PLASTIC SMARTCITIES

WWF

Working with cities worldwide to keep plastic out of nature by 2030

PLASTIC SMART GUIDES FOR CITIES

Developed for cities as a step-by-step process to achieve their Plastic Smart targets.

PLASTIC SMART GUIDES (Summary)

The Plastic Smart Guides were developed for cities as a step-by-step process to achieve their Plastic Smart targets. These guides will continue to be molded from lessons learned, and case study examples across the PSC community, as well as best practices, cataloged on the [Plastic Smart Cities Website](). While the initial guides were developed by WWF colleagues and external experts, moving forward, we seek to include guidance and real-world examples from you, our PSC community.

The Plastic Smart Guides are broken down into the 5 core steps outlined below:

1. DECLARATION OF INTENT

This declaration outlines a city's plastic pledge as a member of the Plastic Smart Cities community. The declaration must be signed by a city authority (e.g. a Mayor), and in some cases, the city council may need to be officially consulted. See the Declaration of Intent guide to launch your city's Plastic Smart journey.

2. BASELINE ASSESSMENT

This guidance was developed by the WWF Baseline & Monitoring Working Group in June 2021, to support cities as they proceed with their first actions following the signing of their Declaration of Intent. This guidance is an efficient step-by-step process for developing a city baseline on waste flows, plastics management and plastics leakage into the environment, identifying preferred data collection and analytical tools to ensure consistent monitoring and reporting of outcomes, and to ensure the recommended baselining process is cost effective and replicable across Plastic Smart Cities.

Please see the Baseline Assessment guide for more information.

3. CITY ACTION PLAN

This guidance outlines a city's approach to developing an action plan, taking into account the findings of the baseline assessment, to identify priority interventions with high impact for reducing plastic pollution. Developing the Action Plan should be an iterative process, involving consultations with key stakeholders, while remaining flexible to adapt as local situations change.

Please see the City Action Plan guide for more information, and download the City Action Plan Template as a reference.

4. IMPLEMENTATION

This guidance outlines the implementation of activities described in the City Action Plan, from policy interventions, to improving waste management capacity (collection, separation and recycling infrastructure), to multi-stakeholder processes and citizen engagement. Implementation toward specific targets, requires careful planning and monitoring and evaluation to assess impact. The implementation phase should also include a pilot project to trial solutions within a designated area, with a goal to reduce plastic pollution by 30% in the pilot area.

Please see the Implementation guide for more information.

5. MONITORING AND EVALUATION

This guidance was developed by the WWF Baseline & Monitoring Working Group in June 2021, to support cities as they identify key performance indicators to monitor and assess changes over baseline conditions. The Monitoring and Evaluation plan closely aligns with the Baseline Assessment, and recommends third-party monitoring tools and internationally recognized guidelines.

Please see the Monitoring and Evaluation guide for more information.

DECLARATION OF INTENT

Plastic Smart Cities is an initiative launched by WWF, with a mission to inspire and encourage cities and coastal centers, and foster collaboration between stakeholders worldwide, to take bold action on plastics to achieve no plastics in nature by 2030. The Declaration of Intent (DOI) outlines a city's plastic pledge as a member of the Plastic Smart Cities community, and must be signed by an official city authority, often a mayor, and often with the support of the city council.

Plastic Smart Cities commit to advance the mission of the Plastic Smart Cities initiative, and to support it by taking ambitious action at a local level, in close collaboration with citizens, civil society, national authorities, international institutions, the private sector and academic institutions, with a view to achieving no plastics in nature by 2030, and also committing to do the following:

BASELINE ASSESSMENT - Conduct a baseline assessment of plastic waste flows in the city to identify current levels of mismanaged waste and priorities for intervention.

CITY ACTION PLAN - Develop a city action plan with clear targets and timelines that describe the city's planned activities in response to the priorities identified in the baseline assessment, as well as allocate adequate resources to execute said activities.

IMPLEMENTATION - Launch a pilot project to trial solutions to plastic pollution within a designated area, with a goal to reduce plastic pollution by 30% in the pilot area and with a goal to reduce plastic pollution throughout the city by 30% within five (5) years.

MONITORING AND EVALUATION - Develop a monitoring and evaluation plan and report annually on progress towards the city action plan.

LEADERSHIP - Appoint an in-house staff member as the city's lead person for the Plastic Smart Cities initiative, and who is responsible for coordinating with WWF staff, and reporting annual progress toward the city's action plan.

Plastic Smart Cities will exercise strong leadership to mobilize the relevant municipal departments, engage citizens and local stakeholders, build the necessary capacity and skills, prioritize resources, promote sustainable products and services through their public procurement practices, and adopt and enforce the necessary policy regulations.

Please download the declaration (English | Spanish) and contact the PSC team to launch your city's Plastic Smart journey.

If your city is working closely with a regional WWF office and/or local funding partner, and is making time-bound commitments, please contact your regional WWF office to launch your city's Plastic Smart journey with a time-bound declaration.

BASELINE ASSESSMENT

This guidance was developed by the WWF Baseline & Monitoring Working Group in June 2021, to support cities as they proceed with their first actions following the signing of their Declaration of Intent. It is not intended to be prescriptive, as cities themselves are best positioned to decide how to conduct their activities, given local challenges, resources and capabilities.

WWF is currently working closely with 25 pilot cities in Southeast Asia and China, and has developed a separate baseline guidance that is relevant to those specific cities. This guidance however, while complimentary to the baseline activities and learnings from the 25 pilot cities, was developed in an effort to create a standard methodology that can be easily and cost effectively replicated across all cities and regions, to enable long-term monitoring and evaluation towards PSC defined plastic targets. This is an evolving guide that will change over time to reflect lessons learned.

WHAT IS A BASELINE?

A baseline assessment provides information on current conditions in which the city seeks to change. It provides a critical reference point for assessing changes and impact over time, as it establishes a basis for comparing the situation before and after interventions, and for making inferences as to the effectiveness of the initiative.

Baseline assessments are most useful when conducted before the City Action Plan is developed, and before interventions are adopted and implemented, so as to serve as a benchmark for monitoring and evaluating change, as well as to guide and inform priorities and decisions.

Baseline assessments should be carried out in a methodical way, ensuring that the same type of data can be collected at different stages in time, in order to compare the results and assess the extent of change, or lack thereof. The type of data to be collected and considered in the baseline is dependent on a number of factors, including, but not limited to, the existing waste management infrastructure, level of informal sector inclusion, current available waste data, the key performance or change indicators expected to be included in the Monitoring and Evaluation methodology, as well as the specific requirements defined within the scope of a project, which can include donor requirements.

Baseline assessments for PSC intents and purposes, can focus on two separate, but closely related assessments:

1. **Waste Flow Scoping Assessment** – assessment of solid waste generation, collection and management, identifying a city's waste management processes, capabilities and possible leakage into the environment; and/or
2. **Litter Baseline Assessment** – community-level data on plastic leakage into the environment, obtained through litter data collection in the field. Litter is defined in this context as plastic waste materials that have been discarded improperly, in an inappropriate location, either intentionally or unintentionally.

While both assessments are recommended, and can be complementary to each other, it is entirely up to the city to decide which types of assessments will best meet its baseline objectives, based on available data, funding, and resources.

In both types of assessments, we must be cognizant of our monitoring capabilities. In instances where we collect robust datasets in our baseline assessments, but cannot collect equivalent datasets through follow-on monitoring efforts, then the baseline can quickly become irrelevant, as there are no mechanisms to measure the effectiveness of interventions and investments. A more streamlined baseline assessment, one that adheres to a monitoring methodology that can be easily and cost effectively replicated, is preferred over an exhaustive baseline assessment that cannot be practicably replicated.

WHAT ARE THE RECOMMENDED BASELINE BOUNDARIES?

While there are many credible baseline assessment methodologies that can be used to collect community-level data to inform and guide a city's PSC approach, given limited time and dedicated resources, we make an effort to define clear boundaries to focus the scope of the assessment. A fully comprehensive baseline assessment can include seven community components: 1) inputs, 2) consumption, 3) product design, 4) use, 5) collection, 6) end-of-cycle management (including collection and waste management), and 7) plastic leakage into the environment.

While all components are relevant to a comprehensive plastics strategy, the upstream components, from inputs through to the use phase, fall outside the scope of our recommended baseline assessment. We therefore suggest a baseline focus on end-of-cycle components (components 5-7 mentioned above) to include at minimum **plastic collection, management and leakage** – downstream data that can be leveraged to inform local policies and interventions. Secondary components that can also be obtained and used to inform local activities can include data on plastics use, in an effort to better understand how plastic waste is generated at the community-level.

WHAT DO WE WANT TO KNOW?

The ultimate measure for the success of the PSC initiative is the reduction of plastic leakage into the environment. Inline with this objective, cities join the PSC initiative and commit to two targets:

1. **Achieving a 30% reduction in plastic leakage in the near term**; and
2. **No plastics in nature by 2030**.

Keeping in mind that the No plastics in nature by 2030 target will require 100% collection rates, full containment and processing capabilities – a hard stop on all plastic leakage - we must set reasonable expectations for PSC's role in building this sector. PSC does not have the capacity, expertise or financial resources to build and manage public infrastructure to meet this target, and so much of this responsibility must be supported by, or delegated to, other entities.

Further, as the No plastics in nature by 2030 target is largely aspirational, and can be assessed without reference to a baseline, it is the 30% reduction target that is most relevant to our baseline methodology. While the ultimate plastic leakage baseline measure is **kg of plastic waste leaked into nature, per capita, per year (kg/capita/year)**, this can be a challenging number to quantify

with a high degree of confidence. Possible alternative quantification approaches can include **plastic item counts and/or weighted volumes in specific target areas**.
The litter data can also be used in a more computational manner – litter counts and volumes per measured area can be combined with city population densities to arrive at relative plastic litter densities, among other relevant multipliers. These more advanced calculations can add perspective and another layer of understanding to better support the City Action Plan, proposed interventions, external communications and public information exchanges.

While a Waste Flow Scoping Assessment can provide key insights concerning leakage from the municipal solid waste management (MSWM) system, such plastic leakage can be difficult to measure accurately when advanced MSWM systems are not in place. Providing fundamental collection services and infrastructure in such cases, can often deliver the most immediate and lasting impacts of any waste management activity. But in many such scenarios, the lack of basic infrastructure is already known, making the scoping assessment most relevant to identifying the specific MSWM infrastructure needs in order to achieve the longer term target of No plastics in nature by 2030.

1. WASTE FLOW SCOPING ASSESSMENT

Purpose

- Understand MSWM infrastructure needs for No plastics in nature by 2030 target
- Gain insight into the city's solid waste collection and management infrastructure, including collection performance, costs, community and collector attitudes (including informal sector) and possible sources of leakage into the environment
- Gain knowledge on quantities, composition and characterization on types of waste
- Identify current waste policies, practices and overall governance
- Identify key intervention areas for inclusion in the City Action Plan

There are many options for collecting and analyzing waste flow scoping data. From scaled down approaches, looking solely at available information and data sets, in an effort to establish a general understanding of the MSWM system processes, capabilities and throughput, to more holistic approaches, recommended for cities that have allocated budgets and technical support for a highly detailed Waste Flow Scoping Assessment.

Option 1 – Low Resolution
Expected time commitment: 3-5 days
Team resources: one person
Output: 3-5 page waste flow scoping report
The Waste Flow Scoping Assessment includes community-level data on waste collection and management, in an effort to identify a city's waste management processes and capacities. The scoping assessment, at the minimum, includes a desk study for relevant reports or data sets on

MSWM data in the city and/or region, as well as interviews with MSWM authorities. Defined leakage from the system can be based on these existing reports and the assumptions made within these reports. The scoping assessment focuses primarily on the physical components of the MSWM system, but also includes some high level governance aspects as well. At the very least, the scoping assessment should answer the following questions:

1. **Solid Waste Collection and Management**
    - How is solid waste collected, processed and managed?
    - What is the composition of the waste stream? (quantification and characterization)
    - How much and what types of plastic are in the waste stream? (quantification and characterization)
    - How and where does storm water drain into other waterways?
    - Plastic leakage assumptions?
2. **Waste Policies**
    - What waste policies are in force and/or pending (bans, taxes, refund deposit schemes, extended producer responsibility)?

This option is based on methods developed for the Circularity Assessment Protocol at the University of Georgia and the Sea to Source Methods Toolkit. For all related research questions from this guidance, see Appendix 1.

The scoping assessment will enable the city to obtain core metrics on the functioning of the MSWM system, which should be assessed on an annual basis to observe changes over time. These metrics should be reported to the PSC team as part of the city's PSC commitment.

WASTE FLOW SCOPING ASSESSMENT OUTPUTS AND REPORTING

Reporting Metrics	Data Source	Method	Frequency
1. % people with access to collection services - collection frequency - separated collection? **2.** % plastics recycled **3.** # items banned or replaced **4.** % landfill properly manage **5.** Estimated plastic leakage	City authorities, waste management agencies, NGOs, Intergovernmental organizations, research institutions	Desk search + interview with MSW staff WWF/Consultants to assist if resources are available	1 x per year Cities report this as part of their PSC commitment

2. LITTER BASELINE ASSESSMENT

Purpose

- Provide the framework and methodology to measure trends in litter in/near pilot areas over time.
- Gain knowledge on quantities, composition and sources of litter entering the environment to enable a targeted approach

- Key intervention/improvement areas can be identified and later addressed in the City Action Plan
- Harmonized litter monitoring across cities
- Use data to drive change by government, business, public/households/individuals

The Litter Baseline Assessment will include community-level data on plastic leakage into the environment that will be obtained through litter data collection in the field.

Litter Data

- What types of litter are found on the ground / types of plastic? (characterization)
- What is the litter density (litter item count/area) in sample locations? (quantification)
- How much plastic is flowing through the storm water system? (quantification)

LITTER BASELINE ASSESSMENT OUTPUTS AND REPORTING

Reporting Metrics	Data Source	Method	Frequency
Quantities, composition, sources and trends in amounts of litter Trends in SUP items in pilot areas	WWF, Citizen Science, Implementing Partners	Surveys on selected reference sites/litter transects near pilot areas	2 x per year at minimum (consider seasonality differences, particularly for tourist destinations)

Process

There are 3 widely adopted monitoring methodologies: OSPAR (Europe), NOAA (USA) and CSIRO (Australia). All methodologies are quite similar, and all can serve your monitoring methodology as reference resources, keeping in mind however that the methodology most frequently used in your region may lend some additional advantages and regional considerations. We recommend using survey field forms from these well-established methodologies. The first survey carried out will serve as the reference for future monitoring. All subsequent monitoring results will be evaluated against the first survey.

For the selection of survey locations, we recommend the Sea to Source Methods Toolkit for land-based systems, as described on pages 10-16 of that toolkit. This toolkit was developed by an interdisciplinary group of scientists and engineers co-led by National Geographic Fellows Jenna Jambeck and Heather Koldewey. The toolkit provides researchers with a common framework and methodology that can be deployed rapidly, with small teams, and provide useful scientific data. The methods provide outputs and results that are either complementary or comparable to current methods in use by other global programs to assess plastic pollution and adhere to accepted scientific sampling methods and standards in peer-reviewed literature.

We recommend a six-step process to planning, implementing and reporting your Baseline Litter Assessment:

1. **Define criteria for site selection and select sites:**
    - 100 meters x 1 meter transects as referenced in the 3 options below;
    - 1 square kilometer sites across a city/community; or
    - use stratified random sampling to select sites within a 10-kilometer x 10-kilometer area of the city, with population density considerations
2. **Organize surveyors – staff, volunteers, trainers**
    - Organize teams of 2 people per site
3. **Set-up data collection and management tool**
    - Leverage Debris Tracker, Litterati, Ellipsis or other tool to ensure consistent data collection and reporting of outcomes; though we recommend the free and open-source Debris Tracker, which aligns with the Sea to Source methodology
4. **Plan survey schedule**
    - at least 2 x per year, but could be as frequently as 1 x per month if resources are available
5. **Conduct first survey**
    - collect data at designated sites, upload to database
6. **Write Baseline Litter Assessment report using initial survey data**
    - Report data and analyze trends

Depending on a city's available resources and time schedule, the litter assessment can be a low resolution and highly concentrated assessment on limited but carefully selected sites and litter categories, or it can be scaled up to capture higher resolution data by adding sites and more detailed litter categories. The three options below can be adapted to fit the local context, with resources and capacity considerations. These low-medium-high resolution options are based on common practices and methodologies that are deployed in the field, by Litterati, Debris Tracker, and the Sea to Source Methods, among others.

Option 1 – Low Resolution
Expected time commitment: 2 hours training + 1 hours per site (for low-quantity litter areas less than 100 pieces per 100-meter transect)
Team resources: 10 people + 1-2 trained experts
Survey sites: 10 sites (3 segments per site), equal to 3 km of linear research
Litter Classification: 1-6 litter categories
Output: 3-5 page litter baseline report

Option 2 – Medium Resolution
Expected time commitment: 2 hours training + 1 hours per site (for low-quantity litter areas less than 100 pieces per 100-meter transect)
Team resources: 10-15 people + 1-2 trained experts

Survey sites: 30 sites (3 segments per site), equal to 9 km of linear research
Litter Classification: 1-60 litter categories
Output: 5-7 page litter baseline report

Option 3 – High Resolution
Expected time commitment: 2 hours training + 1 hours per site (for low-quantity litter areas less than 100 pieces per 100-meter transect)
Team resources: 15-20 people + 1-2 trained experts
Survey sites: 60 sites (3 segments per site), equal to 18 km of linear research
Litter Classification: 1-90+ litter categories
Output: 7-10 page litter baseline report

APPENDIX 1
WASTE FLOW SCOPING ASSESSMENT - RESEARCH QUESTIONS[2]

Waste and Recycling Collection

1. Who collects waste? Who collects recycling? Is there informal sector involvement? (If so, describe system)
2. How is waste collected? Door to door, by community dumpster, etc.?
3. How often is waste collected?
4. What percentage of the community has access to waste collection?
5. How is waste collection paid for in the community? Is there a cost to households? How much does it cost?
6. Are there any specific obstacles to reaching 100 percent collection?

Waste Generation, Characterization, and Management

1. How much waste is generated per capita? Total generation rate for city/community?
2. How much does each type of waste material contribute to the overall output? What percentage of overall waste is organic, paper, plastic, metal, or other materials?

3. What is the biggest source of waste in the community? How much is generated by industry, tourism, households, and by other means? Consider seasonality changes in population, particularly in tourist destinations.

4. How and where is the city/community waste managed? How much of it ends up in a landfill or recycling? Tabulate by percentage if possible. Is there an informal sector involvement? If so, describe the system and how it operates.

5. How many facilities does the city/community use or operate to manage its waste? What types of facilities does each community use?

6. Are there any other waste management practices that I might not have observed?

Policies

1. Does the community have any bans on plastic, or regulations or policies addressing plastic? Examples: bag bans, taxes on certain products, or bottle deposit schemes.

2. How is this policy enforced?

Litter

1. Does street sweeping or gutter cleaning occur in the community? If so, how often?

2. Are there any other litter cleaning practices or policies in place, such as skimmer boats, grate collection devices, or other methods?

3. Is litter abundant in adjacent ecosystems (beaches, rivers, mangroves, seagrass, etc.), and are community cleanups arranged by local groups?

[1] 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 (e.g., single-use plastic) into the environment and increase circular materials management; https://www.circularityinformatics.org/

[2] Research questions derive from the Sea to Source Methods Toolkit

CITY ACTION PLAN

This guidance outlines a city's approach to developing an action plan, taking into account the findings of the Baseline Assessment, to identify priority interventions with high impact for reducing plastic pollution. Developing the Action Plan should be an iterative process, involving consultations with key stakeholders, while remaining flexible to adapt as local situations change. Please see published PSC City Action Plans for best practices and guidance, as well as download the City Action Plan Template as a reference.

BACKGROUND

Our growing waste stream is uniquely representative of the many challenges now facing our global community. With 8-12 million tons of plastic waste entering the ocean annually, and with global waste generation expected to increase by 70% over the next 30 years, plastic waste prevention and management programs are critical to the health and well-being of our urban populations. Poorly managed plastic waste affects human health and livelihoods, it effects our environment, living creatures, and economic opportunities. Therefore, a well developed City Action Plan on plastic waste is critical to ensuring a sustainable, healthy, and inclusive global community.

First, we must take inventory by assessing our local waste stream (see Baseline Assessment), collecting hard data to guide our city strategy. **Second**, we must commit resources and develop a comprehensive strategy to educate, motivate and mandate - both individuals and industry - to adopt waste prevention strategies that reduce the volume of waste that must be collected and managed at the local level. **Third**, we must employ a scalable waste management program that adheres to the universal waste hierarchy, understanding that the largest initial gains in reducing pollution can often come from improving waste collection and processing methods.

While cities will rapidly increase their populace to account for two-thirds of the global population by 2050, they must adopt smart solutions that reduce the collective impact of their prospering communities. This means preventing, minimizing and managing plastic waste, by adopting a comprehensive strategy that changes attitudes and behaviors through actions that educate, motivate and mandate, when necessary:

Educate through public awareness efforts to encourage behavioral change. Creating awareness among the general public as well as the business community is fundamental to changing behavior and attitudes about the way people consume resources and generate waste. Sharing practical information and guiding tools about how individuals or companies can prevent and reduce waste in their daily lives, is a critical first step.

Motivate through measures that incentivize change or disincentivize status-quo. Motivating strategies often provoke actions by incentivizing people to make behavioral changes that support waste prevention. The strongest stimulus is the polluter pays principle, which places all costs for the environmentally sound management of generated waste onto the waste generator. Fees, management prices, or appropriate schemes of Extended Producer Responsibility (EPR) are possible instruments.

Mandate change through regulatory action. Regulatory strategies addressing waste prevention can take many forms such as enforcing bans on the use of single-use plastics (strict avoidance) as well as imposing limits on the volume of waste generated (source reduction) by certain industrial activities. With industry at the helm of making design and production decisions that affect all other product life-cycle stages, industry is often a target for regulatory strategies. Sustainable design requirements, producer responsibility initiatives, environmental controls through permitting and take-back mandates are all examples of regulatory strategies.

ACTION PLANNING

A well-developed City Action Plan will identify trends and key findings from the Baseline Assessment, it will include an overview of the city's priority activities and interventions (see Best Practices for case study examples), as well as an implementation timeline and key performance indicators for measuring changes over time (see Monitoring and Evaluation guide).

As city stakeholders develop a comprehensive strategy and consider the various solutions available to them, a systematic approach for prioritizing actions should closely align with the Baseline findings:

1. Evaluate priority areas and solutions for implementation.

- Based on the findings of the baseline assessment, evaluate interventions that can effectively address the specific problem or need that has been prioritized, and assess solutions for **Appropriateness-of-Fit** and applicability
- Assess the **Ease of Implementation** given the time and resources needed, as well as the city's regulatory and institutional capacity and financial strength and stability.
- Assess the **Impact** of the preferred solution on all sectors and all segments of the population, with consideration for social, economic and environmental impacts.
- Identify preferred solutions for implementation

2. Engage stakeholders and raise public awareness

- Engage stakeholders throughout the entire process of solution formulation, and encourage input from those that will be affected by the preferred solution, using evidence based studies to gain support

- Stakeholders may include retailers, consumers, industry representatives, government, manufacturers, civil society, environmental groups, tourism associations, among others

- Launch a public awareness campaign to clearly articulate the problem and related impacts, and build public support for the intervention prior to adoption and implementation

3. Encourage uptake of alternatives as may be applicable

- Ensure that alternatives promoted by the solution are widely available to all segments of the population, and that the conditions in the local market are adapted to encourage successful uptake

- Consider economic incentives to encourage use of alternatives while also supporting industry through the initial transition
- Incentives can include subsidies, tax rebates, discounts, etc.

FOCUS AREAS AND BEST PRACTICES

Priority activities and interventions should align with the internationally recognized Waste Hierarchy, with prevention as a first priority placed at the top of the hierarchy, and with disposal at the bottom of the hierarchy, considered only as a last resort.

I. PLASTIC WASTE PREVENTION

Waste prevention depends fundamentally on changes in the attitudes and behavior of individuals and businesses, and on a transformative shift in industrial processes and product design. Waste prevention refers to practical actions that reduce the quantity of materials prior to materials and products becoming wastes.

Waste prevention is therefore fundamentally different from waste management activities, as waste management activities are implemented after materials become waste. Employing waste prevention strategies can effectively reduce the volume of waste that must be managed, placing less strain on local waste collection and management programs.

Waste prevention includes Avoidance – eliminating the need for a product or material; Source Reduction – eliminating waste and pollution at source through process changes; and Direct Re-use/Prolonging Use – extending product life, serving as a diversion of waste flows.

See the Plastic Smart Cities Prevention Best Practice catalogue for additional intervention opportunities.

II. PLASTIC WASTE COLLECTION

Half of the world's population does not have access to waste management services. This is largely a result of constrained city budgets, as waste management can often consume 50% of a city's total annual spend. While plastic waste represents a significant economic and environmental cost borne by cities and society as a whole, plastic waste is also a largely untapped opportunity.

Environmentally sound waste management is an opportunity to avoid the detrimental impacts associated with plastic waste in nature. It's also an opportunity to recover valuable resources that can add environmental, economic and social benefits. Advanced waste management processes can reduce costs, create local jobs, protect public health and ecosystem vitality.

A core element of any waste management system is waste collection rates, which are ultimately dependent on local factors – governance, geography, population density, consumption patterns, public awareness, amongst others.

A staggering 90% of waste produced in low-income countries are openly dumped or burned. These same cities are growing at a rapid pace, but without adequate waste management systems in place, the ocean and our global coastlines will only serve as a dumping ground for yet more plastic debris. The imperative is for cities to develop waste management programs that increase collection rates and eliminate leakage during transport to reception facilities.

Waste management is a cooperative process that requires multi-stakeholder engagement - the City Government, businesses, NGOs, and individuals in the community all have an important responsibility to ensure environmentally sound waste management.

See the Plastic Smart Cities Collection Best Practice catalogue for additional intervention opportunities.

III. PLASTIC REUSE AND RECYCLING

Plastic production is expected to double over the next 20 years. According to the Ellen MacArthur Foundation, only 14% of plastic packaging is collected for recycling. Plastic packaging valued up to USD 120 billion annually is leaked into nature after a single-use. Increasing plastic collection rates is first and foremost, in order to recapture valuable materials for reuse and recycling. Developing second-use markets and local recycling infrastructure can extract value from materials that are often discarded.

Reuse extends product and material life cycles, to reduce the waste stream. Innovative reuse models can unlock significant benefits, enabled by digital technologies and shifting user preferences. Such models can help deliver a superior user experience, customize products to individual needs, gather user insights, build brand loyalty, optimize operations, and save costs.

See the Plastic Smart Cities Reduction & Reuse and Recycling Best Practice catalogues for additional intervention opportunities.

IV. PLASTIC MONITORING AND EVALUATION

Monitoring local waste streams is critical to developing sound city strategies. Gathering hard data on the types of waste and volumes of waste that are generated can help the city design fitting waste management programs, allocate resources to ensure appropriate collection infrastructure and scheduling, establish short and long-term targets for collection and diversion, and adapt as consumption patterns evolve. With good data, cities can better assess relevant technologies, applicable best practices given the local context, and identify strategic partners for service provisions.

See the Plastic Smart Cities Baseline Assessment and Monitoring and Evaluation guides. Also see the Waste Flow Tools Best Practice catalogue for case study examples.

IMPLEMENTATION

This guidance outlines the implementation of activities described in the City Action Plan, from policy interventions, to improving waste management capacity (collection, separation and recycling infrastructure), to multi-stakeholder processes and citizen engagement. Implementation toward specific targets, requires careful planning and monitoring and evaluation to assess impact. The implementation phase should also include a pilot project to trial solutions within a designated area, with a goal to reduce plastic pollution by 30% in the pilot area.

OVERVIEW

Cities represent the driving force of development in economic, social, and cultural life, reflecting also the spatial organization of human society. And while each city has its own defining features, challenges, and goals, there are also many commonalities and shared ambitions among us. One notable shared ambition among Plastic Smart Cities, is achieving No Plastic in Nature.

Even as plastic pollution, especially marine plastic pollution, is a transboundary global problem, many cities around the world are working diligently to eliminate plastic in nature, but are grappling with the challenges of addressing the problem at a local level, alongside national, regional and international efforts. Systemic failures across the life-cycle of plastics, such as the price of plastic that excludes the negative externalities to nature and society, cheap plastic resulting in prevalent single-use business models, low waste management capacities in developing countries, and a linear economic model that precludes recovery into high quality - high value resources, have led to plastic pollution on an unprecedented scale.

At the local level, in order for cities to reduce their plastic footprint and the associated impacts on nature, society and the economy, we need new policy standards, new incentives for industry, and new models of innovation for plastic avoidance, use, reuse and waste management.

There is no one-size-fits-all solution. Rather each city's unique defining features and situation on the ground must inform the city's approach. Policy prioritization should also carefully consider the waste hierarchy, with priority on upstream plastic prevention interventions that reduce the volume of plastic waste that must be collected and managed at the local level. These upstream interventions on production and distribution can be complimented by measures that create and support downstream markets and stakeholder interactions that improve waste collection and processing services, strengthens the local recycling sector and transitions open dump sites to controlled disposal facilities.

No single policy is capable of ushering in a smooth transition, but a systematic approach that combines measures across the life-cycle of plastic and across all stakeholders in the city can lead to long-term success.

PRIORITIZING SOLUTIONS

With a host of solutions available to municipal governments, as outlined in Best Practices, it is important to establish a process for prioritizing solutions that can effectively address the plastic challenges and baseline conditions existing within the city, as defined in Baseline Assessment.

A blended approach that leverages instruments across the spectrum, to include a mix of Regulatory Instruments, Financial Instruments, Voluntary Instruments, and Education

Instruments, and that which combine both upstream and downstream measures, can create incentives that reduce production and consumption of plastics, while also increasing collection and recycling capacities.

But it must be emphasized, that local factors must shape municipal plastic policy. Such factors can include climate, attitudes and expectations of citizens, economic factors, animals, financial planning and purchasing, legislation, and architecture and infrastructure. What works in a European city of 400,000 people, can not be directly exported to a city in Brazil of 4 million people, or to a city of 20 million in China or India.

The living situations and needs of a city's residents are vital inputs for designing and implementing successful waste policy. Do residents have space at home for 5 bins? Do they live in large apartment buildings or sparse homes in the countryside? Are they a young or ageing population? Such information can provide invaluable inputs that shape policy and public services from waste collection frequency, to source separation requirements and expectations, to willingness-to-pay for collection services.

Building on the local context, proposed solutions can be prioritized at a local level by assessing three key decision points**: 1. Appropriateness-of-fit, 2. Ease of Implementation,** and **3. Impact**. Each key decision point contains important criteria with value levers that can be scored on a relevant scale, allowing for the comparison of different policy options. A simple scoring method can suffice for this exercise, a scoring range between 1 and 5 for example, with scores being aggregated and weighted across the criteria in the framework, to identify the favored policy option with consideration the three key decision points.

1. **APPROPRIATENESS-OF-FIT**
   Based on the findings of the baseline assessment in ***Step 1*** of the 5-Step Guide, evaluate policy instruments that can effectively address the specific problem or need that has been prioritized, and assess policies for Appropriateness-of-Fit and applicability.

Priority	Criteria	Value Lever	Description
Applicability	Coherence	Alignment with existing policies	Is it aligned with existing regulatory frameworks and ongoing discourse on ocean litter priorities?
	Relevance	Acceptability	Is it aligned with the regional economic and social agenda? Is the measure likely to be acceptable to the wider community?
		Fairness	To what extent is the measure perceived to be a fair instrument?
	Suitability	Enforceability	Is the measure enforceable by the government, given the local behavioral, cultural and business context?
		Trust and transparency	To what extent is the measure vulnerable to externalities like corruption and unavailable data?

Source: "Plastics Policy Playbook, Strategies for a Plastic-Free Ocean," Ocean Conservancy

2. **EASE OF IMPLEMENTATION**
   Assess policy Ease of Implementation given the time and resources needed, as well as the city's regulatory and institutional capacity and financial strength and stability.

Priority	Criteria	Value Lever	Description
Ease of implementation	Financial viability	Implementation cost	What is the total cost of implementation? Is the measure likely to be cost effective?
		Cost recovery	Does the measure provide sufficient financial returns, and does it ensure a sustainable source of financing waste collection?
	Executability	Complexity	How difficult is the measure to understand, implement and enforce?
		Regulatory and institutional support	To what extent is the measure scalable? To what extent is regulatory support required to monitor and control the measure?

Source: "Plastics Policy Playbook, Strategies for a Plastic-Free Ocean," Ocean Conservancy

3. **IMPACT**
   Assess the impact of the preferred policy on all sectors and all segments of the population, with consideration for social, economic and environmental impacts.

Priority	Criteria	Value Lever	Description
Impact	Economic	Collection potential	What is the volume of plastic waste that the measure is trying to address and will it lead to desired levels of improvements in plastic waste collection?
		Coverage	What is the type of plastic waste collected? Does the measure enable collection of diverse, including low value plastic waste?
	Environmental	GHG emissions	What is the impact of the measure on air pollution levels, particularly GHG emissions?
		Marine habitat impact	To what extent will the measure reduce leakage of harmful plastics in the ocean due to open or illegal dumping of waste?
	Social	Employment	Will the measure create sufficient job opportunities and improve employment conditions in the region?
		Health	Will the measure eliminate or address health and safety concerns in waste management?

Source: "Plastics Policy Playbook, Strategies for a Plastic-Free Ocean," Ocean Conservancy

IMPLEMENTATION PHASES

Based on case studies and the existing body of research on plastic solutions , Plastic Smart Cities has categorized the core instruments into three generalized implementation phases: near-term, mid-term and long-term. Though, as outlined in this section, each city's local situation and influences will ultimately dictate the appropriate prioritizations with consideration for Appropriateness-of-fit, Ease of Implementation, and Impact.

Recommended Phase 1 actions (near-term)

- **Public Awareness** - Develop public awareness campaigns in collaboration with business and NGOs, to change the way that plastic is viewed, used and managed as waste. Beach and coastal clean-ups can also increase public awareness and galvanize support across the community.

- **Public Procurement** – Implement Public procurement policies to give preference to environmentally preferable non-plastic products for city operations and contracts, and to set a model example for stakeholders to follow.
- **Municipal Collection** - Establish dedicated collection points throughout the city as well door-to-door waste collection capacity.
- **Source Segregation** – Establish sorting requirements to increase the quality of waste collected at the household or institutional level.
- **Sanitary landfills** - convert any existing open or uncontrolled dump sites into purpose built sanitary landfills.
- **Voluntary Agreements** – Establish voluntary agreements as a strategy to move industry, businesses and citizens towards more sustainable alternatives.
- **Public-Private Partnerships –** Establish strategic partnerships that encourage businesses to make firm commitments on plastic towards transformative business models.
- **Municipal Unions** – Establish collective unions with neighboring municipalities to pool resources and increase capacity for collection and processing, as well as communal interventions in shared waterways, such as trash booms and racks in rivers and storm drains.

Recommended Phase 2 actions (mid-term)

- **Bans** on single-use plastics
- **Pay as you Throw** – Charge fees at the local level for waste collection services.
- **Advanced Disposal Fees** – Levy non-refundable fees on individual products at the point of purchase. The fee is built into the price of the product based on the estimated costs of collection and processing.
- **Taxes and Levies –** Impose taxes and/or levies on manufacturers, retailers or consumers for use of single-use plastic items to support the transition to reuse systems.
- **Blended Financing Instruments** - Use public, private or philanthropic capital to increase investment in projects that improve waste management capacities.
- **Deposit Refund Schemes –** Implement a deposit refund scheme that requires consumers pay a small amount of money when buying plastic products, which can be reimbursed when they bring the container to a collection point after use.
- **Product Certifications –** Endorse third-party certifications, labels or rankings on products that are plastic-free, contain low volumes of plastics, or are composed of secondary plastics to help create awareness and drive market differentiation.

Recommended Phase 3 actions (long-term)

- **Extended Product Responsibility (EPR) –** Collaborate with national authorities to leverage EPR financial resources to fund local collection and waste processing.
- **Packaging Material Fees –** Collaborate with national authorities to leverage pooled fees to fund packaging waste management activities.
- **Municipal Bonds –** Issue municipal bonds to finance capital expenditures for waste management facilities and services.

- **Landfill taxes** – Charge taxes on private landfill operators to help drive waste away from landfill towards preferable disposal alternatives, such as composting, recycling, and reuse.
- **Plastic Credit Systems** – Establish a system that requires producers to meet specified obligations and purchase recycling certificates based on the amount of plastic waste recycled.

[1] Measuring Urban Development and City Performance, Jasmina Mavrič and Vito Bobek, 2014

MONITORING AND EVALUATION

This guidance was developed by the WWF Baseline & Monitoring Working Group in June 2021, to support cities as they identify key performance indicators to monitor and assess change over baseline conditions. The Monitoring and Evaluation plan closing aligns with the Baseline Assessment, and recommends third-party monitoring tools and internationally recognized guidelines.

Monitoring local waste streams is critical to developing sound city strategies. Gathering good data on the types and volumes of waste that are generated can help the city design suitable waste management programs, allocate resources to ensure appropriate collection infrastructure and scheduling, establish short and long-term targets for collection and diversion, and adapt as consumption patterns evolve. With good data, cities can better assess relevant technologies, applicable best practices given the local context, and identify strategic partners for service provisions.

Monitoring should be set as an on-going long-term process based on a series of repeated measurements made to detect the baseline condition and temporal changes in litter. Assessments use such information in a critical and contextualized way to design and evaluate the need for, and success of, public policies and mitigation measures.

WHAT IS A MONITORING AND EVALUATION APPROACH?

The monitoring and evaluation approach should adhere to the Baseline Assessment methodology, as introduced in the Baseline Guidance, and as summarized below:

1. **Waste Flow Monitoring Plan**
   The Waste Flow Monitoring Plan follows the same methodology, and seeks to answer the same research questions as the Waste Flow Scoping Assessment. The monitoring plan merely aims to update the initial assessment on an annual basis, to report changes over time.
2. **Litter Monitoring Plan**
   The Litter Monitoring Plan follows the same methodology, and seeks to answer the same research questions as the Litter Baseline Assessment. The monitoring plan seeks to outline how and when to capture litter survey events at regularly scheduled intervals, to assess changes and impact over time, as compared to the baseline situation. The monitoring plan ensures that the same type of data can be collected at different stages in time, in order to compare the results and assess the extent of change, or lack thereof.

HOW DE WE GET STARTED WITH OUR MONITORING ACTIVITIES?

The Waste Flow Monitoring activities will replicate the Waste Flow Monitoring Assessment, using the same process, boundaries, level of resolution (low, medium, high) and using the same tools (Waste Wise Cities Tool, Waste Flow Diagram, Wasteaware Benchmark Indicators, or other).

Similarly, the Litter Monitoring activities will replicate the Litter Baseline Assessment, using the same process, boundaries, level of resolution (low, medium, high) and using the same tools. Prior to selecting your preferred litter monitoring tool, please consider the monitoring tool requirements listed below:

REQUIREMENTS FOR LITTER MONITORING TOOLS

- Method aligned with politically relevant and widely used methods
- Supported by leading science
- High resolution field forms/entries
- Low cost and replicable
- Flexibility: enables a tailor-made approach for specific cities/regions
- Option to engage the public and leverage citizen science
- Possibility to start quickly

MONITORING TOOL OPTIONS

There are a host of monitoring tools available on the market, and with the many options on offer, it is important to consider the features of each tool in the context of your monitoring and evaluation approach, to ensure the selected tool meets your needs. Below, we include a brief comparative assessment of 3 tools according to some important criteria, but this table is not exhaustive, and can be used to compare and assess other tools as needed.

Debris Tracker	**Litterati**	**Elippsis**	
Citizen Science	x	x	
Open Source	x		
Cost	Free	$$$	$$$
Replicability	Free	$$$	$$$

Developed and managed by non-profit research institute	x		
Developed and managed by for-profit enterprise		x	x
Database and mapping integration into PSC platform	x		
Uses AI to identify litter items, and requires a photo upload and item verification		x	x
Litter data can be uploaded automatically into a database in the field	x	x	x
Litter data can be uploaded into a database manually after a field visit, allowing for the use of traditional field forms should circumstances require (weather, lack of smart phone, etc.)	x		

Localization - translation to local languages	x		