chile; Malaysia; and Viet Nam see a higher prevalence of brands from many other economies. A smaller number of domestically located parent companies could simplify implementation of systems like extended producer responsibility). However, global enterprises may be able to carry learnings from EPR implementation in other geographies and face increased consumer pressure to address plastic pollution.

Figure 2. Locations of top parent companies surveyed in each APEC economy – Chile (n=66)

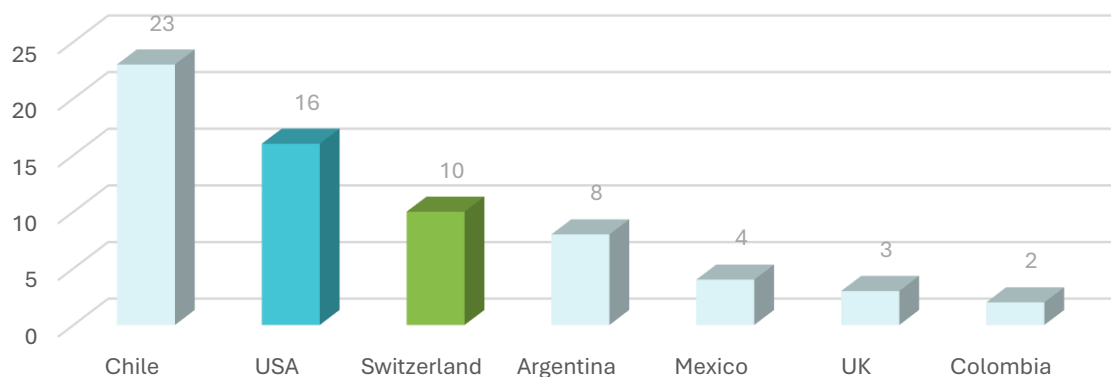


Figure 3. Locations of top parent companies surveyed in each APEC economy – Indonesia (n = 252)

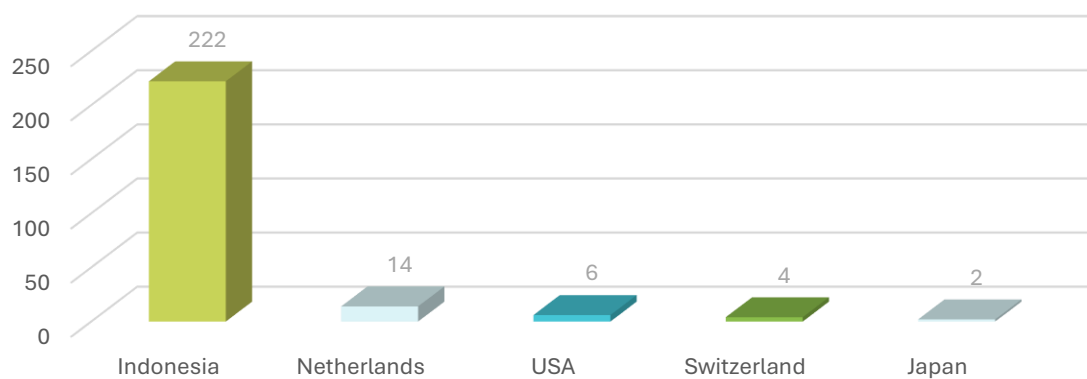


Figure 4. Locations of top parent companies surveyed in each APEC economy – Malaysia (n = 25)

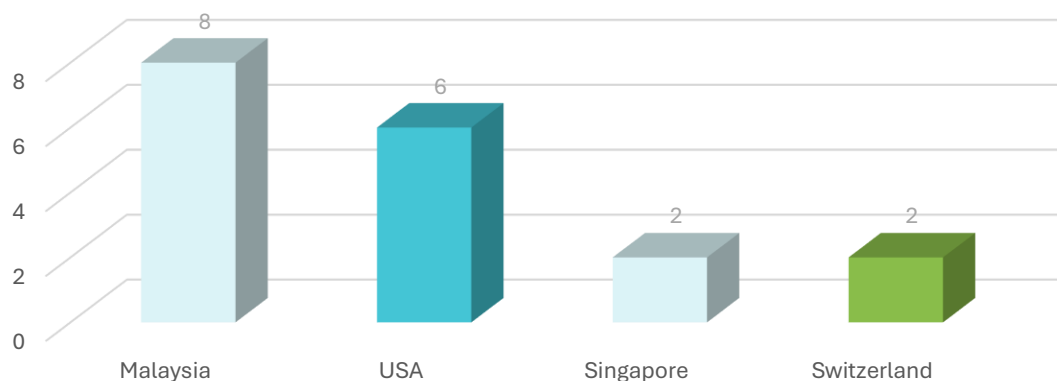


Figure 5. Locations of top parent companies surveyed in APEC economy – The Philippines (n = 93)

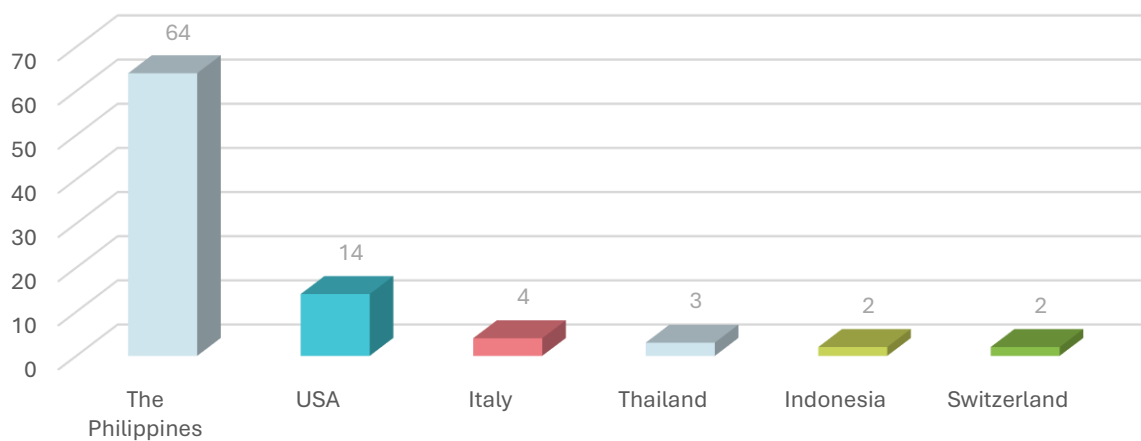


Figure 6. Locations of top parent companies surveyed in each APEC economy – Thailand (n = 93)

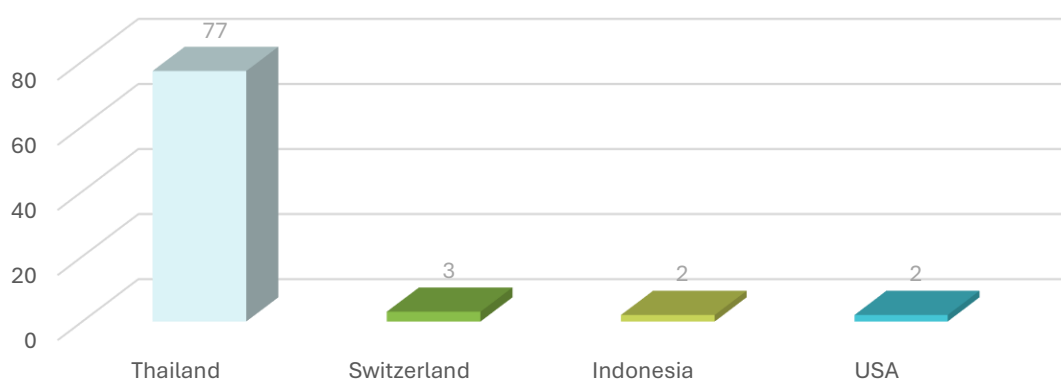


Figure 7. Locations of top parent companies surveyed in each APEC economy – USA (n = 3,356)

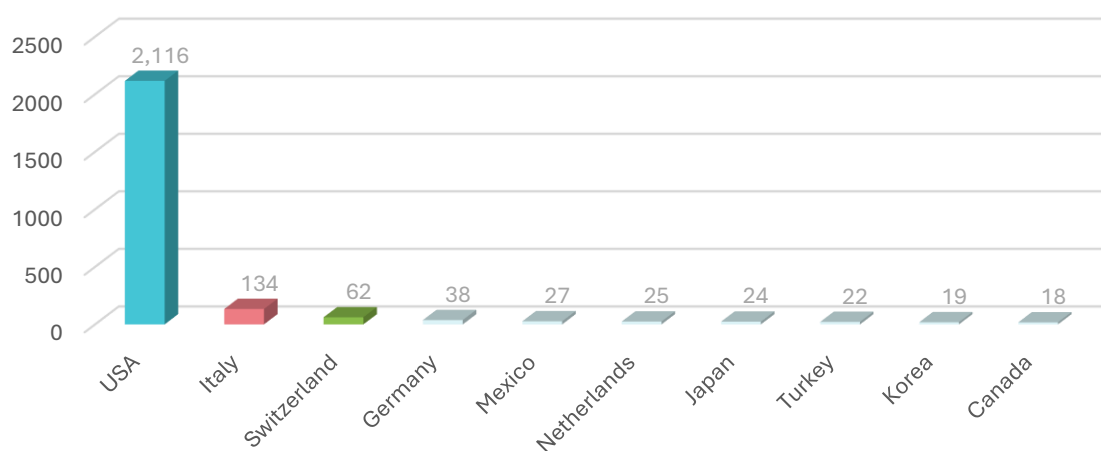
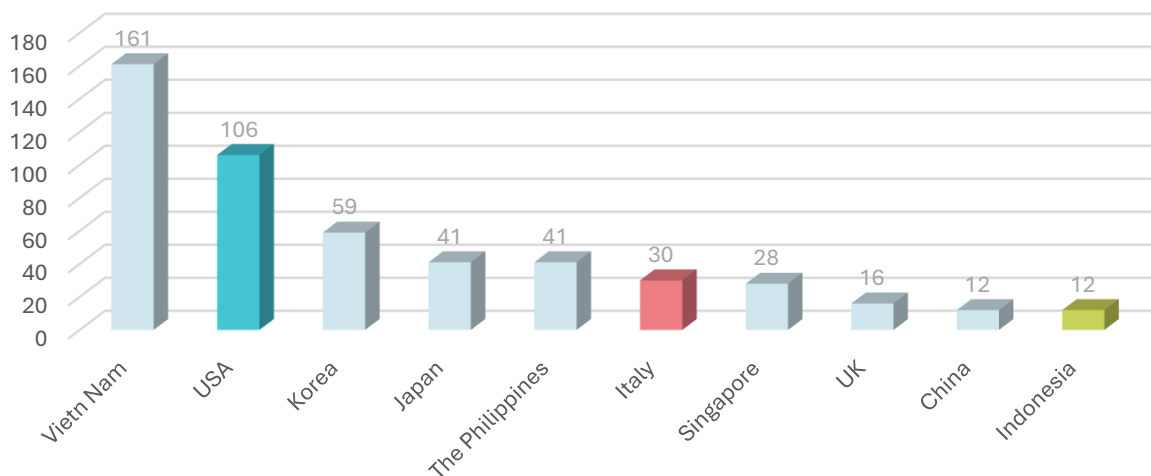


Figure 8. Locations of top parent companies surveyed in each APEC economy – Viet Nam (n = 553)

Community Stakeholder Insights

Insights from community stakeholders regarding waste management and reduction can be divided into two broad categories: main challenges and future directions. In this section, “community members” and “interviewees” are used interchangeably to refer to who was interviewed, which included local city government officials, NGO representatives, waste management representatives, informal sector representatives, small business owners, and community activists, among others.

Among the APEC cities, interviewees shared general concern over consumer education and awareness. More specifically, there tended to be differences in awareness and education between community members who live in cities year-round versus tourists who pass through for a short period of time. Stakeholders also mentioned issues with participation in circularity activities, such as composting, refilling, and reusing, as it relates to income. Higher-income people have the disposable income to participate in these activities, while lower-income people may be barred from participation because they tend to have other priorities. Along those same lines, interviewees described how the high cost of plastic alternatives, including compostable, reusable, and refillable options, as well as the availability of these items, impacts people’s ability to participate in waste reduction and circularity actions at the individual level. Interviewees noted that making sure these activities are supported at the institutional level could help boost consumer participation.

When speaking about infrastructure, stakeholders in APEC cities shared the difficulties they witnessed when it came to recycling and waste management. When waste management and recycling processes were not streamlined, interviewees felt that it tended to be inhibited by a lack of adequate infrastructure (MRFs, processing/sorting facilities, updated technology, the appropriate number of collection vehicles,

etc.); manpower (having a consistent labor force that is well taken care of); and economics (high cost of running SWM services).

When these infrastructure processes are not functioning properly, the open burning of waste, as well as illegal dumping, tends to occur. Stakeholders speculated that this is due to people having no other options to dispose of their waste, as well as people not knowing the environmental and human health impacts of improper waste disposal.

Stakeholders also tended to agree that waste management and reduction activities were further complicated by a lack of coordination among key players, including government entities and offices at the federal, regional, and local level, as well as industry, NGOs, etc. This misalignment was also seen when stakeholders described the current state of informal sector involvement, specifically in the Global South, as many informal sector workers suffer from a lack of labor protections and poor working conditions. However, interviewees differed on how to remedy this issue: some felt that the informal sector wanted to remain informal, while others championed the idea of formalization so that workers can obtain proper protective equipment, access healthcare, and receive other workplace benefits that would improve their livelihood and working conditions. Regardless, it is important to note that any changes to the livelihood of informal sector workers must be designed in direct consultation with informal workers themselves.

Although interviewees shared challenges related to consumer awareness, waste management, and informal sector rights, they also shared ideas and opportunities in the form of future directions. First, interviewees mentioned a need to increase community awareness and education on issues ranging from source separation (to help minimize contamination in the recycling stream) to education related to greenwashing labeling commonly found on products sold in stores. Interviewees noted that education and awareness must be specific and culturally relevant to specific groups. Additionally, increased support will be needed for community groups already doing circularity and zero waste work. Along this same line, community members were interested in cities promoting economic incentives to encourage participation of businesses and consumers. Second, interviewees emphasized the need for the expansion of infrastructure. In rural areas, this could look like increasing recycling processing capacities and opening new recycling sorting facilities. In medium-sized and larger cities, this could look like building industrial composting facilities, specifically if there is a significant amount of compostable packaging already being provided in local stores and restaurants. Exploring reuse was another infrastructure suggestion provided by interviewees, wherein funding from local, regional, and federal governments would be needed to fortify existing reuse and refill startups and companies that need more resources to be able to scale. Further, interviewees expressed interest in focusing on making existing solid waste management collection infrastructure more cohesive, through hiring more people and bringing in more funding to update necessary technology and equipment. Finally, community members emphasized the importance of government policy and regulations as a mechanism for change. This could look like enacting plastic bans and ordinances and ensuring the efficacy of these regulations through proper enforcement.

Material Design and Innovation

Across the cities examined in the seven APEC economies, the CIL identified 925 alternative packaging formats or materials that are intended to replace single-use plastics. If there are existing systems already in place that do not include SUPs, then this packaging survey may not identify those pre-existing systems (for example, in-house dining or bulk refill systems for staple goods). Most alternative packaging was found in the USA (93%), with a small number also identified in Thailand (7%). The remaining cities in the five APEC economies did not have access to packaging alternatives readily accessible on the market, yet this could change as each economy institutes EPR and other parallel policies. Other cities within these five economies may provide more access to alternatives in their stores.

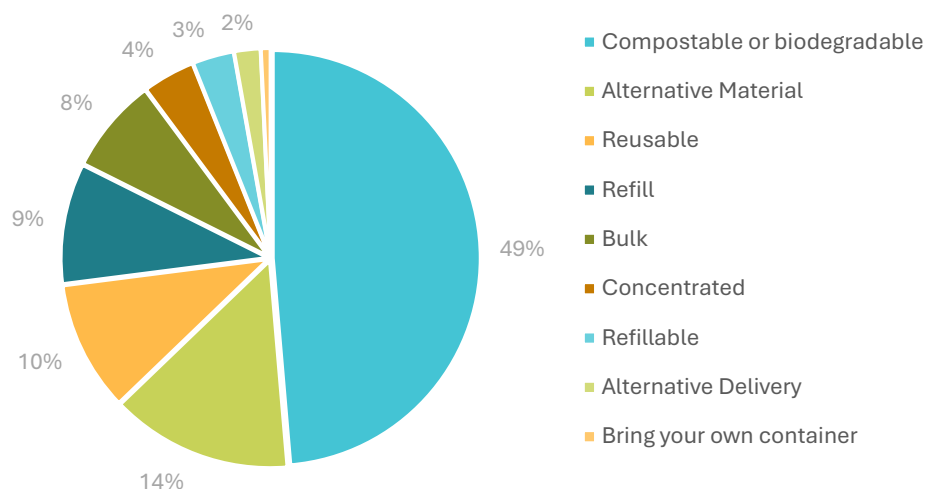


Figure 9. Alternatives to single-use plastics (n = 925)

The common alternatives found in the USA and Thailand included: dinner plates, sandwich bags, cold cups, utensils, hand soap, straws, household cleaner, trash bags, laundry detergent, shampoo, and dish soap. Alternative materials primarily consisted of paperboard, metal, and wood/natural materials. For instance, 48.6% of these documented alternatives (Figure 9) were either compostable or biodegradable materials consisting of compostable plastics and

wood/natural materials, or were alternative materials to plastic (14.2%), such as paperboard. Only 10.2% of products were reusable (intended for reuse at home, such as a reusable water bottle) and 3.2% were refillable (intended for use with a refill package, such as a glass soap bottle and concentrated tablets). Refill products sold to fill durable refillable packaging still frequently relies on plastic packaging, so material innovation is needed to optimize material circularity (Figure 10).

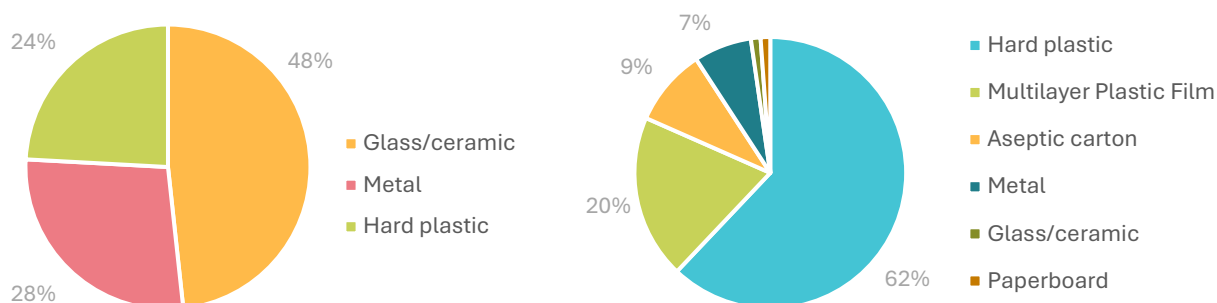


Figure 10. Refillable packaging (left) vs refill products (right)

In addition to examining alternative packaging format and materials in stores, the CAP team also sampled to-go food ware from restaurants in each CAP city, including cold cups, straws, food containers, and utensils. Across APEC economies, cold cups were overwhelmingly hard plastic, with the exception of Chile, where roughly 55% of cold cups were paper or paperboard and the USA where 42% of cold cups were hard plastic and 26% were foam (Figure 11). Similarly, over 60% of the straws in Chile were paper, while straws in the other six APEC economies were overwhelmingly plastic (Figure 12).

Figure 11. Material type across APEC economies – Cold cups (n = 547)

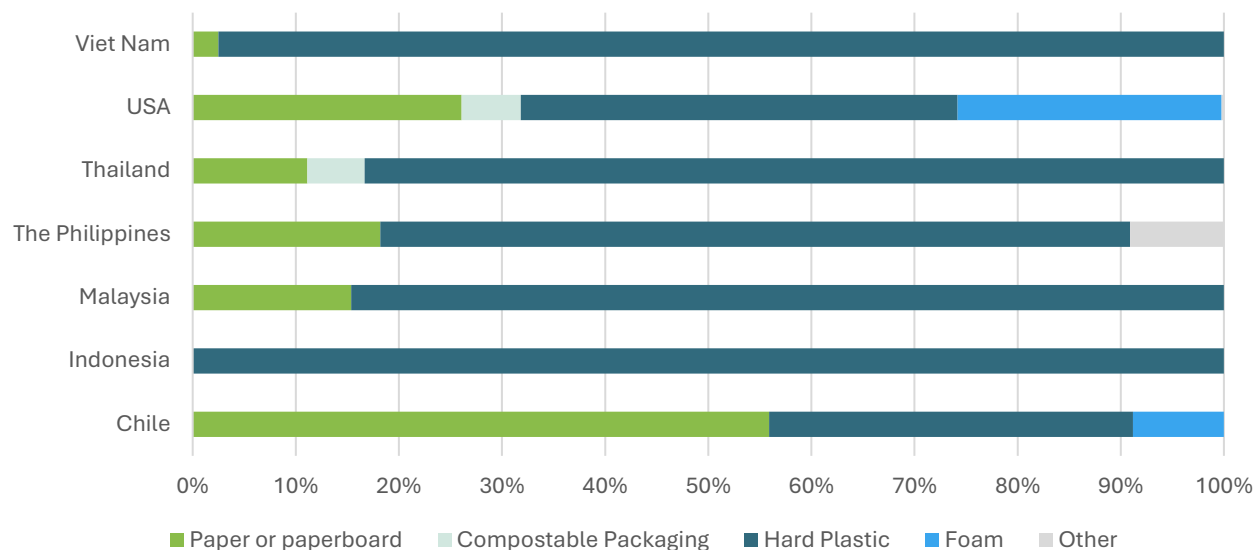
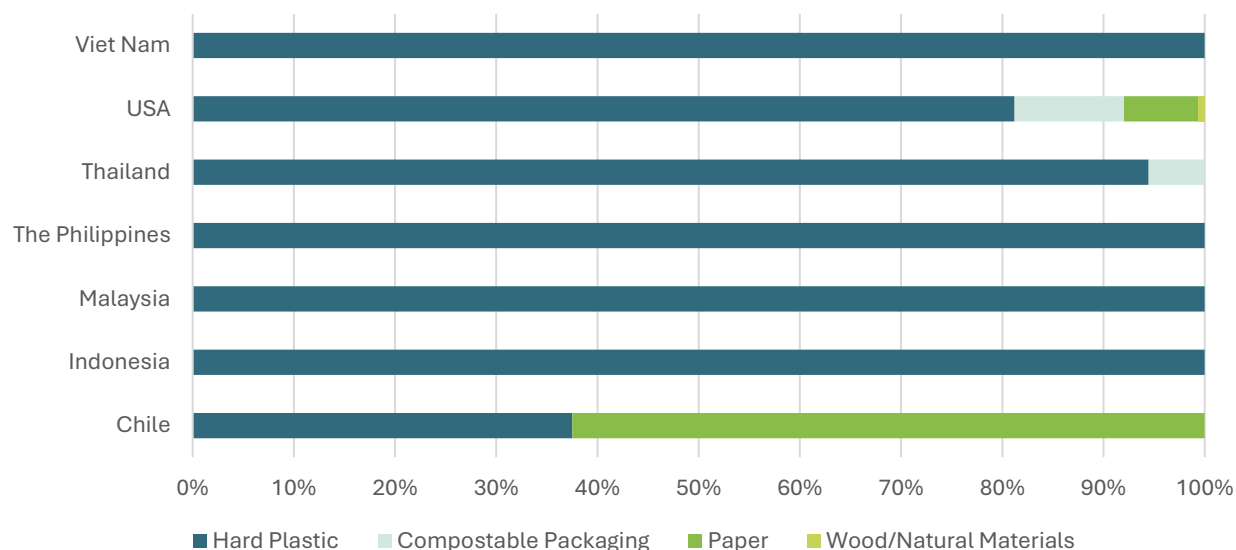


Figure 12. Material type across APEC economies – Straws (n = 414)



In many APEC economies, food containers had slightly more variety in material types, including paperboard containers frequently recorded in Chile; the USA; and Thailand (Figure 13). Notably, however,

foam was also common in these economies, which can more easily fragment and enter the environment compared to other packaging types. Over 30% of food containers surveyed in Viet Nam consisted of film plastic. These variations in materials could present an opportunity for alignment of food container packaging via local, regional, or federal policies. A majority of utensils were comprised of hard plastic, and wood and natural materials were also found, most notably in Malaysia (at 50%) and Chile (at roughly 47%) (Figure 14). (Note that few food vendors surveyed in Malaysia offered utensils.) The USA and the Philippines had a small number of compostable plastic utensils, though commercial composting infrastructure remains limited in these economies.

Figure 13. Material type across APEC economies – Food containers (n = 740)

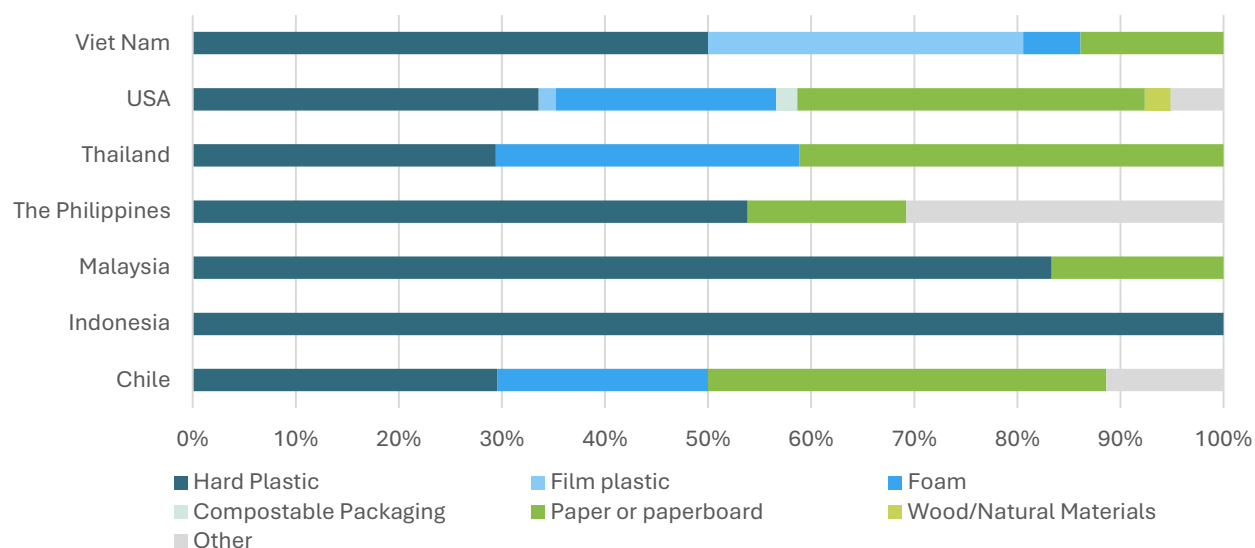
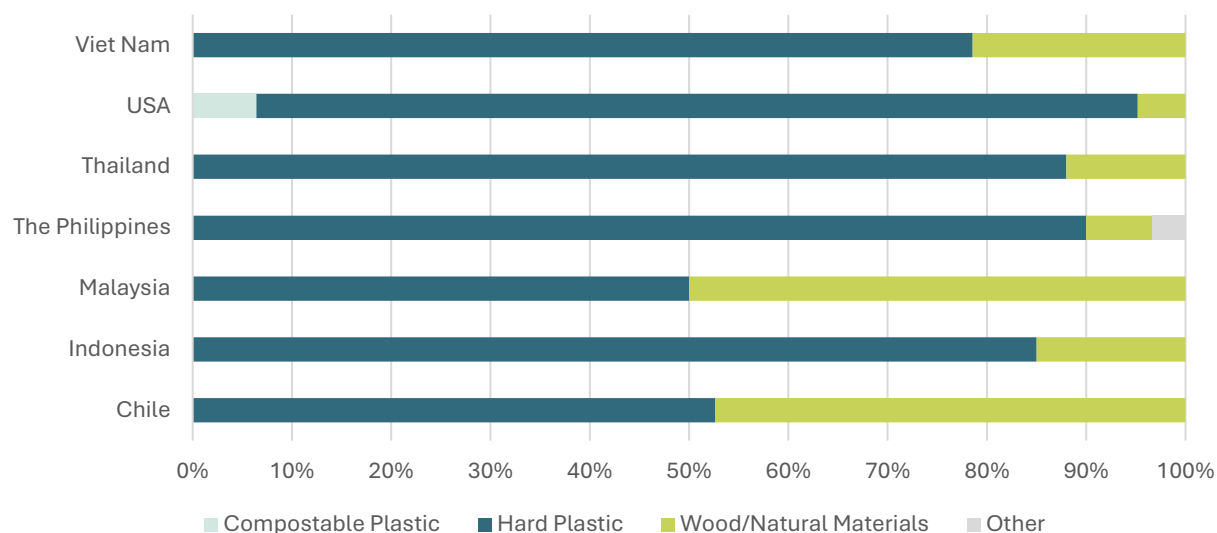


Figure 14. Material type across APEC economies – Utensils (n = 421)



Use and Reuse

There are several overlapping themes related to use and reuse across the seven APEC economies. First, widespread infrastructure for reuse is nascent. Currently, the reuse offerings that do exist tend to come from companies; there is little government funding or support for expansion. Next, policy is a factor that can enhance, inhibit, and/or complicate reuse efforts. Finally, with a few exceptions, the pricing and availability of plastic alternatives is largely dependent on the income of community members. These themes are explored in greater detail below.

Across all 25 cities, infrastructure to support reuse and refill is nascent. Most of the APEC cities have little to no reuse/refill options, except for two companies in Chile, namely Algramo and EcoCarga. Reuse and refill systems like Algramo and EcoCarga exist locally and offer cost savings when compared to traditional plastic packaging. The refillable detergents offered by Algramo were 6.7 – 16.7% cheaper than those packaged in single-use plastic. In comparable CAP studies in the US, we have found that alternatives consistently cost more than the traditional plastic packaged product. Algramo is a notable contrast, as their refills are cheaper than plastic packaged products and they are available in popular grocery stores like Lider. Similarly, EcoCarga began in the Valparaiso region and is now active in both Valparaiso and the metropolitan region. In addition to some brand partners, EcoCarga also facilitates refill systems for their own brands, which include detergent, fabric softener, multi-purpose cleaners, dish soap, and other cleaners. Their website reports that the company has refilled over 800,000 containers as of 2022. Although Algramo and EcoCarga are great examples of locally based refill and reuse companies, all 25 APEC cities have room for refill and reuse infrastructure investment so these types of initiatives can scale and be available to more community members.

Policy can be a barrier or a boon to refill and reuse efforts across the seven APEC economies. For instance, in 2022, Bangkok implemented a domestic ban on four single-use plastic items to reduce single-use plastic consumption, as outlined in Thailand's Roadmap on Plastic Waste Management 2018-2030. The vision for this roadmap is to move towards a more sustainable future using a circular economy. Through Bangkok's CAP, over 100 single-use plastic alternative items were identified across 27 convenience and grocery stores. Most alternatives surveyed (68%) were bulk options, which were found to be the most cost-effective options for products. Interestingly, the average cost across all categories of alternative use types was lower than that of comparable single-use plastic items, which could be a positive result of the policy roadmap instituted by Bangkok.

Policies that directly incentivize and promote reuse/refill do not exist in the cities summarized in this report, yet some have made steps in that direction by attempting bans on single-use plastics. Six out of seven of the APEC economies examined in this report have been in the process of instituting various EPR policies (Thailand; Viet Nam; Indonesia; Chile; Malaysia; and the Philippines; in the USA, seven states have implemented EPR laws). In Metro Manila, the Department of Health recently released refilling guidelines which provided restrictions around refill – businesses will now have to register to have refilling capabilities for cosmetic, household, and hazardous products, as well as adhere to other new guidelines. Some interviewees feared that many smaller sari-sari stores that Filipinos frequent will not be able to participate

in refill, which may stunt circularity efforts. Other cities, particularly in the USA, experienced friction and confusion when having local policies conflict with state endeavors. There are no federal EPR policies, so EPR is left to be determined state-by-state. In the cities of Miami, Orlando, Ann Arbor, and Blytheville, local bans and policies were voided when the state legislatures of Florida, Michigan, and Arkansas passed preemptive bans on local governments trying to prohibit single-use plastics.

Although policy is important to give guidelines for circularity activities, enforcement and incentivization is also important. For example, although the Regional Decree 27/2017 was passed in Semarang, prohibiting the use of plastic for restaurants, hotels, and modern market uses (e.g., bags, straws, to-go containers, etc), implementation is not fully realized. While the passing of the regulation has resulted in many modern markets now selling fabric bags to consumers as reusable replacements for plastic bags, plastic bags and packaging are still being used and distributed by vendors in traditional markets. No other evidence of significant reuse or refill programs was found through interviews or observations. Further, CAP findings suggest that most of the product packaging in both stores and food vendors is single-use, showing that there is still room for further enforcement of the decree.

Of the 25 different cities within the seven APEC economies, only a few cities have plastic alternatives that are cheaper than their single-use counterparts (Bangkok with bulk options; San Antonio, and Santiago with reuse and refill). In rural Cherokee County (Murphy, NC, USA), refillable products (hand soap and household cleaner) were 18% less expensive than their single-use plastic competitors, while reusable items cost on average 168 times more. Although nearly half (46%) of Cherokee County stores offered alternatives made of various materials, none were personal care items. The availability of plastic alternatives indicates that Cherokee County is making efforts to reduce its reliance on single-use plastics, and cost can continue to be a factor at the forefront of this transition, as there is a significant cost difference between refill and reuse.

Across APEC economies, 362 stores were surveyed to determine bag usage, as well as their material type (Figure 15). A majority (86%) of the SUP bags provided at these stores were plastic film, and only 19% of stores offered reusable bags, most commonly plastic or cloth. In many of these 20 cities, cost and the availability of alternatives largely depended on the neighborhood. Generally, higher-income areas tend to have a larger number of plastic alternatives, as is the case in Atlanta and Georgetown County. In Atlanta,

lower-income areas tended to have more polystyrene available as default packaging, while higher-income areas saw more availability of alternatives. These alternatives, however, tended to come with a higher price tag. Similarly, in the survey examining shopping bags provided in 20 stores in Georgetown, all but one store supplied single-use plastic bags. A quarter of the stores offered non-woven PP or cloth reusable bags. In contrast, a survey of nine stores in a nearby higher-income area within the same county found a higher rate of reusable bags offered (60%). This

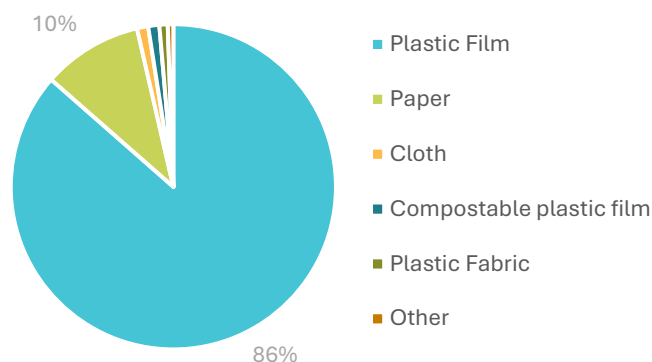


Figure 15. Single-use bag types (n = 362 stores)

discrepancy in the availability of alternatives across income levels indicates that there is room for the expansion of plastic alternatives to neighborhoods that have historically not had access, while also keeping prices low and affordable.

Waste Management Infrastructure

In the 25 APEC cities where CAP was conducted, the municipal solid waste (MSW) collection rate averages 82%. All cities have formal MSW collection via curbside service or drop-off centers, while 57% of the economies also feature informal waste collection, primarily cities in the economies in Southeast Asia. All of the cities have some form of MSW collection operated by the municipality, although some cities include public-private partnerships (e.g., Ha Noi and Nam Dinh), while others are moving away from public to privatized collections (e.g., Melaka). Companies collecting MSW often fill in the gaps that public entities are unable to reach, which occurs in 45% of the economies. 70% of the economies have formal recycling collection, including 87% of the USA cities (n=15), as well as the cities in Chile; the Philippines; Malaysia; and Indonesia. All cities in APEC economies, except the USA, also have informal collection of recycling (86%). Only 2% of the economies have formal composting collection – this includes two cities located in the USA: Minneapolis, Minnesota and Ann Arbor, Michigan. Two other USA cities (2% of the economies) offer private composting collection, also in the USA (Atlanta and Athens, GA). The average quantity of organic materials in the MSW across the economies is 50%, with the lowest quantity being in the USA at an average of 24%, and the highest being in Viet Nam with an average of 69%. Non-source separated organic materials can make recycling more challenging and also provide opportunities for increased composting as a management option.

Over half (54%) of the economies use an engineered landfill to dispose of municipal waste while 39% have more of a dumpsite than a designed landfill. 43% of the seven economies also deal with open dumping. All of the economies (71%) have established informal recycling, outside the USA cities. 89% of the APEC cities examined for this work have formal recycling and 24% of the cities have both formal and informal recycling. The waste banks in Indonesia combine both formal and informal recycling in that they are formally established entities, but both formal and informal collectors can use them. Half of the economies have composting (public or private) available, which is important given the percentage of organic materials in the waste stream. And 43% of the economies also have incineration. Notably, the Philippines currently has a ban on incineration.

Leakage

Across the cities in the APEC economies, the most common category of leakage recorded in litter transects is tobacco products (cigarettes or tobacco sachets) (29%). Tobacco products are followed by food-related plastics like food wrappers and beverage containers (29%). The third highest category is plastic fragments, including plastic pieces that are small or damaged such that the source or form cannot be identified (11%), followed by paper (9%), also often fragmented as well as larger paper products like receipts or labels (9%). Other plastics, metals and glass are all about 4% of what is found on the ground. The rest of the categories, including e-waste, construction materials, and PPE make up the final 10% of what leaks into the environment.

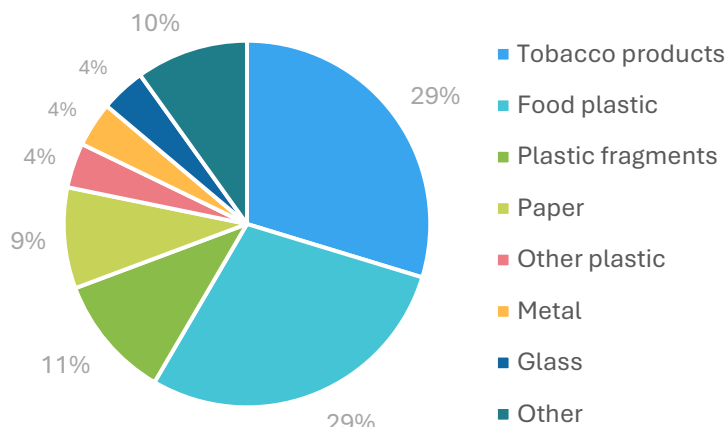
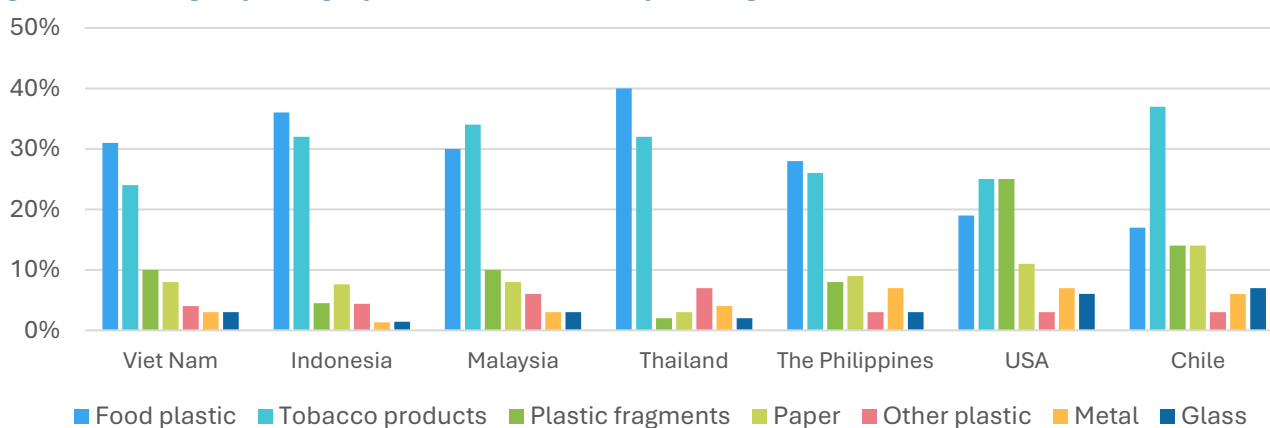


Figure 16. Average Leakage in across Cities in APEC Economies by Category (Percent)

When looking across the economies at the leakage categories (Figure 17), the top category is food plastic in the Southeast Asia economies of Viet Nam; Indonesia; Thailand; and the Philippines. The second highest leakage categories in each of these cases is tobacco products, followed by the rest of the categories at 10% or less. Malaysia had slightly higher tobacco products compared to food plastic when compared to Viet Nam; Indonesia; Thailand; and the Philippines, but all the other categories were similar to the other Southeast Asian economies at 10% or less. Chile also had tobacco products as the highest category found, and it was by far the widest margin compared to any other economy. This was followed by the lowest percentage of food plastic for Chile. Chile also had a bit more than 10% of plastic fragments and paper compared to the economies in Southeast Asia. The USA stood out with the highest categories of items found as plastic fragments. This was followed by tobacco, and then food plastic. Paper was just over 10% in the USA with all other categories being less than 10%.

Figure 17. Leakage by Category (%) for each economy (average)



Transect locations in each city were selected using a stratified random sampling method, in which transects were randomly selected in ten square kilometers which were distributed across three groups of population count (upper, middle, lower) based on LandScan ambient population data. Each transect is 100m² consisting of a 100m path that is 1m wide where every piece of litter is counted and logged. Litter densities are then calculated as number of items/m². Litter items were recorded using the open-source Marine Debris Tracker app. A histogram of litter densities across the cities shows the data to be skewed right (Figure 18). Because the data is skewed, it is more appropriate to use the geometric mean for the average litter density across APEC economies, which is **0.96 items/m²**. As shown in Table 2, Chile has the highest litter density (3.11); followed by Viet Nam (1.66); and Malaysia (1.10). These are then followed by three economies with close values, Indonesia (0.80); the USA (0.79); and the Philippines (0.78). The lowest litter density by economy was in Thailand at 0.70 items/m².

Figure 18. Histogram of Litter Densities across 25 cities in APEC Economies

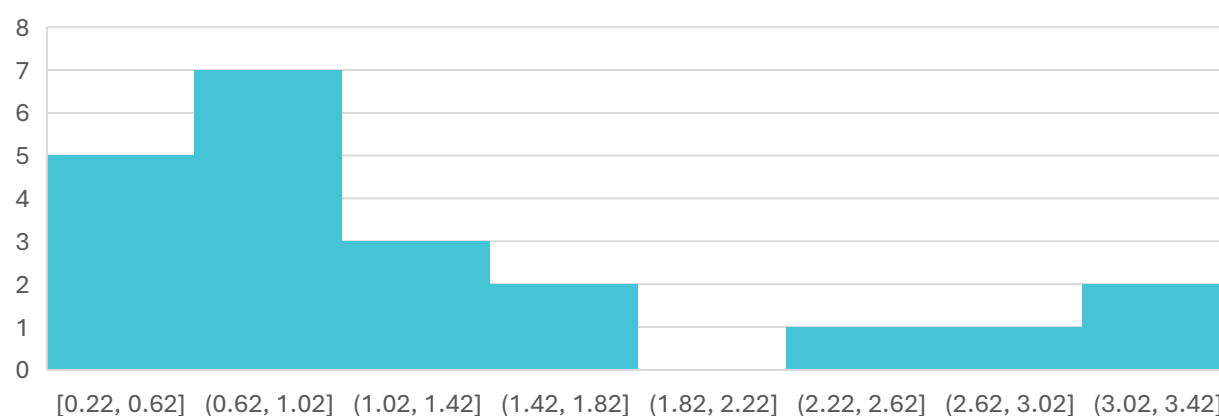


Table 2. Litter Densities (geomean average) in the APEC Economies

Economy	Litter Density Geomean Average (items/m2)
Chile	3.11
Viet Nam	1.66
Malaysia	1.10
Indonesia	0.80
USA	0.73
The Philippines	0.78
Thailand	0.70

Policy Opportunities

APEC has long been at the forefront of global efforts to combat plastic pollution, with ministers flagging the issue as far back as 1990. APEC economies have sponsored much of the foundational work on the issue, such as the 2009 report on “Understanding the Economic Costs and Benefits of Controlling Marine Debris in the APEC Region.” In 2014 APEC ministers approved the Xiamen Declaration, which called for cooperation on the “reduction and mitigation of marine pollution, including from land-based sources and spills, and through continuation and expansion of efforts to reduce marine debris.” In 2019, the APEC Roadmap on Marine Debris was released. APEC economies continue to lead through the Ocean and Fisheries Working Group and the APEC Virtual Working Group on Marine Debris, with many economies contributing to improved understanding of the issue through sponsorship of pragmatic research.

While focus at the highest levels has been key to raising international awareness, there is a significant gap between those efforts and reality on the ground. Waste management, litter prevention, and pollution cleanups are overwhelmingly local responsibilities. Across APEC economies, communities are working every day to prevent and reduce waste, collect refuse, sort recyclable materials, and prevent litter leakage into their local environments and waterways. However, there is often no pathway for their successes, challenges, and opportunities to flow up to the policymakers who can provide support.

The Circularity Assessment Protocol (CAP) can help bridge this gap. The CAP is a standardized diagnostic tool that seeks to understand how consumer plastic flows into a community, is consumed, and flows out, either through waste management systems or leakage into the environment. With CAPs performed in 50+ communities around the world to date, the resulting large and growing data set in the online CAP portal is currently the closest thing to a global picture of how communities around the world are rising to the challenge. The APEC-specific CAP data set includes 20 communities on three continents, in six economies, ranging from Blytheville, Arkansas with a population of 13,406 to Bangkok with a population of over 8 million. While they are radically different in many ways, each of these communities is seeking to improve its circularity as a way of reducing the problem of marine debris and plastic waste. Examining the policy choices, initiatives, and actions at the local level can help policymakers:

- **Surface community-led efforts to lead change:** Communities across APEC serve as laboratories implementing policy from above, in addition to devising their own solutions to the challenge of preventing plastic pollution and marine debris. CAP can help bring innovative and creative programs to the attention of policymakers at higher levels so they can support or replicate them.
- **Connect Stakeholders:** Local governments are key players in improving circularity, but they are not the only actors. Businesses are also engaged, as are other civil society participants. Even within a community, these groups may not be aware of potential collaboration to increase impact. With its holistic approach, CAP maps out what’s happening in a given area so that stakeholders can find each other, both within communities and (with help from policymakers) across them.
- **Demonstrate co-benefits of action to reduce plastic pollution and increase circularity:** Locals are the experts on the places they inhabit. As such, they are acutely aware of the specific problems plastic pollution and other trash cause in their communities, whether it is flooding when trash blocks storm

drains, mosquitoes breeding in water that accumulates in trash piles, microplastic contamination of the water supply, or the effects of air pollution from open burning of trash. Local residents are also often the first to recognize opportunities to launch new businesses in the circular economy space.

Most importantly, CAP data can identify gaps where support (policy, financial, expert) is needed, provide insight into innovative approaches, and highlight opportunities for change. Aggregating and synthesizing this data from across APEC communities also reveals patterns where collective action at the APEC level could maximize impact, pointing the way for how APEC can continue to exercise leadership in this space.

Community Actions on the Front Line

Stakeholders in the APEC CAP communities have demonstrated remarkable creativity in the search for solutions. CAP communities are taking action to increase their circularity and eliminate certain materials, reduce and reuse materials, sort and collect their waste, recycle a wide range of materials, and clean up and prevent litter. They are also finding ways to educate and engage their residents, businesses, and other stakeholders to continually improve their circularity. Below are some examples observed during the CAP process of how APEC communities around the globe are rising to the challenge.

Eliminating Waste

Many APEC CAP cities have taken a straightforward approach to reducing waste in their communities by simply banning certain items. Chile has banned a number of single-use plastics items such as grocery bags, benefitting the cities of **Santiago** and **San Antonio**. The cities also benefit from Chile's decision to limit the use of single-use plastics in food service, including expanded polystyrene (EPS, commonly known by the brand name Styrofoam) containers and plastic cutlery, straws, cups, and lids. After a phaseout period where customers were charged for single-use shopping bags, **Hilo** phased them out in 2014 at the county level. **Hilo** followed this up with a ban on EPS food service containers in 2019. **Orlando** banned single-use bags, straws, and foam from all city events and venues. A regional decree prohibiting single-use items such as bags, straws, and to-go containers for restaurants, hotels, and modern markets, has benefited residents of **Semarang**. **Minneapolis** passed a Green to Go ordinance, which bans EPS, certain plastic-lined plates and cups, and black plastic lids and containers, among other to-go packaging items.

Bans are not the only mechanism for communities to reduce waste. Businesses can also play a leading role. In **Santiago**, many to-go restaurants have eliminated to-go cups, lids, and straws instead selling drinks in returnable bottles or pre-packaged cans. In the **Florida Keys**, the #NoStraw Challenge uses outreach and policies such as straws only upon request to reduce straw usage, while Blue Star tourism operators pledge not to use single-use plastics on their boats or in their vehicles. Businesses and non-governmental organizations can also partner on this issue. For example, the Surfrider Foundation in **Miami** recognizes Ocean Friendly Restaurants that commit to cutting out single-use plastic.

Incentives can drive change. The county in which **Athens** (Georgia) is located passed an ordinance that incentivizes beer-selling businesses to reduce their glass waste by switching to draft or aluminum containers by reducing their beer license renewal fee by 25-50% depending on the amount of reduction undertaken. In **Can Tho**, one restaurant offers customers a discount on drinks when they bring their own containers, a strategy that businesses in the **Florida Keys** are also using when customers purchase a reusable drink container from them. One business in **Ann Arbor**, located in a state that has pre-empted plastic bans, offers a small discount to customers who bring their own bags.

Why it Matters: Preventing certain materials from flowing into a community is the simplest and most cost-effective way to keep them out of landfills or from becoming litter. Chile's bans work. Out of more than 10,000 litter items collected in **Santiago**, only 45 were plastic bags, less than 0.05%. Similarly, in **San Antonio**, only 123 plastic bags were found in more than 8,000 littered items (less than 1.5%). Overall, Chile estimates that phasing out plastic bags in retail stores has saved an estimated 49,000 tons of plastic waste by eliminating more than 6.7 billion bags. Voluntary campaigns can also have an impact: Straws were not among the top litter items found in any of the areas sampled in the **Florida Keys**. Few EPS containers were found in **Minneapolis'** litter, an indication its Green to Go ordinance is working.

Driving Reuse

APEC cities have taken a number of approaches to introduce or increase reuse options in their communities. In **Athens**, a Teacher Reuse Store accepts office and school supplies, diverting an estimated 1400 pounds of waste from landfill while supporting local educators with free supplies. **Minneapolis** instituted a five-cent levy for single-use plastic bags to encourage customers to bring their own bags. The fee goes back to the retailer to offset costs or to charity. The city also offers Fix-It clinics to help residents repair items to prevent them from becoming trash, and toy and tool libraries promote reuse. In **Hilo**, Hawaii County is working with non-governmental organizations Perpetual and Zero Waste Hawaii to facilitate a community-driven process to design and implement a city-scale reusable foodware program.

Businesses can have a major impact in this area. **Santiago** and **San Antonio** will benefit from a requirement in Chile's extended producer responsibility (EPR) law requiring supermarkets and convenience stores to offer a minimum of 35% of beverages in reusable containers and to accept returns of that packaging. Chile's EPR law will require businesses to report how much plastic they're putting in the market and to pay associated fees. As a result, businesses are looking to reduce their plastic usage in both business to business and business to consumer contexts, with one business in **San Antonio** looking to switch out the stretch film it currently uses in its shipping process with reusable tarps. In **Bangkok**, the Environmental Justice Foundation (with support from the Norwegian Retailers Environment Fund) and the Bangkok Metropolitan Administration are creating a network of free water refill stations to encourage reusable water bottles by providing accessible, clean drinking water to the public for free. The initiative also includes the creation of a map of the refill station locations. Similarly, in **Miami** Woosh water bottle refill stations allow customers to pay to refill reusable water bottles.

Why it Matters: Reuse keeps materials in circulation, reducing waste and increasing circularity. Providing clean and accessible drinking water in **Bangkok** not only reduces the need for single-use plastic water bottles, but it also saves poorer residents money and improves public health outcomes – a significant win for a modest investment.

Expanding Bulk Purchasing and Refill

At present, bulk and refill offerings are more a niche product than a widespread offering in most CAP cities, although there are some success stories. The Chilean company Al Gramo, active in **Santiago**, sells a wide range of products in on-demand sizing with a bring-your-own-container model, allowing customers to buy only what they need (and can afford). Importantly, the company's products are actually cheaper than alternative single-use packaging. For example, detergent was 6.6-16.7% cheaper than alternatives packaged in single-use plastic, generating considerable savings for customers. Similarly, in **Bangkok**, a ban on four commonly littered single-use plastic items has spurred a number of bulk and refill delivery systems, with a lower average cost across items. One grocery store in **Ann Arbor** offers water refilling at a competitive price in partnership with a major bottled water producer.

Why it Matters: Many low-income customers cannot afford to buy products in large sizes. Instead, they are forced to purchase single-use sachets or smaller formats. These sachets are typically more expensive on a per unit basis than larger sizes. Additionally, single-use sachets are generally made of mixed material plastics, which are very difficult to separate and recycle. As a result, at best they end up in landfills. However, because of their light weight, they are frequently littered. Bulk purchasing and refill can reduce both cost and packaging.

Improving and Incentivizing Collection

Local governments are finding creative ways to collect trash that might otherwise be littered. In many cases, this involves establishing drop-off locations or holding events where customers can bring their trash. In other cases, it involves offering incentives. For example, **Ha Noi** has a proposed program to incentivize offshore fishermen to bring their trash back to shore by offering reward points that can be redeemed for basic food items or necessities for their next trip in exchange for trash. **San Antonio** has incentivized collection by creating distinctive bell-shaped containers for a single type of recyclables at some drop off locations, donating the profits from recycling those materials to certain charities. The city is also contemplating the installation of sensors to alert collectors when recycling containers are full so that they can be picked up promptly.

Deposit return systems are also an effective way to incentivize collection. For example, **Hilo** benefits from the Hawaiian Deposit Beverage Container Program (HI-5), which provides a five-cent refund for any

eligible beverage bottle (including metal, glass, or plastic) brought to a redemption center. Similarly, a Michigan law requiring a ten-cent deposit on beverage containers is in place in **Ann Arbor**.

Expanding access and convenience for residents is also a key to improving collection. **Athens** has established several strategically located drop off centers for materials throughout the city to maximize consumer convenience, including fire stations and the vehicle license office. **Athens** also hosts recurring clean up and drop off events to encourage people to bring their hard-to-recycle items. **Cape Girardeau** accepts trash, recyclables such as paper, metal, cardboard, glass, plastics, and electronics, bulky items, and appliances for drop-off at its transfer station. Motor oils are accepted and used to heat city facilities. The community's fire stations host additional drop-off locations for glass.

Civil society stakeholders are also active in promoting collection. The So+Ma Vantagens project in **Salvador** sets up drop-off locations for recyclables such as cardboard, glass, and aluminum that can be exchanged for reward points. The collected materials are provided to recycling cooperatives. Keep **Orlando** Beautiful organizes e-waste and textile recycling events throughout the city so that residents can bring their items. In **Vicksburg**, MIDD-West Industries (a non-profit organization that operates a variety of employment and skills training programs for the developmentally and physically disabled of the county) runs several drop-off locations. The city funded the purchase of a shredder and mobile recycling trailer for the group with proceeds of a grant from the state.

In some CAP cities, residents work together to self-organize their trash collection. For example, in parts of **Semarang** that lack municipal waste collection, residents will hire a driver to take their waste to a collection station run by the city. The business community also has a role to play. The Federation of Thai Industries and the Thailand Council for Sustainable Development collaborated on a project to create 300 drop-off locations for low-value single-use plastic film and bags around **Bangkok**. The collected plastic was used to make 1,200 reflective work suits for street sweepers in the first phase, with 3,600 vests produced in the second phase. In **Semarang**, businesses have established Waste Banks (77 as of 2019) where residents can bring their waste for a small payment. While this works well when waste prices are high, banks stop buying when prices drop, demonstrating the limits of this system. **Vicksburg** has benefitted from a Keep America Beautiful (KAB) initiative that partners with major beverage manufacturers like Coca-Cola, Dr. Pepper, and Snapple to provide grants like the Park Recycling Bin Grant program which provides annually awarded grant resources that expand recycling opportunities in public parks. **Minneapolis** mandates that all commercial businesses collect three or more materials for recycling. Rigid plastic packaging, glass bottles and jars, aluminum and steel cans, cardboard and boxboard are the most commonly recycled items.

Why it Matters: Waste management is often the single largest item in municipal budgets around the world, with collection a significant portion of that cost. However, capturing waste is a prerequisite to recycling and circularity and waste that is not collected is often dumped, littered, or burned. Creative collection and funding schemes that enhance or augment municipal resources can help communities succeed in their circularity goals. Deposit schemes give customers an incentive to return materials that might otherwise be landfilled or littered. They work: In **Hilo**, plastic bottles were not one of the top ten most littered items (as is common elsewhere).

Leveraging Extended Producer Responsibility (EPR)

In some cases, local governments are supported by EPR that requires producers of certain plastic and packaging to contribute to the costs of collecting and recycling or disposing of the products they put into the market. **Manila** will benefit from recent EPR legislation for flexible and rigid plastic packaging, rigid plastic cutlery and promotional items, plastic bags and EPS. The law will be phased in, with obligated entities required to divert 20% of their product by 2023, with a requirement to increase this to 80% by 2028. Minnesota passed EPR legislation in 2024, which will help **Minneapolis** as the law requires producers (including brands, packaging manufacturers, and distributors) to pay half the recycling costs for the products they put in the market beginning in 2029, with that share increasing incrementally to 90% by 2031. Chile has also adopted an EPR law that requires producers and importers to take financial responsibility for the collection, recycling, and treatment of specific products after their useful life, which will support **Santiago** and **San Antonio**'s solid waste management systems. The law covers tires, packaging, used oils, lighting, electronic equipment and batteries.

Why it Matters: Cost is the largest barrier communities face in improving circularity. Single-use plastics are often the cheapest option for businesses, which explains their ubiquity. Many of these plastics are not easily recyclable and they often end up landfilled or littered. The significant end-of-life collection and disposal costs of these materials are generally borne by local governments, who often lack the resources to manage them, especially given their rapidly growing volume. EPR facilitates producers sharing these costs and provides an incentive for businesses to develop or choose more sustainable materials.

Advancing Source Segregation

Local governments in many places have focused on source segregation. **Ha Noi** has launched a program to incentivize its citizens to sort their waste. **Can Tho** is also piloting source segregation. The requirements are communicated to residents through informational meetings and brochures, ads on television and radio, and through networks such as the Women's and Youth Unions. Customers in the **Florida Keys** get feedback on their source segregation efforts in the form of "oops" tags on recycling bins that contain nonrecyclable materials. **Orlando** passed an ordinance requiring all multi-family homes and commercial properties to have special recycling containers and accompanying collection services, after a bottom-up request by residents. The ordinance was phased in over four years and includes an estimated 60,000 multi-family units. Properties must provide recycling verification to the city, provide access to the property for collection, and establish service with an approved waste hauler. Using a small grant, **Atlanta** conducted an audit of its recycling carts and provided residents with feedback and targeted education, which helped it reduce recycling contamination by 35%.

Successful source segregation requires citizen participation and often includes an educational component. In **Bangkok**, communities are coming together to lead waste segregation in canal neighborhoods, demonstrating the power of citizen engagement. In **Orlando**, twelve stakeholder meetings were held with haulers, business owners, processors and others before the ordinance was put to a vote.

Why it Matters: Proper waste separation is critical to increasing recycling and circularity. Improperly sorted waste can contaminate recyclable waste streams, reducing or eliminating their recyclability. Not only does this result in the loss of potentially valuable materials, it also needlessly increases waste flows to landfills, many of which are rapidly nearing capacity. Providing customers feedback on their source segregation efforts has been successful in improving outcomes in some parts of the **Florida Keys**.

Capturing Hard-to-Recycle Materials

Communities are exploring various ideas to expand access to recycling, as well as the materials they can recycle. For example, **Orlando** partnered with a private company to launch a pilot textile recycling program for certain city apparel. **Athens'** Center for Hard to Recycle Materials (CHaRM) and materials recovery facility (MRF) together have diverted an estimated 19,000 tons per year of material from landfill. The Center was funded through a special-purpose local-option sales tax, a mechanism that lets communities use state sales tax proceeds for approved capital improvement projects. Many items, such as mixed recyclables, scrap metal, and food scraps can be dropped off for no charge. Other items require a small processing fee (\$3 for residents, \$8 for businesses). The MRF processes 70-80 tons a day of materials including aluminum, certain plastics, metals, glass containers, cardboard, and paper. The MRF is operated as a public-private partnership, with the county paying a fee for every ton of recycled waste processed and receiving 80% of the proceeds for the sale of the recycled materials. In **Ann Arbor**, the non-profit Recycle Ann Arbor runs a popular drop-off station and recovery yard for hard-to-recycle materials. **Minneapolis** provides drop-off locations for residents to dispose of garbage, recycling, compost, hard-to-recycle materials, and hazardous waste including building materials, appliances,

Why it Matters: Expanding recycling reduces waste disposal and increases circularity, and it can also be an important source of jobs and economic activity. It is estimated that 69% of the materials collected in **Minneapolis** for recycling are made into new products in the state, with 95% of materials staying in the region, supporting 78,000 jobs and a \$23.9 billion recycling industry in Minnesota alone.¹ One series of small-scale initiatives to capture hard-to-recycle plastics in Southeast Asia created nearly 2,000 jobs in APEC economies over a five year period.²

¹ Minnesota Pollution Control Agency. "Recycling in Minnesota." <https://www.pca.state.mn.us/air-water-land-climate/recycling-in-minnesota>

² Mathis, Jennifer, et al. "Reducing ocean plastic pollution: Locally led initiatives catalyzing change in South and Southeast Asia." *Marine Policy*. September 2022. <https://doi.org/10.1016/j.marpol.2022.105127>

electronics, mattresses, and metal items. The city also holds hazardous waste collection events where residents can bring their materials, with up to 85% of these materials being re-used or recycled. **San Antonio** has benefited from Revaloriza, a plant in the region that manages construction and demolition waste. Construction companies can bring waste to the plant mixed or sorted, although the cost is higher for mixed waste. Waste is recycled into products such as asphalt, flooring, and cement kiln fuel.

Expanding Composting

A number of APEC CAP communities are working to expand access to composting. **San Antonio** has a composting program that captures some organic waste (yard waste, leaf and limb debris). The city of **Orlando** furnishes free backyard composters to residents upon request. The composters are city property and must remain at the residence they were issued to if the families move. The city provides an online composting guide with tips and videos to help home composters. **Pittsburgh** has established a drop-off location for composting at its farmer's market. **Athens** hosts a facility that processes food waste and leaf and limb debris. Residents can drop off materials at several locations across the city. For a fee businesses can contract for curbside pickup of these materials either from the city or from approved private collectors (who may also be hired by private households). **Minneapolis** introduced curbside composting services at no additional cost, with compostable items aggregated in compostable bin liners. It offers yard waste pickup biweekly from mid-April to mid-November. The city also requires large organics generators, including multi-unit residences, to have an organics program. **Ann Arbor** offers free composting carts and curbside pickup for single-family residences.

Even where municipal composting options are unavailable, residents in some places are creating their own informal compost systems. In **Hilo**, some households, businesses, and schools give their food waste to farmers for animal feed or other uses. In **Miami**, where the city has no industrial composting facilities, non-profits such as Back2Earth, launched by a high school student, offer pick-up services, drop-off locations, and education programs around food scrap composting. The dining service at the University of Georgia in **Athens** recovers leftover food and donates it to local agencies, collecting almost 9 metric tons in 2021, which provided 4.4 metric tons of meals to local residents. The dining service also sends food scraps to be composted at the University's Bioconversion Research and Education Center.

Entrepreneurs are also building businesses around composting. Compost for Life offers curbside collection for both residential and commercial customers in **Miami** and **Atlanta** for a fee, which is then processed by a farm. In **Atlanta**, Goodr contracts with businesses to collect their surplus food and coordinate its donation to those in need, while food scraps are sent for composting.

Why it Matters: On a global basis, 48% of the waste stream is composed of organic materials. It can be much higher in some places. For example, in **Can Tho** the figure is 85%. Separate processing of organic waste can reduce contamination of other waste streams, increasing recyclability of those materials. Properly segregated and processed organic waste is an asset that can provide valuable inputs for farmers and generate local jobs. In addition, as communities phase out certain single-use plastics, compostable replacements are increasingly common. However, the vast majority of these items must be processed in an industrial composting facility to break down properly. While the technology to circularize organic materials is not complicated, many communities lack facilities to process organic waste so it ends up in landfills, which are rapidly running out of space. Composting is a successful diversion strategy: Compost for Life in **Miami** estimates that it has kept almost 8 million pounds of organics out of landfills since 2020. **Minneapolis** diverted 168,311 tons of organic materials from landfills in 2022.

Focusing on Events that Generate Large Quantities of Waste and Litter

Many communities host seasonal or other events attracting large numbers of people – often from outside the community – that generate high amounts of waste and littering. In response, **Miami** is adjusting the special event permit process to encourage the use of reusables over single-use plastics. **Orlando** created a Green Events Guide to help event planners reduce resource use and unintentional pollution. As part of the event permit process, organizers are required to present a solid waste plan. Single-use plastics are banned for events with more than 100 people, although monitoring and enforcement is still an issue. **Minneapolis** has specific waste management guidelines for events that need permits, including a requirement that organizers provide a 1:1 ratio of recycling to garbage containers for participants. **Ann Arbor**, the home of the University of Michigan, is reducing litter associated with the crowds attending its sporting events by having more frequent trash collection during football and basketball seasons.

Why it Matters: Interventions to minimize waste and litter at events can ease the strain on already stretched municipal services and prevent trash flows into waterways and the ocean.

Supplementing with Last Chance Capture

Many local communities are working to recapture litter once it has escaped into the environment. **Miami** is installing storm drains that can capture litter before it flows out to Biscayne Bay. **Miami** has also contracted to run a Scavenger Boat, which travels along the Miami River on a daily basis removing litter. **Can Tho** has installed a mobile catchment facility in the Cai Khe Canal to capture trash.

Litter cleanups are also widespread. In **Ha Noi**, the Ha Noi Youth League organizes cleanups. The Clean City initiative in **Minneapolis** supplies litter bags, gloves, and litter grabbers to residents or groups who want to organize cleanups. The city's Clean Sweeps program helps neighborhoods organize cleanups and rent trucks, with the city covering disposal costs. The Missouri Department of Transportation hosts a volunteer litter clean up event every April called No MOre Trash!, providing trash bags and brightly colored vests to volunteers who work on the state's highways, including in **Cape Girardeau**. This event saves the state \$1 million a year. Civil society stakeholders are also important partners. For example, Debris Free Oceans are very active in cleanups in **Miami**. In **Ha Noi** and **Nam Dinh**, the Centre for Marinelifelife Conservation and Ocean Conservancy have installed a series of locally designed low-cost innovative trash traps on the Song Hong river. Data is recorded on the captured waste to identify alternative processing options, develop recommendations for infrastructure improvements, and inform policy, with recyclable waste sent for further processing. In **Cape Girardeau**, 203 volunteer groups participate in the city's Adopt-A-Street program, with the city providing bags for trash collection. The city also sponsors an annual Keep Cape Beautiful event that includes a cookout for volunteers.

Why it Matters: Cleanups and other last chance measures aim to capture trash before it enters the ocean, where it is much more expensive and difficult to remove. These initiatives can also be very important educational and outreach tools to help consumers understand where their mismanaged waste ends up.

Including the Informal Sector

Some communities are seeking ways to partner with informal waste collectors. For example, Chile is looking to certify informal waste collectors to work directly at its recycling centers and has specified in its EPR law that a certain percentage of waste must be managed by the informal sector, which will be implemented in **Santiago** and **San Antonio**. In **Ha Noi**, non-governmental organizations and informal recyclers collaborate with companies that can convert low-value plastic waste into plastic bricks, asphalt, pallets, and roof tiles. **San Antonio** has undertaken pilot programs to integrate informal recycling workers into its local solid waste management system through a pilot program to support these recyclers in collecting materials from commercial entities.

Why it Matters: In many communities, informal waste collectors play a key role in recycling. In **Bangkok**, informal waste collectors are estimated to collect an estimated 2 tons of recyclable waste each day (not much less than municipal collection of 2.6 tons per day). In Chile, an estimated 60,000 informal waste workers collect, separate, and commercialize materials like cardboard, glass, paper, and metal, contributing 86% of recycling at the economy level. Although they perform a valuable service, informal waste collectors often work in very difficult, unhealthy, and even dangerous conditions so efforts to integrate them and increase the effectiveness of recycling collection are important for both environmental and social reasons.

Increasing Stakeholder Outreach and Participation

Local governments are investing in public outreach and education to build public support and to encourage required behavior change. **Can Tho** included education on plastic pollution in primary and secondary curricula for students. Similarly, **Minneapolis** developed a Clean City Classroom curriculum for grades K-6 to teach students about litter prevention, waste reduction, recycling, composting, and other topics. **Orlando** established an Education Center at its water reclamation facility. Tours are free and the center features interactive components on wastewater, stormwater, water quality, conservation, litter, waste, recycling, and other relevant topics. In **Athens**, the county's Recycling Division has created materials to help businesses comply with mandatory recycling requirements, including "quick start" guides, FAQs, and a list of approved service providers, as well as sector-specific information for businesses such as retailers, restaurants, and bars. The county in which **Minneapolis** is located has a grant program to help residents, businesses, and organizations reduce waste, recycle more, and compost. The Missouri Department of Natural Resources has created an online directory that helps users, including residents of **Cape Girardeau**, find local vendors, contractors, and drop-off locations that offer recycling, reuse, and disposal.

Non-profit stakeholders are also key in this space. In **Bangkok**, a number of groups are using technology to incentivize, reward, and gamify improved waste management. For example, Bangkok Greenie's Thailand Green Map shows recycling drop-off locations, repair shops, eco-friendly options for food and convenience shopping, bulk and refill stations, second-hand clothing stores, sustainable accommodations, and other green options across the city. Eco-Life's app in **Bangkok** encourages waste separation and plastic reduction. In **Miami**, Clean Miami Beach and Miami Waterkeeper organize Classrooms in the Sand, which combine beach cleanups, water quality testing, and other activities to help students connect what they see in cleanups with items they use in their everyday life. Keep **Orlando** Beautiful, a volunteer organization, has hosted two Trash 2 Trends fashion show fundraisers in partnership with Sea World. The group produces a litter index for the city, as well as tracking litter from stormwater and street cleaning. Recycle Ann Arbor works with the city of **Ann Arbor** to provide recycling resources and education, including their user-friendly A to Z recycling guide that lets users enter the item in question to see if and where it can be recycled.

Businesses can also contribute to outreach and education. In **Santiago**, one local recycler conducts school visits with its mobile collection station, teaching local kids how to sort recyclables properly to minimize contamination.

Why it Matters: As consumers, residents make decisions about what to purchase on a daily basis. When they understand the consequences of those choices, they often become enthusiastic partners in reducing waste, whether it's bringing their own bags and water bottles, or forgoing a straw at a restaurant. Waste must be captured and sorted for circular systems to work, with residents playing their part to properly sort and dispose of their waste so that it can be recycled.

CAP as a Catalyst for Change

Building a circular economy is a process and many CAP communities have used the data and insights generated by the CAP to further advance their circular economy journey. A few examples include:

- **Bangkok** improved waste traceability and data to better align with its key performance indicators after its CAP.
- **Can Tho** is creating a plastics and recycling data hub by mapping and surveying informal recycling activities to quantify recyclable flows as a result of data surfaced by the CAP.
- **Melaka** is planning to create a clean river and coastal area by enhancing recycling infrastructure, building upon governance frameworks and policies, and increasing education with a focus on single-use and multilayer plastic building on insights from the CAP.
- CAP data was an input for a draft ordinance to eliminate plastic bags and EPS containers at the point of sale in **Athens**.
- The mayor of **Cape Girardeau** advocated for city needs with the federal government using CAP data.
- **Georgetown County** began bringing school-aged children to the landfill and recycling facility to learn about waste and circular economy after reviewing the results from its CAP.
- **Cherokee County** improved signage at its main drop off center and landfill facility based on CAP recommendations.
- **Minneapolis** mentored **Athens** in the implementation of a composting pilot program, demonstrating the power of the CAP program to surface insights and connections.

Included in the Appendix of this report is an Action Plan Template, which includes questions based on the CAP to understand plastic usage and pollution in a community. The template can guide decision makers to brainstorm and prioritize interventions across the plastics value chain.

Where APEC Leadership Could Make a Difference

As is evident from the CAP data, APEC CAP communities – including local governments, businesses, civil society actors, and everyday residents – are developing creative and innovative ways to improve circularity and prevent litter and marine debris that are appropriate to their specific context. However, authorities at the local level often lack the authority and resources (financial, technical, expert) to meet their goals. In particular, local governments need a supportive enabling policy environment for change to take root. The CAP APEC research clearly shows that policy at the economy level can foster or undermine local efforts. While the communities involved in this study vary greatly in context, size, and geography, some common themes emerge clearly from the data. APEC economies have an opportunity to exercise continued global leadership by targeting one or more of the following challenges:

Tobacco products: As noted in the Synthesis Report, tobacco products were the most littered item across APEC CAP cities (as they are globally). Even many smokers are unaware that their cigarette filters are made of plastic (cellulose acetate) that does not biodegrade in the environment. Worse, littered cigarette filters leach toxins, including heavy metals, nicotine, and pesticides into the environment, which often end up in the water supply. Further research on context-specific interventions to address tobacco products could generate significant environmental, social, and potential health benefits.

Extended Producer Responsibility (EPR): A few APEC CAP cities are in economies or U.S. states that have adopted EPR. A number of others are in economies where EPR is being rolled out or under active consideration. While EPR and the financial support it brings is unquestionably a boon for communities struggling to manage growing volumes of difficult-to-recycle or non-recyclable waste, there is considerable confusion among local governments around how EPR actually works in practice. Although EPR laws differ according to location and context, research into how to integrate local governments into new EPR regimes and resources to help local governments navigate the transition will help ensure that EPR is introduced as efficiently and effectively as possible.

Outreach and engagement: Consumers play an outsized role in building a circular economy. Consumers often need to sort and segregate their waste to facilitate recycling in line with their community's waste management system to avoid contamination and loss. They need to make the effort to dispose of their hazardous and other materials properly, which often involves bringing them to a specific location at a specific time. And they need to make a conscious decision not to litter, even when there are no convenient disposal options in their location. Many APEC CAP communities have challenges helping residents to understand their responsibilities and make the needed behavior changes – especially given confusing or misleading labeling on many items (especially compostable, biodegradable, and biobased plastics). Research into successful outreach and engagement initiatives, materials, and incentives that could be shared across APEC economies could give communities a starting point for these efforts. A more ambitious effort could focus on standardizing clear, easy-to-understand recycling labels for various alternative materials to minimize consumer confusion.

Source segregation: As is clear from the CAP data, many APEC CAP cities aim to introduce or improve source segregation. Their efforts are hampered by product labeling that is often confusing or misleading with regard to recyclability. As a result, even committed consumers struggle to sort their waste properly and often include non-recyclable items in their recycling (known as “wishcycling”), contaminating the entire bin. In some CAP cities with high population densities, small residences lack space for multiple recycling bins which complicates efforts, as does the inability to store waste for anything other than very short periods due to lack of space. Knowledge-sharing between APEC economies on creative programs, effective incentives, and clear consumer information could help more APEC cities implement source segregation in their communities, diverting waste from landfill and improving the recyclability of the remaining waste stream.

Access to composting: As noted previously, 48% of waste is organic on average globally, with the figure much higher in some APEC CAP communities. Processing organic and inorganic waste separately has a huge impact on waste management systems – diverting significant quantities of waste from landfills and improving the quality and recyclability of the remaining waste stream. Additionally, compostable materials

are increasingly used as substitutes for single-use plastic items that are being phased out, but most of these materials require industrial composting to break down properly. Compostables can be a problem if facilities are not set up to manage them. For example, in **Ann Arbor** the local composting facility stopped accepting most compostable plastics because they were not breaking down easily, underscoring the need for proper composting infrastructure for product use in the community. In some places composting is provided as a municipal service. In other cases, the private sector takes the lead. More information on how to support municipal governments – especially with low-cost options, how to get started, best practices, and how to bring consumers on board – or how to incentivize the private sector to enter the market could help more communities introduce this service.

Continuing to Build Policy on Solid Data: Finally, the APEC CAP reports provide a rich source for understanding what is happening on the ground in the region, including innovative solutions, challenges, pilot programs, and entrepreneurial initiatives. The value of this data would be enhanced by follow-on analysis to track the emergence of new ideas, policy and program implementation, and the concrete results of previous interventions. The upcoming CAP data portal and autonomous online training tools will simplify this effort by making the CAP cheaper and more accessible to implement, while also providing dynamic city-specific dashboards and comparison options that make data easier to synthesize for insight. APEC could again lead the way globally by investing in CAPs in additional cities and supporting repeated monitoring of key indicators like leakage and product design against CAP baselines to track progress over time and inform economies' next steps.