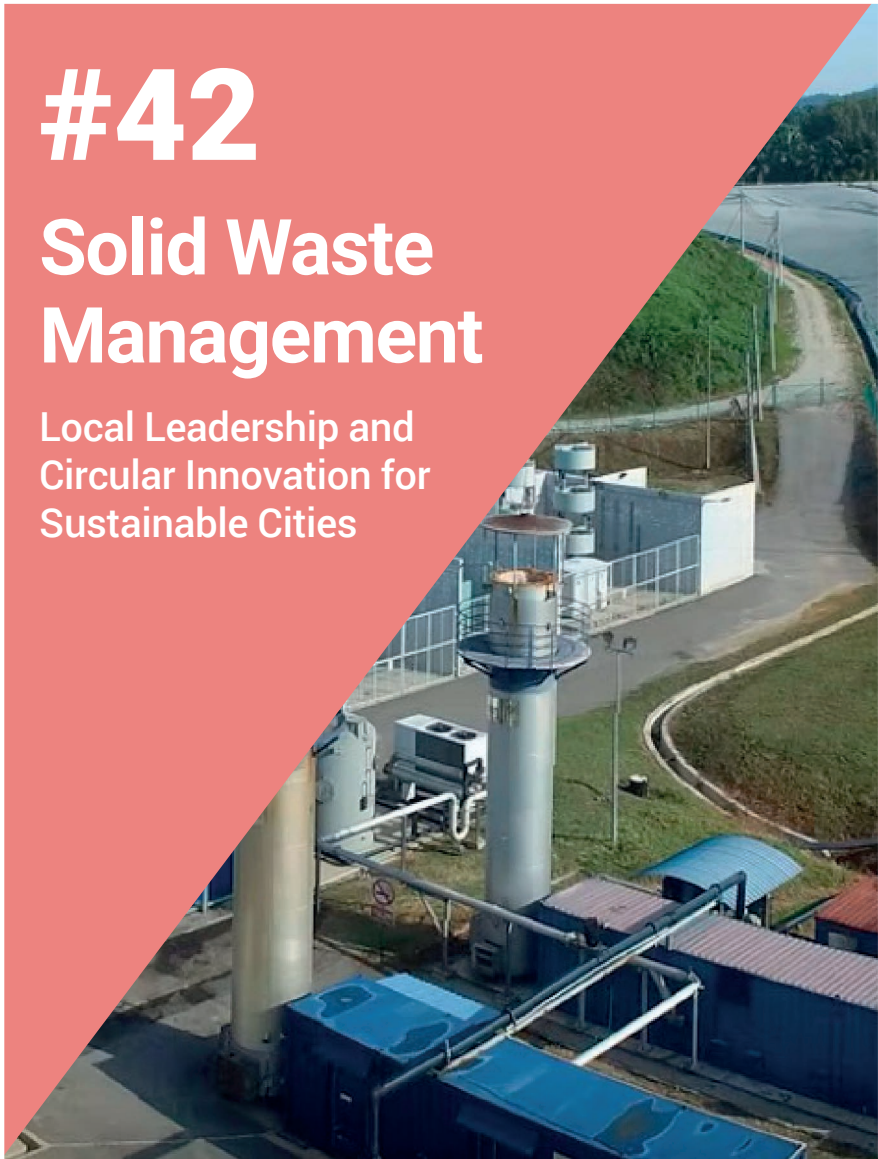


#42

Solid Waste Management

Local Leadership and
Circular Innovation for
Sustainable Cities



Peer Learning
Kuala Lumpur, Malaysia
12–14 August 2025



United Cities and
Local Governments
Asia-Pacific



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Coordination

United Cities and Local Governments Asia-Pacific (UCLG-ASPAC)
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Editors

United Cities and Local Governments Asia-Pacific (UCLG-ASPAC)
United Cities and Local Governments (UCLG)

For more information, contact:

UCLG ASPAC

UCLG Learning - learning@uclg.org

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Foreword

Across Asia and the Pacific, cities are standing at the frontlines of an urban transformation that is both urgent and inevitable. Waste is no longer a side effect of development, it is a mirror reflecting the efficiency, equity, and resilience of urban governance. The way a city manages its waste reveals how it values its people, its environment, and its future. In recent years, local governments across the region have demonstrated remarkable ingenuity in transforming this challenge into an opportunity for innovation, partnership, and reform.

For rapidly growing urban centres, the city transformation is deeply intertwined with how we manage waste not merely as a technical service, but as a strategic lever for sustainability, resilience, and inclusive development. Waste today is no longer a side effect of growth; it is a mirror reflecting the efficiency, equity, and foresight of urban governance. Kuala Lumpur's best experience affirms this reality, as a dynamic city, we continue to confront the pressures of population growth, consumption, and climate risks. In response, the city has increasingly embraced circular economy principles by prioritising waste reduction, resource recovery, and the integration of environmental responsibility into urban systems. These efforts recognise that sustainable waste management is inseparable from public participation, behavioural change, and trust between local government and communities.

This Learning Note captures the collective momentum of cities across the region that are navigating similar challenges with innovation and determination. It is not merely a compilation of technical solutions, but a reflection of leadership, collaboration, and peer learning. The practices documented here, shared during the ASEAN Governors and Mayors Forum (AGMF) 2025, demonstrate that progress often begins

with mindset: citizens who take ownership of their environment, institutions that work across silos, and leaders who view waste as part of a broader urban ecosystem.

The lessons emerging from this peer-learning process reaffirm a fundamental truth: sustainable waste management is not solely an environmental obligation. It is a foundation for democratic governance, economic intelligence, and social wellbeing. When communities are engaged as partners, when innovation enhances accountability, and when policy frameworks incentivise participation, waste systems can evolve from sources of pollution into engines of circular and inclusive prosperity.

As Mayor of Kuala Lumpur, I strongly believe that city-to-city pairing and peer-to-peer learning is essential in accelerating this transition. Through platforms such as UCLG ASPAC and initiatives like the Urban-Act Project, cities are strengthening their collective capacity to localise global commitments from the Sustainable Development Goals to the Paris Agreement—into practical, people-centred action on the ground. The journey toward cleaner, greener, and more resilient cities is ongoing. Yet with every exchange of knowledge, every innovative partnership, and every act of local leadership, cities across ASEAN and Asia Pacific are demonstrating that sustainable urban transformation is not only possible; it is already underway.



Maimunah Mohd Sharif
Mayor of Kuala Lumpur

Introduction

Context of the Peer Learning

Rapid urbanisation across Southeast Asia has magnified the complexity of solid waste management, revealing its deep interconnection with environmental degradation, public health, and urban resilience. As cities expand, so too do the volumes of waste they generate—stretching the limits of existing systems. Many local governments are struggling to cope with outdated collection infrastructure, limited disposal capacity, informal waste practices, and institutional or financial constraints. What once appeared to be a technical issue has now become a matter of governance and leadership—demanding collaboration, innovation, and shared learning among cities.





80+
participants



20
cities



2
rounds of
case sharing

The Learning and Pairing Session on Waste Management, held from 12–14 August 2025 at Kuala Lumpur Convention Centre as part of AGMF 2025, included a visit to Bukit Tagar Enviro Park and two days of discussions and city-to-city dialogue. Over twenty cities from India, Indonesia, Malaysia, the Philippines, and Thailand attended, exchanging ideas for sustainable and inclusive waste management.

The session was organised by United Cities and Local Governments Asia-Pacific (UCLG ASPAC) under the Urban-Act Project, co-financed by the German The Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) and implemented by GIZ, in partnership with UNESCAP, IREUS Stuttgart University, and TU Dortmund University. Together, these institutions are building regional ecosystems of learning to empower local governments in localising global sustainability frameworks such as the Sustainable Development Goals (SDGs), the Paris Agreement, the Sendai Framework, and the New Urban Agenda.



**“Circular economy
succeeds when citizens
co-create solutions that
connect social value with
environmental goals.”**

**Mr. Glenn P. Flores, Mayor of Alaminos, Laguna,
Philippines (2022–2025).**



“Global partnerships achieve impact only when cities act as equal partners, translating global frameworks into local change.”

Mr. Eugene Zapata Garesche,
European Commission TALD Facility, GIZ EU

The peer learning adopted a horizontal approach—treating each participant as both a teacher and a learner. Through poster sessions, city showcases, and technical exchanges, cities reflected on what works, what fails, and what can be replicated. The session became a regional platform to connect policy with practice, emphasising the role of local leadership, public-private collaboration, and community participation in achieving circular economy outcomes.

Ultimately, this initiative reaffirmed that effective waste management is not merely about logistics—it is about governance, inclusion, and innovation. The discussions helped transform city-level experiences into shared regional knowledge, laying the groundwork for long-term partnerships among ASEAN cities striving for cleaner, greener, and more resilient futures.



Capstone Projects & City-Pairing

The Urban-Act Project is a regional initiative designed to strengthen climate-sensitive urban development and foster inclusive climate action. Implemented across multiple countries, the project focuses on enhancing urban resilience, promoting sustainable infrastructure, and integrating climate adaptation strategies into city planning and strengthening the capacity building for both national and local governments.

As part of the project, Pilot Cities prepare a Capstone Project aiming to translate learning into action by designing and implementing practical, locally adapted solutions to priority urban challenges. The Capstone Projects are strategically linked to the UCLG ASPAC City Pairing activity, which facilitates structured peer-to-peer cooperation between cities across Asia. Through this pairing, Urban Act pilot cities will receive technical exchange, mentoring, and best-practice insights from partner cities with relevant experience. This ensures that each capstone intervention is grounded in tested approaches while adapted to local context.

Capstone Project Ideas



Medan

Community-based waste infrastructure and waste-to-energy



Shimla

Construction & Development (C&D) waste management



Padang

Circular economy transition and Integrated Resource Recovery Centre (IRRC)



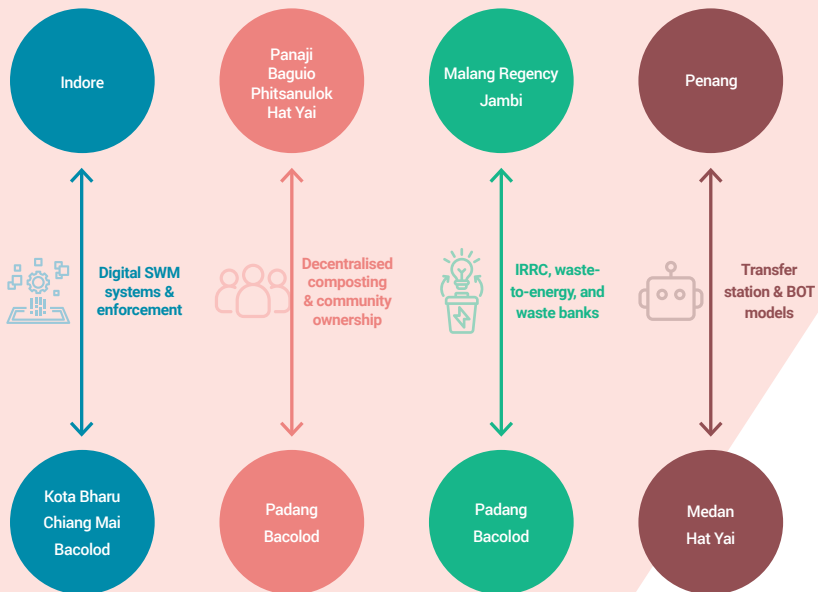
Hat Yai

Integrated Resource Recovery Centre (IRRC)

The integration of Capstone Projects with City Pairing aims to:

- Transform knowledge exchange into measurable pilot implementation
- Strengthen institutional capacity through structured peer learning
- Encourage cross-city technical collaboration and joint problem-solving
- Produce scalable and replicable urban solutions

Proposed City Pairing



Background:

Solid Waste Management: Global Trends and Policy Context

Solid waste generation is rising rapidly worldwide, outpacing population growth and straining local governments responsible for waste services. Municipal solid waste (MSW) reached roughly **2.1 billion tonnes in 2023**, and is on track to nearly double to about **3.8 billion tonnes by 2050**.¹ This surge is driven by urbanisation and economic growth, cities today produce roughly half of the world's solid waste.² **Local governments** are on the front line of this challenge, often managing growing waste volumes with limited resources. In many low-income regions, waste management systems remain rudimentary: an estimated **93% of waste in low-income countries is currently dumped or burned openly** for lack of proper disposal facilities.³ Such practices carry high costs for public health and the environment, underscoring the urgent need for improved waste management capacity and infrastructure at the local level.

Environmental and Public Health Implications

Mismanaged waste has serious environmental and health repercussions. Decomposing organic waste in landfills **produces methane** and other gases, contributing about **5 per cent of global greenhouse-gas emissions**,¹ a significant driver of climate change. Open dumping and burning of refuse pollute the air, soil and water; **unsanitary landfills** often contaminate drinking-water sources and attract disease vectors, **spreading infections and disease in nearby communities**. The dispersal of plastic debris and other litter from inadequate waste systems also harms ecosystems, from urban waterways to the oceans. Moreover, new waste streams are posing fresh challenges: for example, **electronic waste (e-waste)** is the fastest-growing waste stream worldwide, containing hazardous components that threaten both environmental and human health if not safely managed. Poor waste management thus directly impacts public health and quality of life, while also exacerbating global issues

like climate change and marine pollution. Improving collection, safe disposal, and treatment of waste is critical to reduce these harms.

Circular Economy Potential

While the waste crisis is daunting, it also presents an opportunity to advance a **circular economy** – an economic model aimed at eliminating waste and keeping materials in use. Embracing waste prevention, recycling, and resource recovery can significantly mitigate the problem and even yield economic benefits. For instance, recycling and re-use **conserve natural resources**: recycling one tonne of paper saves about **17 trees and 50 per cent of water** compared to virgin production.¹ Circular approaches are also **job-creating** – activities like recycling, repair, and composting are more labour-intensive than landfilling. The recycling sector already employs **12 million people in just Brazil, China and the United States alone**,¹ and scaling up circular practices could create many more green jobs worldwide. Modelling by the UN suggests that a full shift to a circular economy, decoupling waste generation from economic growth, would not only curtail pollution but actually **turn waste from a cost into a net economic gain**. By 2050, committing to zero-waste and circular strategies globally could save society over **USD 100 billion per year** in net terms, instead of incurring ever-rising cleanup and health costs under a “business-as-usual” scenario.¹ In sum, a circular-economy approach – reducing waste at source, and treating waste as a valuable resource to be reused or recycled – holds immense potential to alleviate environmental pressures while fostering innovation and economic development.

International Policy Frameworks

Solid waste management has risen on the international policy agenda, with several frameworks guiding action. The **2030 Agenda for Sustainable Development** highlights waste in its goals: under **SDG 11** (sustainable cities) countries commit to reduce the adverse environmental impact of cities including by improving municipal waste management, and under **SDG 12** (responsible consumption and production) Target 12.5 calls on countries to “**substantially reduce waste generation through prevention, reduction, recycling and reuse**” by 2030. Multilateral environmental agreements reinforce these aims – for example, the **Basel Convention** regulates the transboundary movement of hazardous wastes (including certain plastics), promoting environmentally sound disposal. Likewise, the **Stockholm and Rotterdam Conventions** address hazardous chemicals and wastes, and have been updated to tackle modern

waste challenges like e-waste and plastic pollution. Recognising the link to climate change, many national climate plans (NDCs under the Paris Agreement) now include waste-sector reforms to cut landfill methane. There is also momentum towards new global initiatives – notably a **proposed international treaty on plastic pollution** under the UN, reflecting worldwide concern over plastic-waste leakage.

At regional and local levels, policy trends such as the **EU’s Circular Economy Action Plan** and various “zero-waste city” programmes provide concrete strategies for waste reduction, recycling, and circular design. These frameworks collectively signal a broad consensus: reducing and better managing solid waste is essential for sustainable development. They provide goals and principles that help guide local governments in improving waste services, investing in infrastructure, and collaborating across borders to share solutions. Local authorities are encouraged to align with these international best practices – from phasing out open dumps, to expanding recycling and composting, to engaging communities and the private sector in waste minimisation, as part of a global shift towards a circular, waste-wise future.



¹ United Nations Environment Programme. (2024). [Global waste management outlook 2024](#).

² Organisation for Economic Co-operation and Development. (2024). [Circular economy in cities and regions](#).

³ World Bank. (2023). [More growth, less garbage: Decoupling waste generation from economic growth](#).

Field Visit

Bukit Tagar Enviro Park, Kuala Lumpur

The site visit to **Bukit Tagar Enviro-Park** provided a tangible illustration of how cities can advance toward low-carbon and resilient futures. By converting waste into energy while maintaining rigorous environmental safeguards, such facilities underscore the potential of technology to support climate action when guided by strong governance, transparency, and long-term planning. For Kuala Lumpur and many cities in the region, these approaches offer valuable lessons in balancing environmental responsibility with service reliability and energy resilience.

Located in Hulu Selangor on the outskirts of Kuala Lumpur, Bukit Tagar Enviro-Park (BTEP) is widely regarded as one of Southeast Asia's most advanced sanitary landfills and a benchmark for sustainable waste infrastructure. Developed on 659 acres and surrounded by a 1,000-acre permanent buffer zone, the site exemplifies how careful planning and regulatory compliance can address public concerns around landfills while protecting surrounding ecosystems and communities. Designed as a fully engineered Level IV sanitary landfill, BTEP ensures that no untreated contaminants are released into the environment, reflecting Malaysia's evolving standards for environmentally responsible waste management.

What distinguishes Bukit Tagar is its transformation from a disposal site into an integrated **resource recovery hub**. Conceived as a long-term solution to the growing waste pressures of urban centres, the facility currently handles up to 3,000 tonnes of waste per day from Kuala Lumpur and surrounding municipalities, with the capacity to scale further. Central to this model is its 12 MW **landfill gas-**

to-energy (LFGTE) facility, the largest in Malaysia. By capturing methane emissions and converting them into renewable electricity, the plant has generated more than 339 million kWh since 2011, supplying power to the national grid while significantly reducing greenhouse gas emissions. The project's registration under the Clean Development Mechanism further demonstrates how waste infrastructure can contribute measurably to climate mitigation goals.

Beyond energy recovery, participants observed how BTEP manages hazardous and industrial waste through advanced treatment and co-processing systems. By transforming hazardous waste into alternative fuels and raw materials for industries such as cement manufacturing, the park reduces reliance on virgin materials and fossil fuels, reinforcing circular economy principles in practice. Equally important are the site's environmental safeguards, including a multi-stage leachate treatment system designed to minimize pollution risks and work toward a long-term zero-discharge objective.

For peer-learning participants, the visit offered more than a technical tour. Bukit Tagar demonstrated how strong public-private partnerships, clear regulatory frameworks, and sustained investment can redefine the role of landfills—from environmental liabilities into strategic assets for climate action, resource efficiency, and urban resilience.



Case Studies

Baguio City, Philippines

Food waste management & the pursuit of low-cost, sustainable landfill alternatives in a dense mountain city



Overview

Baguio City launched its Black Soldier Fly (BSF) Pilot Programme, a decentralised organic waste management initiative that transforms biodegradable waste into nutrient-rich compost and animal feed. Supported by the United Nations Development Programme (UNDP), the project applies BSF larvae to rapidly decompose organic material—especially food waste, which constitutes 93% of all biodegradable waste in the city. Each BSF facility can process up to 300 kilograms of food waste daily, converting it into organic fertiliser and high-protein larvae suitable for livestock feed.

The city government established three barangay-based BSF facilities to reduce transportation costs and treat waste directly at the source. With an overall investment of USD 26,000, the pilot integrates both environmental and economic objectives: lowering landfill dependence, reducing methane emissions, and creating a localised circular economy. Revenue streams include tipping fees from food establishments, sales of protein larvae, and sales of organic fertiliser. Through these community-level systems, Baguio's waste management approach evolved from reactive disposal to proactive resource recovery—turning organic waste into economic value while addressing the city's space and capacity constraints.

Challenges

Steep geography, limited landfill space, and growing food waste volume posing severe environmental risks, compounded with limited public awareness of waste segregation and recycling.

Strategies

Adoption of **Black Soldier Fly technology** as a cost-effective, low-emission, and scalable method to process organic waste at the barangay level. Partnership with local cooperatives and farmer groups to strengthen technical and operational capacity while linking BSF outputs to agricultural demand.

Lessons

- Adopt low-tech biological technology to divert waste, linking it with food systems and local income generation.
- Develop decentralised waste treatment mechanisms to enhance resilience and reduce logistical costs.
- Integrate public education and local entrepreneurship.





Hat Yai City, Thailand

Policy-Driven, Community-Centered Circular Waste Management

Overview

Hat Yai City, the economic hub of Southern Thailand, manages waste for approximately 150,000 residents within a compact 21 km² area. High-density neighborhoods, bustling markets, hospitals, tourism facilities, and commercial centers generate large and diverse volumes of waste, putting pressure on collection and treatment systems. Moving beyond the traditional “collect-and-dispose” model, Hat Yai has adopted a **circular economy approach** that emphasizes source separation, resource recovery, and public engagement.

Under the **Hat Yai Green City Action Plan (2022–2032)**, the city mandates four-stream waste separation: organic, recyclable, general, and hazardous/infectious waste. Organic waste is treated locally through household and community composting programs and animal feed initiatives. Citywide awareness campaigns—including WWF’s Free Plastic City program—promote food waste reduction and plastic-free living, fostering community ownership of waste management. To strengthen resource recovery, the municipality is advancing plans for an **Integrated Resource Recovery Centre (IRRC)**, guided by a pre-feasibility study.

Despite its progress, Hat Yai contends with the operational challenge of transporting waste roughly 50 km to external facilities, managing thousands of waste sources, and safely handling hazardous and infectious materials. The city’s prior reliance on a single waste-to-energy facility underscored the need for diversified, flexible treatment solutions. Strong municipal leadership, clear ordinances, and community-driven programs remain central to the city’s approach, helping integrate environmental goals with practical, scalable solutions for sustainable urban waste management.

Challenges

Large and diverse volumes of waste, putting pressure on collection and treatment systems within a dense compact area.

1

Sustainable Development Goals (SDG)**SDG12** – Ensure sustainable consumption and production patterns**SDG14** – Conserve and sustainably use the oceans, seas and marine resources for sustainable development

2

National Strategic Plan (2018-2037)

Bio-Circular-Green Economy (BCG)

3

The Thirteen National Economic and Social Development Plan (2023-2027)

BCG and Low Carbon City

4

National Solid Waste Action Plan (2023-2027)

3Rs (Reduce, Reuse, Recovery) and Integrated Solid Waste Management

5

Hat Yai Green City Action Plan (2022-2032)

6

Mayor's policy: "Hat Yai clean city model"**Strategy**

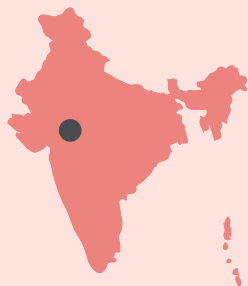
Hat Yai relies on clear municipal ordinances, mandatory source separation, and community engagement programs, while planning the IRRC to recover value from waste.

Lessons

- Strong policy and visible leadership drive compliance and behavior change.
- Diversify treatment technologies to increase resilience and reduce reliance on single solutions.
- Promote active community participation to strengthen system sustainability and public buy-in.

Indore, India

Urban solid waste management and the shift from landfill dependency to a circular city model.



Overview

Indore Municipal Corporation developed a comprehensive solid waste management (SWM) system through a structured and data-driven approach. The city collects approximately 1,200 tonnes of waste daily from over half a million residential and non-residential units, managed across 22 zones and 85 wards. The initial challenges included poor collection, unsegregated disposal, limited financial allocation, and heavy reliance on secondary storage bins and landfills. To overcome this, Indore introduced a multi-component SWM strategy combining source segregation, ICT integration, and strict regulatory enforcement. The system's foundation, 100% segregation at source, became the "soul of Indore's SWM model", supported by vigilant door-to-door collection, thematic IEC (Information, Education, and Communication) campaigns, and real-time digital monitoring.

The city strengthened operational efficiency through Digital Beat Management, ensuring workforce transparency and accountability via GPS tracking, Aadhaar-based attendance, and daily inspections. Mechanised sweeping arrangements with 27 road sweepers, 10 high-pressure water jets, and a fully GPS-enabled vehicle fleet improved urban hygiene and air quality. Indore also invested in large-scale bioremediation of 1.5 million tonnes of legacy waste, expansion of waste processing capacity each year, and establishment of Bio-CNG and composting plants, including a 550 TPD Bio-CNG facility. Community-level waste reduction initiatives—*Bartan Bank*, *Jhola Bank*, *Nekki ki Diwar*, home and community composting, and "zero waste events", fostered behavioural change and reduced per capita waste generation.

Challenges

Poor initial waste collection, unsegregated disposal, limited infrastructure, and low citizen participation constrained progress. Over-dependence on landfills created health and environmental concerns.

Strategies

Integration of ICT systems for daily monitoring, partnerships with NGOs, and leadership-driven field inspections. Strict enforcement of SWM Rules 2016 and citizen engagement through IEC campaigns-built accountability.

Lessons

- Continuous behavioural reinforcement and persistent leadership are critical for success.
- Combine technological innovation, political will, and community participation for systemic transformation.
- Back day-to-day management and governance with data to secure reliability and enhance civic pride.



Malang Regency, Indonesia

Integrated Resource Recovery Center (IRRC) Waste to Energy Model for Traditional Market Organic Waste Management

Overview

With a population exceeding 2.7 million and over 1,200 tonnes of waste generated daily, Malang Regency established a Circular Waste Management System based on upstream, midstream, and downstream integration. The “Bersih Indonesia Project” promotes household-level waste

sorting and the use of biopores for organic reduction. Midstream actions strengthen 3R practices, waste banks, and material recovery facilities (MRFs), while downstream initiatives focus on controlled landfills, landfill mining, and large-scale RDF and IRRC development. The Mantung Market IRRC, operational since 2017, serves as a game-changer, processing organic waste into compost, biogas, and electricity, supporting both local farmers and energy use for nearby roads.

Malang’s circular model is underpinned by BLUD (Local Public Service Agency) governance, ensuring financial sustainability through green funding and e-payment systems (E-RIKA). The regency plans to expand with new MRF–RDF facilities in Kasembon, Pujon, and Ngantang districts by 2026, supported by a USD 1.1 million local budget. The new system will transform the waste sector from a cost centre to a resource-generating business model, producing compost, RDF, and renewable energy. This approach supports SDGs 7, 11, 12, and 13, linking waste recovery with food security, emission reduction, and rural livelihoods.

Challenges

Large and geographically dispersed population, limited capacity for waste segregation, and dependence on traditional landfill management.



Strategies

The government adopted a **circular economy model** integrating waste-to-resource conversion, digital financial management, and multi-district coordination. IRRC and MRF–RDF systems were positioned as the operational backbone.

Lessons

- Align financial mechanisms and institutional frameworks—like BLUD—to local production systems.
- Combining agriculture, energy, and waste recovery (IRRC) can help integrate circular systems in large rural regions
- Explore community-based and revenue-linked models to turn waste to a local resource rather than a liability.



Panaji, India

Reducing landfill reliance and advancing community-based waste systems in a tourism city



Overview

The Corporation of the City of Panaji adopted a decentralised approach to waste management, replacing the conventional landfill system. The city handles 54 tonnes of solid waste daily, comprising 22 tonnes of dry waste and 32 tonnes of wet waste. To manage this, Panaji introduced a 16-way waste segregation system at the colony level, significantly improving the recovery of recyclables (by 70–80%), reducing pressure on material recovery facilities, and cutting transportation costs.

The approach enhanced citizen ownership and encouraged behavioural change towards sustainable waste handling.

Panaji complemented this with residential compost stations, bulk composting units, decentralised biodigesters, and RRR Centres (Reduce–Reuse–Recycle). The city uniquely incentivises participation by paying residents for handing over clean segregated dry waste, turning waste management into an income-generating civic practice. Its decentralised model ensures higher efficiency, lower environmental impact, and stronger local resilience. The transformation from *NIMBY* (“Not in My Backyard”) to *YIMBY* (“Yes in My Backyard”) symbolised a cultural shift, establishing Panaji as India’s first Zero Landfill City—a model of participatory circularity built on small-scale, community-owned systems.

Challenges

Public hesitation towards segregation, high centralised costs, and weak citizen participation initially limited progress.

Strategies

Modular, community-level facilities, providing financial incentives for segregation, and embedding education into its waste policy. Transparency and local monitoring created trust.

Lessons

- Adopt decentralised systems to increase efficiency, reduce risks, and build ownership.
- Multiply small actions across different communities to create durable environmental change.
- Use economic incentives to sustain behavioural change and citizen engagement.



Penang, Malaysia

Rapid waste generation, lack of landfill space, and rising costs of waste disposal on an urban island.

Overview

Penang Island, home to nearly 800,000 residents across 306 km², faced mounting pressure from increasing waste volumes and limited landfill availability. To resolve this, the City Council of Penang Island (MBPP) developed the Penang Island Waste Transfer Station (PIWTS) at Batu Maung under a 16-year Build–Operate–Transfer (BOT) agreement with Eurasia Express Sdn. Bhd. Fully operational since 2018, PIWTS handles 800–900 tonnes of domestic waste daily, employing a vertical compaction system and advanced facilities including leachate treatment, recycling hubs, and bulk waste management. Consolidated waste is transferred to the Pulau Burung Sanitary Landfill located in Nibong Tebal on the mainland. This system significantly cuts transportation costs, reduces emissions, and centralises waste logistics under one smart-controlled hub.



The project also supports Penang's broader Zero Waste Vision, complemented by 120+ recycling centres, drive-thru collection points, and school-based recycling education programmes. The Council is now expanding the PIWTS into a fully integrated waste processing complex, adding a Construction and Demolition (C&D) waste plant (2027) and a Waste-to-Energy (WTE) facility (2032) capable of processing 500 tonnes per day. With a recycling rate of 43.7% (targeting 66% by 2027), Penang leads Malaysia in institutionalising a sustainable circular economy within a dense island setting.

Challenges

Severe space constraints, increasing waste volumes, high operational costs, and uneven public participation in waste segregation.

Strategies

Infrastructure innovation—through a waste transfer station and recycling network—to manage waste sustainably. Accompanied by education, digital awareness, and cross-sector collaboration to underpin the system's success.

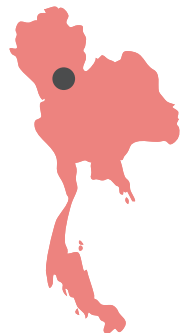
Lessons

- Transform physical limitations into efficiency gains through integrated transfer and treatment systems.
- Sustain innovation by ensuring governance consistency and long-term BOT partnerships.
- Invest in technological efficiency and citizen collaboration to strengthen circular waste economies.



Phitsanulok, Thailand

Rising waste volumes and the shift from landfills to a circular, community-driven waste system.



Overview

Phitsanulok Municipality launched a city-wide Waste Revolution Programme under the Community Waste Management System Development Project with support from GIZ. The initiative aims to build a comprehensive waste system integrating public participation, municipal capacity-building, and circular economy principles. With an average waste generation of 140 tonnes per day, the city introduced source segregation for organic, recyclable, hazardous, and used oil waste, followed by a centralised process chain involving collection (20 trucks, 20 daily routes), a transfer station, RDF production, composting, and hazardous waste collection points. This system enables efficient waste flow while creating a feedback loop between households, communities, and the private sector.

Several community innovations emerged from the initiative. The eco-friendly composting tank allows households to separate wet waste for home gardening despite limited space, reducing food waste and encouraging self-sufficiency. Community waste banks collect, sell, and repurpose used plastics into income-generating products, such as homemade dishwashing liquid. Complementary activities like garbage markets and Eco Guardian networks further sustain public awareness and civic engagement. The results are significant: waste generation reduced by 31.4% (from 140 to 96 tonnes per day), 1,228 tCO₂e emissions avoided annually, and USD 355,000 in municipal cost savings, along with measurable community income gains and improved urban cleanliness. The example proves how waste management reform succeeds when residents perceive direct value from their participation.

Challenges

Urban waste generation had outpaced collection and disposal capacity, with low segregation rates and limited household space for organic waste management. The city also faced limited financial and technical resources for sustainable processing.

Strategies

Multi-level approach that combined municipal planning, citizen participation, and external partnerships. Collaboration with GIZ and local communities supported technology transfer, while “waste bank” and composting initiatives created social ownership of the system.

Lessons

- Integrate community incentives, practical household innovations, and transparent monitoring to ensure both behavioural change and operational efficiency.
- Align circular economy goals with social empowerment.
- Low-cost innovations such as compost tanks and community waste banks can be replicated widely, especially in dense urban areas with limited landfill options.



Key Lessons

Across the examined practices, a strong and coherent pattern emerges effective solid waste management in Asian cities is no longer confined to the realm of municipal operations—it has evolved into a social, economic, and governance transformation. From community composting to advanced waste-to-energy systems, cities are building models that merge citizen participation, technological efficiency, and financial innovation. The results demonstrate that sustainability is not achieved through infrastructure alone, but through the capacity of institutions and communities to continuously adapt, co-create, and hold shared responsibility for urban cleanliness, climate resilience, and circular economy outcomes.

1. Building behavioural change through participatory systems ensures the longevity of waste management reforms

Waste management succeeds when it becomes a lived social practice, not merely a service. The most transformative cases embedded participation at every stage—segregation, collection, reuse, and monitoring—supported by awareness campaigns, school programmes, and peer-led enforcement. Cities moved beyond punitive measures toward civic ownership, encouraging residents to view waste as a shared responsibility. When citizens are engaged in waste banking, composting, or segregation incentives, the culture of disposal transforms into a culture of stewardship.

The behavioural shift was made durable through continuous feedback loops: local governments monitored participation, recognised compliant households, and reinvested cost savings into community facilities. This participatory ecosystem-built trust and accountability between citizens and authorities, reducing resistance to change. Ultimately, behaviour-driven reform cultivated collective pride and turned the idea of “clean city” from a bureaucratic slogan into a communal identity—one that sustains waste reforms far beyond project lifespans.

2. Integrating the circular economy into local governance converts waste from a burden into an economic resource

Circularity proved to be a pragmatic governance strategy, not an abstract ideal. Cities reimagined waste streams as raw materials for compost, biogas, bio-CNG, and recyclable feedstock, closing the loop between consumption and production. This integration reshaped municipal budgeting, as revenue was generated through waste sales, energy recovery, and small-scale enterprises linked to local economies. By framing waste within the language of productivity and profit, cities unlocked political and community support that purely environmental arguments could not achieve.

The shift to circular thinking also encouraged entrepreneurship and gender-inclusive economic participation. Women's cooperatives, youth groups, and informal collectors became recognised partners in the value chain, legitimising the informal sector's contribution. This inclusivity stabilised revenue flows and reduced social inequity. In doing so, circular governance aligned environmental imperatives with livelihood creation, proving that the green economy thrives when it is locally owned, decentralised, and economically rewarding.

3. Technological adaptation and digital monitoring strengthen transparency and operational efficiency

Technology emerged as a silent enabler of credibility. Cities employed digital dashboards, GIS tracking, and mobile applications to monitor collection routes, attendance, and segregation rates in real time. These tools transformed manual, opaque systems into data-driven operations that allowed swift responses to performance gaps. The automation of collection and reporting reduced leakages, optimised resource use, and made municipal operations auditable.

Yet, the most effective use of technology was context sensitive. Rather than relying solely on costly high-end equipment, cities adapted low-cost tools such as barcodes for waste bags, QR-based reporting, or simple GPS systems for field supervision. When paired with transparent public dashboards, technology amplified accountability and fostered citizen trust. Digitalisation thus became more than an administrative upgrade—it institutionalised integrity, turning waste management into a measurable, publicly visible public good.

4. Institutional innovation and financial sustainability are prerequisites for scaling successful models

Structural change within local institutions determined whether good practices endured. Municipalities that introduced new financial and governance frameworks—such as local service agencies, public–private partnerships, or BOT agreements—secured long-term continuity beyond political cycles. These instruments allowed waste systems to evolve from cost centres into semi-autonomous, revenue-generating entities capable of reinvestment and innovation.

The alignment of policy, finance, and institutional design created a multiplier effect: increased fiscal stability attracted external grants, enabled better planning, and allowed experimentation with advanced technologies like RDF or waste-to-energy. Importantly, cities that established cost-recovery mechanisms also reinvested savings into education, infrastructure, and maintenance. Sustainable waste management, therefore, is not simply a technical matter but an administrative craft—requiring bureaucratic flexibility, fiscal discipline, and a willingness to treat environmental services as strategic urban investments.

5. Partnerships and knowledge exchange accelerate learning, replication, and innovation

Inter-city cooperation and regional learning platforms played a decisive role in spreading innovation. Many cities learned through collaboration with development agencies, research institutions, and regional networks that provided technical expertise, benchmarking, and visibility. This exchange nurtured experimentation—allowing cities to adapt models such as waste banks, decentralised composting, or BSF bioconversion within their local context.

Partnerships also helped bridge capacity gaps between local governments and private or community actors. Through shared resources and co-designed pilot projects, partnerships turned fragmented initiatives into coherent, scalable systems. Over time, this collective learning built a regional knowledge economy on urban waste governance—where each successful practice

contributed evidence, tools, and narratives that encouraged others to act. Waste innovation, in this sense, became contagious: a collaborative evolution shaped not by competition, but by solidarity among cities confronting shared environmental challenges.

The Way Ahead

The next chapter of urban waste management in Asia Pacific will not be written by technology alone, nor by isolated success stories, but by a redefinition of how cities understand growth, value, and responsibility. The waste agenda has matured: it is no longer about cleaning cities but about rebuilding the metabolism of urban life—how materials flow, how citizens behave, and how institutions sustain that rhythm. The future therefore calls for governance that sees waste as part of the city's economy and ecology, where every discarded item is a data point, a resource, and a social contract.

Cities will increasingly need to design integrated systems that connect waste with energy, food security, and climate resilience. Composting and waste-to-energy plants should not be seen as stand-alone projects but as nodes within a larger network that powers urban agriculture, renewable energy generation, and green industry. This systemic thinking requires planners to abandon linear administrative logic and adopt circular policy frameworks that reward efficiency and regeneration. Regulatory reform must move beyond enforcement to enable experimentation—allowing municipalities to test fiscal tools, performance-based incentives, and partnerships with start-ups and research institutions.

As global climate pressures mount, financing mechanisms will become the hinge between ambition and action. Cities that survive the fiscal volatility of the coming decade will be those that can quantify environmental returns, translate them into creditworthiness, and attract blended finance for circular infrastructure. Carbon markets, green bonds, and climate gap funds must be localised, ensuring that smaller cities and subnational governments can access them without excessive bureaucracy. This shift demands that local finance officers, not just environmental planners, become climate strategists—capable of linking waste reduction to emission mitigation and economic productivity.

At the same time, the human dimension must stay at the core of this transformation. Future waste governance must prioritise equity, dignity, and inclusion. Informal workers, women's cooperatives, and community

recyclers—often the invisible backbone of circular economies—should be formally integrated into policy frameworks with fair wages, social protection, and technical training. Cities must adopt participatory planning models where communities not only segregate and recycle but also co-design public spaces, manage micro-enterprises, and monitor local environmental performance. Such participation is no longer a token of engagement but a form of democratic environmental governance that restores trust between citizens and the state.

Knowledge will also be the new currency. The ability of cities to generate, share, and act upon evidence will determine the pace of progress. Regional cooperation—through city networks, digital knowledge platforms, and peer-learning mechanisms—can prevent duplication and accelerate innovation. This shared intelligence can inform national urban policies, shaping coherent agendas that align local circular economy practices with national and global commitments such as the Paris Agreement, SDG 12, and the New Urban Agenda. In this sense, the future of waste management is also the future of urban diplomacy: cities learning from, competing with, and supporting one another across borders.

Ultimately, the way ahead is about designing cities that metabolise like living organisms—resilient, adaptive, and restorative. Waste will no longer be treated as the end of consumption but as the beginning of a new production cycle. The measure of success will not be how clean a city looks, but how intelligently it uses what it discards. This transition will require courage from leaders, creativity from institutions, and continuity from citizens. The direction is already clear: the sustainable city of the future will be the one that can transform waste into wisdom.



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