Baseline for Circular Economy in the Philippines:

A DATA COMPILATION

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Disclaimer

Acknowledgment

Acronyms

ACE	Accelerating Nationally Determined Contribution through Circular Economy in Cities
ADB	Asian Development Bank
ALBA	Algal-Bacterial
BOI	Board of Investment
BREEAM	Building Research Establishment Environmental Assessment Methodology
CCC	Climate Change Commission
CCS	Climate Change Service
CFR	Collected-For-Recycling
CE	Circular Economy
CHED	Commission on Higher Education
CMMO	Coastal and Marine Management Office
CNG	Compressed Natural Gas
COVID-19	Coronavirus Disease 2019
CO_2	Carbon Dioxide
CSE	Common-Use Supplies and Equipment
DENR	Department of Environment and Natural Resources
DFA	Department of Foreign Affairs
DMC	Direct Material Consumption
DOE	Department of Energy
DOST	Department of Science and Technology
DOTr	Department of Transportation
DTI	Department of Trade and Industry
EEC	Efficiency in Electric Consumption
EEF	Efficiency in Fossil Fuel Consumption
EMB	Environmental Management Bureau
ENNA	Expanded National Nutrition Survey
EnV	Enteroviruses
EPR	Extended Producers Responsibility
EU	European Union
EV	Electric Vehicle
FDS	Food Demand Survey
FNRI	Food and Nutrition Research Institute
FSI	Foreign Service Institute
GDP	Gross Domestic Product
GERD	Gross Expenditure on Research and Development

GHG	Greenhouse Gases
GIS	Geographic Information System
GPP	Green Public Procurement
GVA	Gross Value Added
HDPE	High-Density Polyethylene
HH	Household
HVAC	Heating, Ventilation, Airconditioning
IACENRS	Interagency Committee on Environment and Natural Resources Statistics
IASC	International Accounting Standards Committee
IRR	Implementing Rules and Regulation
LGU	Local Government Unit
LDPE	Low Density Polyethylene
LLDPE	Linear Low-Density Polyethylene
MCM	Million Cubic Meter
MLD	Minimum Liquid Discharge
MSME	Micro, Small and Medium Enterprises
MV	Motor Vehicle
NDC	Nationally Determined Contribution
NDRRMC	National Disaster Risk Reduction and Management Council
NEDA	National Economic and Development Authority
NELP-GCP	National Ecolabelling Program—Green Choice Philippines
NG	Natural Gas
NGA	National Government Agency
NGO	Non-governmental Organization
NPOA ML	National Plan of Action for the Prevention, Reduction, and Management of Marine Litter
NSWMC	National Solid Waste Management Commission
NWRB	National Water Resources Board
OECD	Organization for Economic Co-operation and Development
PAP4SCP	Philippine Action Plan for Sustainable Consumption and Production
PBD	Philippine Bidding Documents
PCENRO	Pasay City Environment and Natural Resources Office
PCEPSDI	Philippine Center for Environmental Protection and Sustainable Development, Inc.
PCR	Polymerase Chain Reaction
PE	Polyethylene
PET	Polyethylene Terephthalate
PP	Polypropylene or Polypropene

PPP	Public-Private Partnership
PPIA	Philippine Plastics Industry Association, Inc.
PRO	Producer Responsibility Organization
PS	Polystyrene
PSA	Philippine Statistics Authority
PSTOs	Provincial Science and Technology Offices
PVC	Polyvinyl Chloride
RPS	Renewable Portfolio Standards
RandD	Research and Development
RandI	Research and Innovation
SCP	Sustainable Consumption and Production
SDG	Sustainable Development Goal
SEC	Securities and Exchange Commission
SLF	Sanitary Landfill Facility
STP	Sewage Treatment Plan
SUV	Sports Utility Vehicle
SWMD	Solid Waste Management District
TESDA	Technical Education and Skills Development Authority
TVET	Technical and Vocational Education and Training
TPY	Tonnes Per Year
UNDP	United Nations Development Programme
UV	Utility Vehicle
WACS	Waste Analysis and Characterization Study
WWF	World Wildlife Fund

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Foreword

The United Nations Development Programme (UNDP) is pleased to present *Baseline for Circular Economy in the Philippines: A Data Compilation*, a first-of-its-kind publication that endeavors to contribute in gathering data and evidence on where the country is in terms of its on-going journey towards a circular economy. In line with the 2030 Agenda for Sustainable Development, circular economy promotes an across-the-board systemic transformation that is founded on the principles of resource efficiency, value creation from waste, sustainable production systems, and regeneration of nature. With the potential to minimize greenhouse gas emissions, circular economy is driven by technological change and innovation, and entails mindsets and lifestyles oriented towards sustainability.

There is good momentum in the Philippines for circularity, propelled by the crafting of the National Plan of Action for the Prevention, Reduction and Management of Marine Litter, Extended Producer Responsibility Act of 2022, and the Philippine Action Plan for Sustainable Consumption and Production. This report presents a collection of 100 circular economy indicators that could assist the public and private sectors in measuring and assessing national progress towards circularity. Further, the report outlines such indicators, and presents the corresponding data – both

existing and new – for 61 of them. Drawn from consultations with major stakeholders on the national and local levels, the range of indicators presented here is diverse, covering the vast multitude of facets and aspects of the economy that must evolve for it to be truly circular. Indicators such as household waste recycled, energy consumption, and percentage of recycled content used in materials figure in the collection, along with indicators such as awareness campaigns on marine litter, publications on circular economy, and citizen participation in an inclusive recycling program.

The data presented in this report emanate from secondary sources, mostly of national government agencies, as well as surveys in the local government units (LGU), which are among the current partners of UNDP on circular economy. These are the LGUs of Caloocan City, Cotabato City, Manila City, Pasig City and Quezon City. Notably, this report is the product of an extensive data-harvesting effort, which occurred over the course of 2023, and assembles the data in a single package for the use of public and private stakeholders. To ensure sustainability, mechanisms to institute and regularize the collection of data for the 100 indicators are needed.

UNDP wishes to express its gratitude to the Government of Japan for making the production of this report possible, and to the Department of Environment and Natural Resources for their steadfast partnership and collaboration. I hope that this publication will make a significant contribution towards strengthening the country's commitment to circular economy.

Selva Ramachandran
UNDP Resident Representative

Executive summary

As a transformative model for sustainability, circular economy (CE) is not an entirely new concept in the Philippines. The country has had policy initiatives towards this model since almost half a century ago, the earliest of which was perhaps the Marine Pollution Decree of 1976 (Presidential Decree 979). In more recent times, the Philippine Ecological Solid Waste Management Act of 2000, amended as the Extended Producer Responsibility (EPR) Act of 2022, was crafted in line with circular economy principles.

This report aims to identify a robust set of circular economy indicators for the Philippines, developed in consultation with key government stakeholders at national and local levels, as a first step towards establishing benchmarks for the linear-to-circular transition. The report adopts a circular economy baseline framework encompassing policy and structural components. Acknowledging the evolutionary nature of circular transition, the baseline framework uses a phased approach and allows for the gradual maturation and institutionalization of indicators to enable regular and reliable data collection, measurement, and tracking over time.

The baseline framework is built on three pillars: **governance and infrastructure, environment, and business and technology**, which are divided into specific categories: *public awareness and education, capacity building, greening of routine processes, sustainable consumption* and production, and closing of resource loops. The phased approach outlines immediate, medium, and long-term indicators, as shown in the following figure.

The circular economy indicators that are presented in this report draw primarily from the OECD Inventory of CE Indicators, which comprises 474 indicators from various CE studies at country, region, and city levels in Europe.

UNDP's Pintig Lab undertook several steps in trimming down the 474 indicators to 121. The first step involved deduplication of the list of indicators, which meant to reduce their number. Identical duplicates were removed programmatically while "near identical" ones were first identified using fuzzy matching before resorting to human intervention for deciding if an indicator or one of its matches would be kept. Secondly, the OECD list was merged with outcomes and actions in the NPOA ML using standard Levensthein Distance, partial ratio, token sort ratio, and token set ratio for fuzzy matching.

The third step took the average of the four (4) match scores and compared such with the mean of all these average match scores. All indicators with an average score falling below the mean were then dropped. The remaining indicators were classified under tier 1 if they belonged to the 75th percentile, tier 2 if they fell between the 50th and 75th percentile, and tier 3 if they fell between the 25th and 50th percentile – all others were dropped. Finally, one hot encoding is used for the actors (i.e., agencies, organizations, institutions) identified in the matched NPOA ML outcome/action.

The resulting list consisted of 121 indicators, composed of 39 tier 1 indicators, 37 tier 2 indicators, and 45 tier 3 indicators. A total of 25 NPOA ML actions/outcomes were mapped to the list.

The authors of this report further condensed the list from 121 to 100 indicators applicable to the Philippine context through the following methods:

• **Stakeholder participation to assess possible data availability.** The list of 121 indicators was presented during the stakeholders meeting with the Department of Environment and Natural Resources, Department of Trade and Industry, Commission on Higher Education, Philippine Statistics Authority, National Economic and Development Authority and Department of Science and Technology, among others, which are identified as cooperating agencies under the National Plan of Action for the Prevention, Reduction and Management of Marine Litter (NPOA-ML) to seek their suggestions on possible data availability.

• **Further deduplication.** For example, indicators on CO2 emissions and CO2 emissions reduction were removed as information on these indicators can already be covered by baseline data on greenhouse gas emissions and greenhouse gas reduction.

• **Inclusion of indicators beyond the scope of NPOA ML.** Indicators beyond the NPOA ML, such as ecolabel holders, use of packaging waste articulated to extended producer responsibility, and percentage of urban wastewater treated/total wastewater generated were added.

The final selection of 100 circular economy indicators for the Philippines is presented below:

No.	Indicator
1	Publications on the circular economy
2	Actions to divulge a long-term Randl agenda for speeding up the circular economy in the country
3	Number of companies that publish sustainability reports
4	Number of partnerships with municipalities/distribution
5	Mainstreaming education for sustainable development into the curriculum
6	Number of experimental projects initiated
7	Number of awareness-raising activities for waste prevention carried out
8	Awareness campaigns to reduce food waste
9	Creation of a municipal or regional web platform for information on the circular economy
10	Level of traffic on the web platform for information on the circular economy
11	Awareness campaigns on marine litter
12	Creation of the booklet and action sheets on the circular economy
13	Number of economic actors mobilized in an innovation platform for the circular economy
14	Number of awareness-raising activities carried out for plastic use reduction
15	Actions taken to disseminate water efficiency guides
16	Development of new laws and regulations that discourage linear practices
17	Circular economy vision documents
18	Public procurement procedures including ecological and circular criteria
19	Financial assistance granted to companies related to the circular economy
20	Institutions willing to collaborate on a circular economy initiative
21	Circular economy researchers
22	Training courses on the circular economy
23	Community-driven associations
24	Citizen participation in an Inclusive Recycling Program
25	People trained in the circular economy fields of activity
26	Good practices on public procurement identified and disseminated
27	Policy process for new circular laws and regulations
29	Study of the establishment of waste disposal charges or other types of financial instruments
30	Protocols developed to incentivize reuse of components, recovered or recycled materials, development and/or use of material passports, promotion of the use of "empty" built space
31	Directives adopted to improve water efficiency and water reuse
32	Directives adopted for research and innovation on the circular economy
33	Number of staff trained on the circular economy

No.	Indicator
34	Illegal dumping
35	Quantities of waste sent to landfill
36	Food waste
37	Mapping of existing sites for reuse and recycling and needs
38	Circular innovation projects
39	Number of waste collection devices installed
40	Separate waste collection
41	Construction waste
42	Life cycle and cost-benefit studies in waste management
43	Percentage of recycled content used in materials
44	Amount invested in circular economy projects
45	Eco-designed products and services included in the regional catalogue
46	Number of restaurants with the ZERO plastic label
47	Energy from renewable sources
48	MW installed from renewable sources
49	Amount of renewable electricity available to each household
50	Energy consumption (final)
51	Diesel consumption (transport sector)
53	Use of private vehicle in cities
54	Car-sharing
55	Water consumption
56	Percentage of urban wastewater treated / total wastewater generated
57	Solid waste generated
58	Total amount of waste produced by households
59	Total amount of waste produced by commerce and industry
60	Tons of waste avoided
61	Total waste treatment: Landfill
62	Total waste treatment: Recycling
63	Household waste recycled
64	Non household waste recycled
65	Recovery of fisheries waste
66	Number of collection points for reuse of materials
67	Recycling rate of plastic packaging waste
68	Percentage of recyclable plastic packaging placed on the market
69	New circular products
70	Number of companies or products with tax benefits to incentivize the circular economy

No.	Indicator
71	Ecolabel holders
72	Public procurement contracts with a circular economy dimension
73	Recovery rate of construction waste as material
74	Recycling rate of construction waste
75	Number of waste disposal sites with a reuse area
76	Quantity of bio-waste managed by on-site composting
77	Waste recovery through an Inclusive Recycling Program
78	Ratio of products repaired to new products sold (including reused vs. new schoolbooks)
79	Total number of approved water reuse projects / year
80	Use of packaging waste articulated to extended producer responsibility
81	Reduced waste through green public procurement
82	Quantity of bio-waste managed by on-site composting
83	Investment in RandD over the GDP
84	Weight of the green economy in GDP
85	Number of green jobs created and secured
86	Number of places devoted to repair
87	Objects collected and diverted for reuse
88	Objects recovered in reuse centres
89	Objects redirected/repaired from recycling centres
90	Evolution of the tonnage of plastics used in the city
91	Evolution of the tonnage of plastics recycled in the city
92	Adequate environmental management of plastic packaging waste
93	Water extraction, direct
94	GHG Emissions
95	Greenhouse gas reduction
96	Products/services covered by circularity criteria in the public procurement
97	Level of implementation of Biowaste strategy
98	Recycling of biowaste per capita
99	Waste reduction economic savings
100	Construction works with circular design

Primary and secondary data were gathered for the 100 selected indicators, 61 of which were found to have existing data while 39 had none at the time the data collection was carried out. On the one hand, as part of primary data collection, two surveys were conducted -- one targeting junkshops and another targeting households in the five ACE Project cities, which are the local government units of Pasig City, Manila City, Quezon City, Caloocan City and Cotabato City. Due to the limited completion rate, significant non-response, and non-randomized design of the surveys, caution is advised in generalizing the survey findings. On the other hand, with respect to secondary data collection, government agencies, including the DENR–Environmental Management Bureau (DENR-EMB) Solid Waste Management Division, Department of Trade and Industry (DTI), Department of Science and Technology (DOST), and the Commission on Higher Education (CHED) were engaged. Secondary data was sourced from the Department of Energy (DOE) and the National Water Resources Board (NWRB).

An examination of the data collected suggests that circular economy in the Philippines is in its nascent stages. The country has taken steps to incorporate circular economy principles in laws and mechanisms in recent years. Similarly, the Philippines has achieved several milestones to improve waste management and reduce its environmental impact, closing all 945 illegal dumpsites as of 2021. This report was able to document that the Philippines has 17 circular products, 22 experimental projects, and 8 circular innovation projects.

Existing publications discuss circular economy including the Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP), and the desk review of trends and issues on SCP in the Philippines as published by the Asian Development Bank. UNDP, together with DENR and the Government of Japan, also released a comprehensive report called Circular Economy and Waste Management in the Philippines: A Stocktaking Report 2022. More recently, landmark circular economy legislation – the EPR Act of 2022 (RA 11898) – has been enacted and mandates businesses to establish strategies for the retrieval of their plastic packaging waste.On the other hand, the impact of circular economy-related laws and policies has remained limited. For instance, materials recovery facilities in the country (MRFs) fell short by 22.07percent of the 2020 national waste diversion target of 68.7percent. The survey conducted as part of this report revealed that only 26 to 58 percent of households engage in waste management practices – a large number of households still need to be convinced to compost, recycle, segregate, reuse, and reduce waste.

While the household survey shows a high proportion of households agreeing that environmental protection can stimulate economic growth, only a relatively small number practice green behavior. A small proportion reported selling to junkshops (34percent), adopting solar power use (11.5percent), and engaging in car-share services (19percent). These results show a need for effective strategies to encourage households to improve green behavior.

Similarly, the country could still improve in terms of: (1) increasing the number of MRFs, which is currently low at 11,637 considering there are 42,046 barangays; (2) reducing the amount of waste sent to landfill (currently there are 20,537,709.97 kg of biodegradable, recyclable, special, and residual waste and 2,000 tons of food waste); and (3) setting up more composting plants (only one on record).

Meanwhile, the country's progress towards greener and more sustainable energy can be observed in its investments toward a low-carbon economy. In 2021, 7,914 MW came from renewable energy (RE) produced by 160 RE plants. Similarly, there has been a gradual increase in the treatment of wastewater. But much still needs to be done to transition towards a low-carbon economy. The results suggest the need to: (1) improve wastewater treatment (currently at 17.4percent as of 2019), and (2) closely monitor and ensure that

increasing energy demand is met sustainably and efficiently (54percent increase over 14 years).

The data gathered in this report exhibited an upward trend in terms of: (1) number of workers involved in the green sector (7 million as of 2016); (2) investment in RandD and innovation (from 0.112percent of GDP in 2011 to 0.194percent in 2018); and (3) number of repair establishments (from 4,072 in 2010 to 9,856 in 2020).

For junkshops, the survey found that: (1) women comprise 25.4 percent of their workers, (2) of these 46.5 percent are unpaid females and 21.4 percent unpaid males, (3) junkshop operators find the cost of business registration to be beyond their capacity, and (4) 88.5 percent reported not receiving any form of incentives or support from government.

In light of junkshops' essential role in waste management and recycling efforts, the study recommends the following to help policymakers better address their needs: (1) conduct further research to understand the workforce dynamics and experiences of women solid-waste workers, (2) promote gender equity and ensure fair compensation and opportunities for all workers in the waste management industry, (3) streamline registration processes and reduce fees to help improve formalization rates, and (4) incentivize junkshops and facilitate collaboration and networking opportunities to unlock their full potential in advancing CE.

It is recommended for the Philippines to prioritize the development of a comprehensive national circular economy framework, including a statistical framework specifically for circular economy to ensure effective measurement and monitoring. This involves a suite of national and local metrics organized within a database, akin to the Philippine Statistics Authority (PSA) system. The baseline framework proposed in this study seeks to contribute as a reference towards this end.

In addition to a comprehensive national circular economy framework and a statistical framework, a fundamental shift in societal behavior towards the circular economy is crucial. This can be catalyzed through public awareness campaigns and education. Given the inherently technical nature of circular economy concepts, it is critical to illustrate their relevance to daily life, encouraging widespread adoption and facilitating the country's transition towards a circular economy.

Photo: Jilson Tiu/UNDP Philippines

I.
Introduction

A. Baseline framework

Circular economy, a transformative model for sustainability, is not an entirely new concept in the Philippines. Efforts to embrace this model can be traced back to policy initiatives over half a century ago. Circular economy aims to change the linear economic model of "take-make-waste" into a circular system that is regenerative and restorative by design.[1] This requires transforming waste into productive inputs as well as reducing pollution and other negative externalities to the environment and health.

Although there has not been any comprehensive legislation tackling CE in the Philippines, several laws have been in place that focus on selected aspects. As early as 1976, the Philippine government passed the Marine Pollution Decree (Presidential Decree 979), recognizing the need to address marine pollution. The turning point, however, was the Philippine Ecological Solid Waste Management Act of 2000 (Republic Act 9003). This law institutionalized mechanisms to pursue circular economy through solid waste management on both national and local levels. Key elements related to CE in RA 9003 include waste avoidance and reduction, waste segregation, recycling, and recovery.

Other laws such as the Clean Water Act of 2004, Environmental Awareness and Education Act of 2008, Energy Act of 2008, Climate Change Act of 2009, and Green Jobs Act of 2016 also contribute to the ideals of CE. Several policy documents have also been formulated in support of CE, including Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP).

Recently, landmark legislation on Extended Producer Responsibility (EPR) has been enacted. The EPR Act of 2022 (RA 11898), requires firms to establish a mechanism to recover their plastic packaging waste. Considered a landmark law since it was enacted with CE in mind, the EPR Act is significant since it advocates SCP, specifically in the production, importation, and disposal of plastic packaging by obliged enterprises. The measures stipulated in its implementing rules and regulations emphasize waste reduction, recovery, and recycling.

The definition used in this report is based on the EPR Act of 2022, which defines the circular economy as:

> "...an economic model of creating value by extending product lifespan through improved design and servicing and relocating ways from the end of the supply chain to the beginning. This intends to efficiently utilize resources by its continual use and aims to retain the highest utility and value of products, components, and materials at all times, through sharing, leasing, reuse, repair, refurbishment, and recycling in an almost closed loop."

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1 Ellen MacArthur Foundation. (n.d.). The circular economy in detail. How to Build a Circular Economy. https://www.ellenmacarthurfoundation.org/the-circular-economy-in-detail-deep-dive

Emphasizing the "transition to a circular economy" is critical. A review of various frameworks and research on CE, like the definition above, suggests that the concept of "transition" is crucial. This reflects the understanding that developing effective CE indicators will take time and requires the institutionalization of regular data gathering, indicator derivation, and progress tracking. Shifting from a linear economic mindset to a circular economic mindset is a systemic change that requires time, as evidenced by the current implementation deficits in existing laws supporting CE, such as the Solid Waste Management Act of 2000 and the EPR Act of 2022.

Understanding the current state of CE progress requires a comprehensive and unifying framework that consolidates policies, legislative frameworks, and governance structures in place to monitor CE initiatives. It must also include a set of indicators that can accurately measure the transition towards CE. In the absence of a comprehensive national CE framework, this report has developed a baseline framework for the purposes of guiding the selection of specific circular

economy indicators tailored to the Philippine context.

Using the proposed baseline framework, this report provides a detailed selection of indicators, data collection processes, and a discussion of the findings at the national and local levels. It includes a summative assessment of the current baseline situation of CE in the Philippines, with a specific focus on the ACE Project cities where pilot assessments were conducted. Various frameworks were reviewed, many influenced by the European Union (EU) and the Organisation for Economic Co-operation and Development (OECD). In the Philippine context, the National Plan of Action for the Prevention, Reduction and Management of Marine Litter (NPOA-ML) and the PAP4SCP offer valuable insight and guidelines for transition.

The baseline framework (see Figure 1) prioritizes public awareness and education as the starting point. As understanding and adoption of circular practices increase, the framework progresses towards a society where sustainable consumption and production become the standard.

Figure 1. Baseline Framework
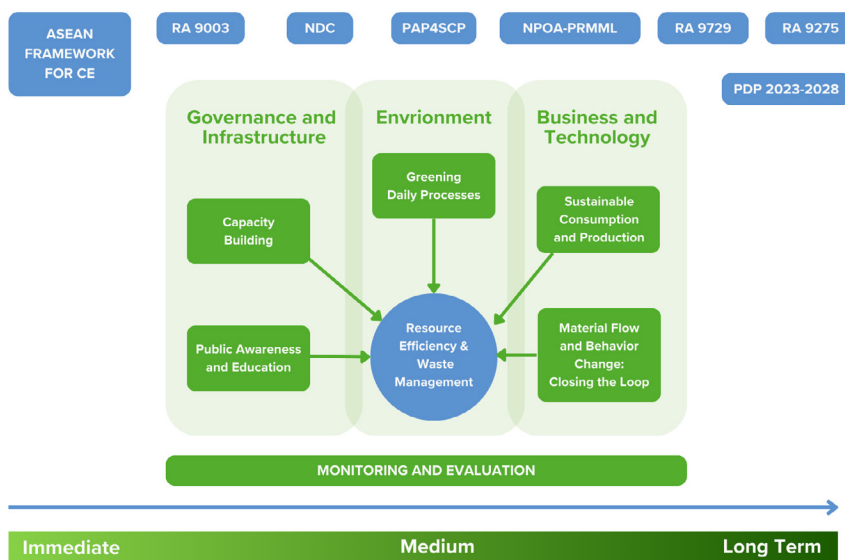
The baseline framework considers the various policies currently being implemented in the Philippines. These include a range of laws, plans, and international frameworks that shape the country's direction towards sustainability and circularity.

The challenge is translating these into practical indicators that can be consistently and sustainably gathered at different levels of data collection. The framework addresses this by providing guidance on identifying these indicators and clarifying what a circular economy means in the Philippine context and how it is envisioned in the medium and long term.

The baseline framework uses specific criteria to evaluate and select indicators for inclusion, such as feasibility – ensuring that data can be realistically collected. The indicators should also align with national and regional policies, ensuring coherence with broader sustainability goals. The potential impact of indicators in driving CE progress is considered and stakeholder engagement is prioritized to foster ownership and inclusivity.

Pillars and Categories of the Baseline Framework

The baseline framework adopted in this report consists of three pillars and categories; it recognizes that establishing a strong foundation is essential before widespread adoption of CE practices. It consists of three major elements:

Governance and Infrastructure

lays the groundwork by establishing the necessary systems and environment. This includes creating institutions, enforcing the rule of law, and developing both soft and hard infrastructure. These foundational elements are crucial to enabling and supporting the large-scale adoption of circular practices.

Environment

focuses on the transition phase, where daily behavioral processes start to embrace CE principles. This involves making circular practices more commonplace in households and businesses. By incorporating circular thinking into everyday activities, the transition towards a circular economy gains momentum.

Business and Technology

looks at integrating CE principles throughout the entire value chain. This means ensuring circularity from upstream sources to the final users. It involves optimizing processes to minimize waste and maximize the value of resources.

Within each pillar are five categories that progressively build on each other:

1. *Public Awareness and Education.* The baseline framework emphasizes that these are foundational elements of CE. By raising awareness and providing education on CE principles, society becomes more conscious of the benefits of sustainable practices.

2. *Capacity Building.* As public awareness grows, capacity building becomes vital. This involves equipping individuals, organizations, and institutions with the necessary skills and knowledge to implement CE practices effectively.

3. *Greening Daily Processes.* The next step involves translating awareness efforts into tangible changes in daily activities. This means adopting circular practices in households, businesses, and government operations to minimize waste and environmental impact.

4. *Sustainable Production and Consumption.* As behavioral changes take hold, sustainable processes start to manifest in both production and consumption. This means adopting circular practices in the way products are made and used.

5. *Closing the Loop.* CE processes becoming the norm throughout the entire lifecycle of products, from production to consumption, "closes the loop." This signifies the successful integration of circular principles in the economy.

B. Selection of 100 Circular Economy Indicators

The circular economy indicators that are presented in this report draw primarily from the OECD Inventory of CE Indicators, which comprises 474 indicators from various CE studies at country, region, and city levels in Europe.

UNDP's Pintig Lab undertook several steps in trimming down the 474 indicators to 121. The first step involved deduplication of the list of indicators, which meant to reduce their number. Identical duplicates were removed programmatically while "near identical" ones were first identified using fuzzy matching before resorting to human intervention for deciding if an indicator or one of its matches would be kept. Secondly, the OECD list was merged with outcomes and actions in the NPOA ML using standard Levensthein Distance, partial ratio, token sort ratio, and token set ratio for fuzzy matching.

The third step took the average of the four (4) match scores and compared such with the mean of all these average match scores. All indicators with an average score falling below the mean were then dropped. The remaining indicators were classified under tier 1 if they belonged to the 75th percentile, tier 2 if they fell between the 50th and 75th percentile, and tier 3 if they fell between the 25th and 50th percentile – all others were dropped. Finally, one hot encoding is used for the actors (i.e., agencies, organizations, institutions) identified in the matched NPOA ML outcome/action.

The resulting list consisted of 121 indicators, composed of 39 tier 1 indicators, 37 tier 2 indicators, and 45 tier 3 indicators. A total of 25 NPOA ML actions/outcomes were mapped to the list.

The authors of this report further condensed the list from 121 to 100 indicators applicable to the Philippine context through the following methods:

• Stakeholder participation to assess possible data availability. The list of 474 indicators was presented during the stakeholders meeting with the Department of Environment and Natural Resources, Department of Trade and Industry, Commission on Higher Education, Philippine Statistics Authority, National Economic and Development Authority and Department of Science and Technology, among others, which are identified as cooperating agencies under the National Plan of Action for the Prevention, Reduction and Management of Marine Litter (NPOA-ML) to seek their suggestions on possible data availability.

Photo: Jilson Tiu/UNDP Philippines

Photo: Jilson Tiu/UNDP Philippines

Table 1. List of National Government Agencies Consulted

National Government Agencies	Date Coordinated
Department of Environment Natural Resources-Environment Management Bureau (DENR-EMB) – Pollution Adjudication Board	23 January 2023
Department of Environment Natural Resources – Climate Change Service (DENR-CCS)	23 January 2023
Department of Environment Natural Resources – Knowledge and Information System Service (DENR-KISS)	23 January 2023
DENR-EMB – Solid Waste Management Division	23 January 2023
Department of Trade and Industry (DTI)	7 February 2023
Commission on Higher Education (CHED)	16 February 2023
Philippine Statistics Authority (PSA)	22 February 2023
National Economic and Development Authority (NEDA)	3 March 2023
Department of Science and Technology (DOST) – Industrial Technology Development Institute	23 May 2023

• **Further deduplication.** For example, indicators on CO_2 emissions and CO_2 emissions reduction were removed as information on these indicators can already be covered by baseline data on greenhouse gas emissions and greenhouse gas reduction.

• **Inclusion of indicators beyond the scope of NPOA ML.** Indicators beyond the NPOA ML, such as ecolabel holders, use of packaging waste articulated to extended producer responsibility, and percentage of urban wastewater treated/total wastewater generated were added.

Table 2. List of Indicators

No.	Indicator
1	Publications on the circular economy
2	Actions to divulge a long-term RandI agenda for speeding up the circular economy in the country
3	Number of companies that publish sustainability reports
4	Number of partnerships with municipalities/distribution
5	Mainstreaming education for sustainable development into the curriculum
6	Number of experimental projects initiated
7	Number of awareness-raising activities for waste prevention carried out
8	Awareness campaigns to reduce food waste
9	Creation of a municipal or regional web platform for information on the circular economy
10	Level of traffic on the web platform for information on the circular economy
11	Awareness campaigns on marine litter
12	Creation of the booklet and action sheets on the circular economy
13	Number of economic actors mobilized in an innovation platform for the circular economy
14	Number of awareness- raising activities carried out for plastic use reduction
15	Actions taken to disseminate water efficiency guides
16	Development of new laws and regulations that discourage linear practices
17	Circular economy vision documents
18	Public procurement procedures including ecological and circular criteria
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20	Institutions willing to collaborate on a circular economy initiative
21	Circular economy researchers
22	Training courses on the circular economy
23	Community-driven associations
24	Citizen participation in an Inclusive Recycling Program
25	People trained in the circular economy fields of activity
26	Good practices on public procurement identified and disseminated
27	Policy process for new circular laws and regulations
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29	Protocols developed to incentivize reuse of components, recovered or recycled materials, development and/or use of material passports, promotion of the use of "empty" built space

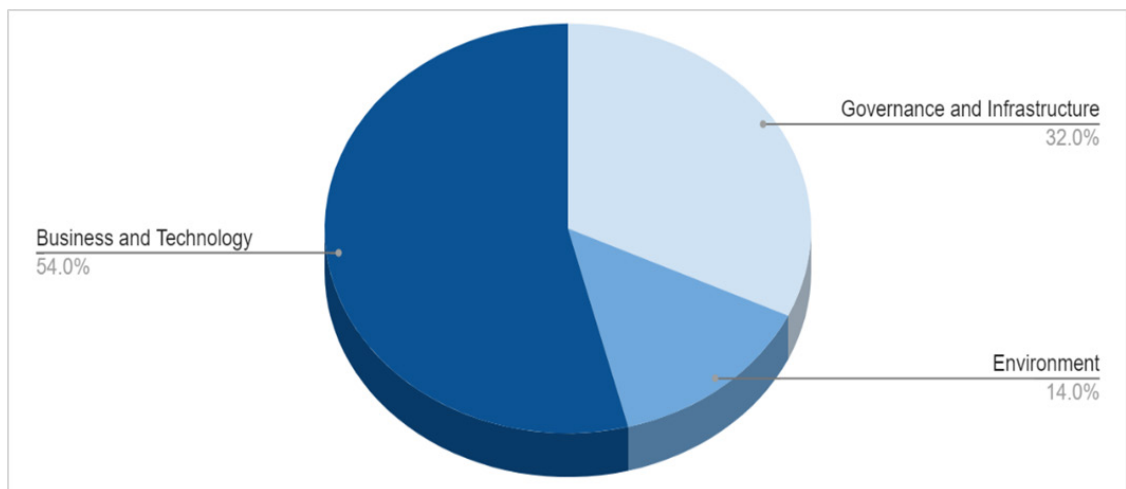| No.	Indicator
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31	Directives adopted for research and innovation on the circular economy
32	Number of staff trained on the circular economy
33	Illegal dumping
34	Quantities of waste sent to landfill
35	Food waste
36	Mapping of existing sites for reuse and recycling and needs
37	Local composting plants created
38	Circular innovation projects
39	Number of waste collection devices installed
40	Separate waste collection
41	Construction waste
42	Life cycle and cost-benefit studies in waste management
43	Percentage of recycled content used in materials
44	Amount invested in circular economy projects
45	Eco-designed products and services included in the regional catalogue
46	Number of restaurants with the ZERO plastic label
47	Energy from renewable sources
48	MW installed from renewable sources
49	Amount of renewable electricity available to each household
50	Energy consumption (final)
51	Diesel consumption (transport sector)
52	Gasoline consumption (transport sector)
53	Use of private vehicle in cities
54	Car-sharing
55	Water consumption
56	Percentage of urban wastewater treated / total wastewater generated
57	Solid waste generated
58	Total amount of waste produced by households
59	Total amount of waste produced by commerce and industry
60	Tons of waste avoided
61	Total waste treatment: Landfill
62	Total waste treatment: Recycling
63	Household waste recycled
64	Non household waste recycled

No.	Indicator
65	Recovery of fisheries waste
66	Number of collection points for reuse of materials
67	Recycling rate of plastic packaging waste
68	Percentage of recyclable plastic packaging placed on the market
69	New circular products
70	Number of companies or products with tax benefits to incentivize the circular economy
71	Ecolabel holders
72	Public procurement contracts with a circular economy dimension
73	Recovery rate of construction waste as material
74	Recycling rate of construction waste
75	Number of waste disposal sites with a reuse area
76	Quantity of bio-waste managed by on-site composting
77	Waste recovery through an Inclusive Recycling Program
78	Ratio of products repaired to new products sold (including reused vs. new school-books)
79	Total number of approved water reuse projects / year
80	Use of packaging waste articulated to extended producer responsibility
81	Reduced waste through green public procurement
82	Quantity of bio-waste managed by on-site composting
83	Investment in RandD over the GDP
84	Weight of the green economy in GDP
85	Number of green jobs created and secured
86	Number of places devoted to repair
87	Objects collected and diverted for reuse
88	Objects recovered in reuse centres
89	Objects redirected/repaired from recycling centres
90	Evolution of the tonnage of plastics used in the city
91	Evolution of the tonnage of plastics recycled in the city
92	Adequate environmental management of plastic packaging waste
93	Water extraction, direct
94	GHG Emissions
95	Greenhouse gas reduction
96	Products/services covered by circularity criteria in the public procurement
97	Level of implementation of Biowaste strategy
98	Recycling of biowaste per capita

No.	Indicator
99	Waste reduction economic savings
100	Construction works with circular design (percent).
Note: Indicators highlighted in grey currently have no data available.	

These indicators cover various aspects of CE. Under business and technology are 54 indicators, 32 under governance and infrastructure, and 14 under environment (see Figure 2). Governance and infrastructure is further divided into public awareness and education and capacity building. The environment category focuses on greening the economy, while the business and technology includes sustainable consumption and production and closing the loop indicators (see Annex A).

Figure 2. Number of Indicators per CE Element

While the study has gathered data for a significant number of CE indicators through cooperation with NGAs and LGUs, data gaps remain. A total of 61 indicators have data available either through new primary data collection activities or existing secondary data from national government agencies (NGAs) and local government units (LGUs). However, 39 indicators have no identified data sources (see Table 2). This underscores the importance of continual efforts to ensure comprehensive, sustainable data collection.

Table 3. Summary of Overall CE Indicator Data Collection

Indicators	Frequency
Indicators with Data	
Indicators with Primary Data	12
Indicators with Secondary Data	41
Indicators with Primary and Secondary Data	8
Total Number of Indicators with Data	**61**
Indicators without Data	39
Grand Total Number of Indicators	**100**

For the indicators with available data, 13 indicators were supplied by both NGAs and LGUs. Aside from indicators available from both NGAs and LGUs, secondary data for 34 indicators were from NGAs only, while data for 2 indicators came from LGU sources only.

Table 4: Summary of Available Secondary Data Per Source Level

Indicators	Frequency
With National and LGU Data	13
With National Data Only	34
With LGU Data Only	2
Total Number of Indicators	49

C. Methods of Data Collection

With respect to secondary data, the team reached out to various government agencies and private entities. The Solid Waste Management Division of DENR-EMB, specifically the secretariat of the National Solid Waste Management Commission (NSWMC), provided valuable data on solid waste. Additional data sources included NEDA, CHED, and DTI, contributing to a comprehensive pool of secondary information.

With respect to primary data, recognizing the importance of capturing data from households and businesses, the study team conducted surveys within the ACE Project cities. Two surveys were carried out, one for households and another on junkshops to represent business operations related to CE practices at the community level.

Junkshop survey respondents were identified using simple random sampling from the list of registered junkshops provided by ACE cities. Using Krejcie and Morgan,[1] the team targeted a sample size that aims for a 95 percent confidence interval for each city. The interviews were conducted between March 7 and March 20, 2023.

The junkshop survey faced challenges as 159 junkshops either refused to participate or had unreachable mobile numbers. The team completed 49 interviews, resulting in a completion rate of 23 percent and a 95 percent confidence interval with a 12 percent margin of error overall. Due to the low completion rate and high non-response (see **Table 5**), caution is advised in generalizing the survey findings. Nevertheless, this pilot survey among junkshops allowed the team to test the questionnaire and gather valuable baseline data.

The household survey was conducted from March 13 to 17, 2023. The initial design was a multi-stage sampling with 30 respondents for each city (95percent confidence interval, 18percent margin of error [city level]; 8percent margin of error [ACE cities]). The small sample size is due to limited time and field personnel.

The change in design from multi-stage sampling to quota sampling was decided after a recommendation by the LGUs to identify the barangays to be covered. To accommodate this, the team increased the quota from 30 to at least 40 households (except in Manila, with only 28 household respondents). The LGUs provided staff members to assist in the interviews. Quezon City used their scheduled activities with selected households to implement the survey. In Cotabato, members of the Pantawid Pamilyang Pilipino Program (4Ps) and senior citizen groups were identified to participate. In other cities, house-to-house method was used.

The survey was completed by 279 respondents, with more females (198) than males (81). The data can be disaggregated according to city, sex, educational attainment, self-rated poverty measure, household size, and employment status. Qualified respondents must fit the following criteria: not residing in a hostel-type accommodation and preferably mostly or partly involved in household decision making. Some respondents were not involved in decision making, but since these were completed interviews, they are included in the baseline report.

1 Krejcie, R.V. and Morgan, D.W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-610. https://doi.org/10.1177/001316447003000308

Table 5. Number of Junkshops provided by the LGU

ACE City	# of Registered junkshops	Sample size	Total junkshops contacted	Call Result		
				Completed	Refusal	Cannot be reached/ No contact number/ Inactive
Caloocan	72	61	72	24	8	40
Cotabato	3	3	3	3	0	0
Manila	72	61	17	6	1	65
Pasig	36	33	36	11	10	15
Quezon City	25	23	25	5	5	15
Total	**208**	**181**	**153**	**49**	**24**	**135**

Table 6 presents the number of respondents per ACE city, barangays where the respondents reside, number of completed interviews, and sex of the respondents. Due to the non-randomized design of the survey, the results only pertain to the respondents and cannot be generalized to the respective cities or barangays.

**Table 6. Number of Respondents Interviewed**

ACE City	Barangay/district	# of respondents	Sex	
			Male	Female
Caloocan	Brgy. 153	44	10	34
Cotabato	Poblacion IV	62	17	45
Manila	6 districts	28	5	23
Pasig	Maybunga and Ugong	89	32	57
Quezon City	Matandang Balara	56	17	39
Total		**279**	**81**	**198**

By employing both secondary data compilation and primary data collection methods, the study team aimed to ensure a comprehensive assessment of CE indicators in the Philippines, offering valuable insight for policymakers and stakeholders alike.

II.

Presentation of Individual Indicators and Values
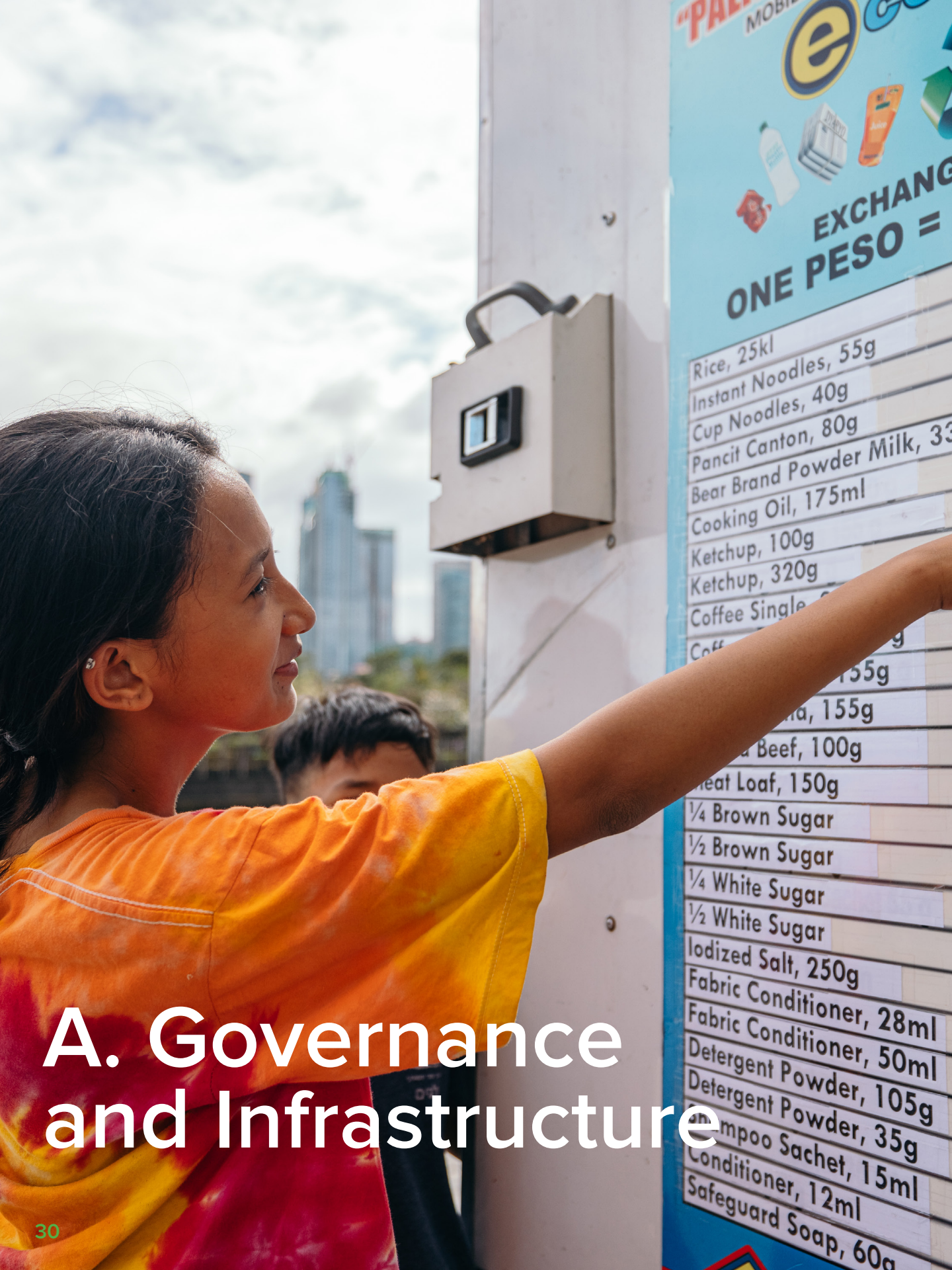
A. Governance and Infrastructure

Public Awareness and Education

Eight indicators pertain to public awareness and education (see **Table 7**). Secondary data is available on seven of these indicators. Primary data has been collected for two indicators, including one of the seven indicators where secondary data is available.

Table 7. List of Indicators on Public Awareness and Education

No.	Indicator	Primary Data	Secondary Data
1	Publications on the circular economy		✓
2	Actions to divulge a long-term RandI agenda for speeding up the circular economy in the country		✓
3	Number of companies that publish sustainability reports		✓
4	Number of partnerships with municipalities/ distribution		✓
5	Mainstreaming education for sustainable development into the curriculum		✓
6	Number of experimental projects initiated		✓
7	Number of awareness-raising activities for waste prevention carried out	✓	✓
8	Awareness campaigns to reduce food waste	✓	

1. Publications on the Circular Economy

The "publications on the circular economy" indicator pertains to knowledge- and expertise-related documents related to CE practices. In this report, five significant publications – four at the national level and one at the city level – have been identified.

1. The Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP).[1] Formulated by the National Economic and Development Authority (NEDA), this plan discusses a long-term research and innovation agenda to accelerate CE in the country. It also includes CE vision documents.

2. CE In the Philippines.[2] The Asian Development Bank (ADB) reviews international and national best practices that can be adapted and implemented in

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1 National Economic and Development Authority (2023). Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP). https://neda.gov.ph/pap4scp/
https://neda.gov.ph/wp-content/uploads/2023/01/Philippine-Action-Plan-for-Sustainable-Consumption-and-Production.pdf

2 Schroeder, P. (2020). ADB-NEDA Circular Economy Report Philippines.
https://www.adb.org/sites/default/files/project-documents/50158/50158-001-tacr-en_5.pdf

the Philippines to promote sustainable consumption and production (SCP). The report assesses existing CE-related policies and identifies interventions to facilitate the upscaling of best practices and support the country's transition. It offers recommendations on how to promote CE practices across sectors and identifies key stakeholders involved.

3. Towards the Attainment of Sustainable Consumption and Production in the Philippines: A Desk Review of Trends and Issues.[3] According to the ADB, this served as a scoping study in preparation for the formulation of the PAP4SCP. It provides background on sustainable development, maps existing arrangements and policies on SCP, and offers an overview of thematic policy opportunities, including waste management. It also includes examples of other countries' experiences with SCP and CE practices.

4. **Circular Economy and Waste Management in the Philippines: A Stocktaking Report 2022**[4] This UNDP report describes CE and solid waste management in the Philippine context. It reviews existing policies on solid waste and CE and identifies over 200 initiatives from different sectors that contribute to the CE in the country.

5. In Pasig, one of the five ACE cities, a 2022 study titled **Circular Economy in the City: A Rapid Ethnographic Research on Circular Economy in a Philippine Urban Setting**[5] was published by UNDP. This study presents an organized understanding of the professional and personal experiences of various sectors functioning within the context of a circular economic ecosystem in Pasig City.

Publications on circular economy provide insights, best practices, and policy recommendations to foster CE in the Philippines, building awareness, knowledge, and informed decision-making by promoting sustainable consumption and production practices.

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3 Arcenas, A., et. al. Towards the Attainment of Sustainable Consumption and Production in the Philippines: A Desk Review of Trends and Issues. https://www.adb.org/sites/default/files/project-documents/50158/50158-001-tacr-en_0.pdf

4 UNDP Philippines (2022). Circular Economy and Waste Management in the Philippines: A Stocktaking Report.

5 UNDP Philippines (2021). Circular Economy in the City: A Rapid Ethnographic Research on Circular Economy in a Philippine Urban Setting. https://www.undp.org/philippines/publications/circular-economy-city-rapid-ethnographic-research-circular-economy-philippine-urban-setting

2. Actions to divulge a long-term RandI agenda speeding up the adoption of the circular economy in the country

"Dissemination of circular economy documents" refers to the steps taken to disseminate knowledge- and expertise-related documents on CE practices. This report identifies two significant documents that support this indicator.

1. Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP)

PAP4SCP consists of programmatic interventions, including CE strategies, designed to steer the country's economic growth away from environmental degradation, particularly amidst the challenges posed by the coronavirus disease 2019 (COVID-19) pandemic.

Operationalizing this requires active participation from multiple stakeholders to ensure the effective execution of identified actions. These include adequate financing,

capacity building, and the availability of appropriate technology, among other factors.

Priority actions relevant to CE transition include:

- Developing and adopting green technologies and solutions for waste minimization and resource efficiency.
- Conducting life cycle assessment programs to evaluate the environmental impact of products throughout their life cycle.
- Creating and scaling up sustainable business models.
- Supporting the transition to clean and renewable energy, including emerging options like ocean wave energy, tidal energy, and ocean thermal energy.

2. National Innovation Agenda 2032

The National Innovation Agenda 2032 envisions deepening and accelerating innovation efforts through inclusive innovation programs and public-private partnerships, including collaborations with micro, small, and medium enterprises (MSMEs), academic institutions, and research and development (RandD) organizations.

The agenda identifies priority areas for the next 10 years, including:
- Manufacturing and trade, with a focus on sustainable manufacturing practices.
- Energy sector, with an emphasis on promoting waste-to-energy solutions and accelerating the transition towards clean and sustainable energy sources.

The availability of documents on CE practices provides guidance for advancing the CE agenda in the Philippines. By disseminating these documents and encouraging collaborative efforts, the country can forge a sustainable and circular path towards inclusive innovation and environmentally conscious practices across sectors.

3. Number of companies that publish sustainability reports

This indicator aims to assess the extent to which companies report their sustainability measures and initiatives related to sustainable development.

Securities and Exchange Commission (SEC) Memorandum Circular 2019-04,[1] defines sustainability reporting as the practice of organizations publicly disclosing their significant economic, environmental, and/or social impacts in accordance with globally accepted standards. This allows organizations to measure, understand, and communicate their EESG (economic, environmental, social, and governance) performance, set goals, and effectively manage change.

The SEC reports a positive trend in sustainability reporting.[2] For 2019, 90.77 percent of publicly listed companies in the country filed sustainability reports (only compliance rate is available, no data on exact number of companies). This indicates a significant number of companies acknowledge the importance of disclosing their sustainability efforts. The trend continued in 2020, with 93.3 percent submitting reports as of September 2021.

1 SEC (2019). Memorandum Circular No. 04 s.2019: Sustainability Reporting Guidelines for Publicly-listed Companies. https://www.sec.gov.ph/wp-content/uploads/2019/10/2019MCNo04.pdf

2 Rivera, D. (2021, October 8). Over 90percent of listed firms file sustainability reports. Philstar.com. https://www.philstar.com/business/2021/10/09/2132768/over-90-listed-firms-file-sustainability-reports

Sustainability reporting allows companies to assess their performance in areas such as environmental impact, social responsibility, and corporate governance. By publicly disclosing this, organizations communicate their commitment to sustainable development, engage stakeholders, and foster a culture of responsible business practices.

With an increasing number of companies embracing sustainability reporting, the business landscape in the Philippines is witnessing a positive shift towards more transparent and socially responsible practices. As sustainability remains a crucial aspect of global development, continued efforts in reporting and improving EESG performance are expected to contribute significantly to the country's journey towards a more sustainable future.

4. Number of partnerships with municipalities/distribution

This indicator aims to identify the: (1) partnerships involving national RandD, (2) the municipalities and/or cities' waste management systems, and (3) the distribution and EPR of the companies.

Partnerships involving national research and development (RandD) drive manufacturing innovation. These collaborations focus on product design and analysis to boost innovation in manufacturing processes. By aligning with CE principles, they encourage sustainable product development and implementation.

Collaborative efforts with municipalities and/or cities are vital for the development of effective waste management systems in line with CE principles. These partnerships can develop guidelines and establish a network of infrastructure to support local actions in waste management, empowering communities to adopt sustainable waste practices, contributing to the circular economy.

Partnerships with companies are crucial for the successful implementation of EPR initiatives. By collaborating, companies can also establish an infrastructure network to support sustainable distribution. Emphasizing EPR in these partnerships ensures a more responsible approach to product lifecycle management and supports CE objectives.

This report, however, does not include the total number of partnerships with municipalities regarding CE projects.

The Department of Science and Technology (DOST) is mandated to execute its programs and initiatives for technology promotion and transfer through its Provincial Science and Technology Offices (PSTOs)[1] which play a crucial role in executing science and technology programs at the provincial level. PSTOs also foster institutional linkages with provincial offices of other NGAs, LGUs, academic institutions, and nonprofit organizations. These linkages promote collaboration and knowledge exchange, furthering CE initiatives across various provinces in the country.

Partnerships play a pivotal role in advancing CE projects in the Philippines. Collaborations involving national RandD, municipalities and/or cities, and companies contribute to boosting manufacturing innovation, improving waste management systems, and promoting sustainable distribution practices. The engagement of institutions like the PSTOs strengthens the foundation for sustainable development and innovation at the provincial level. As CE gains momentum, continual efforts in forging partnerships are essential.

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1 DOST (n.d.). Regional Offices' SandT services. https://www.dost.gov.ph/products-and-services/regional-offices-s-t-services.html

5. Mainstreaming education for sustainable development into the curriculum

This indicator assesses whether the Philippines has taken steps to promote the concept of CE in its educational system. The country does this through the National Environmental Awareness and Education Act of 2008 (RA 9512), which lays out the policy framework for integrating environmental awareness and education into the system.

To complement RA 9512, the National Environmental Action Plan 2018–2040 was formulated. It outlines a comprehensive environmental education strategy that aligns with the principles of sustainable development and recognizes regional sociocultural values as catalysts for fostering sustainable development practices. The Action Plan is divided into three distinct phases:

- Medium-term are short- to mid-term initiatives and actions aimed at promoting

environmental awareness and education.

- Long-term devises longer-term strategies to sustain and enhance environmental education efforts in the educational system.

- Foresight is a forward-looking phase that emphasizes the integration of environmental consciousness into the long-term vision of sustainable development in the Philippines.

The Philippines demonstrates its commitment to promoting environmental education and sustainable development through RA 9512 and its National Environmental Action Plan. By mainstreaming education for sustainable development into the curriculum, the country aims to instill a culture of environmental consciousness and CE principles in the minds of future generations.

6. Number of experimental projects initiated

The "number of experimental projects initiated" indicator refers to any research and development or pilot demonstration project related to CE. Based on the DOST list of RandD projects on the environment, 22 projects from 2019 to 2023 have been identified, focusing on various aspects of CE

(see **Table 8**). The projects explore innovative approaches and solutions that align with CE principles. Through research and pilot demonstrations, these initiatives seek to address environmental challenges, promote sustainable practices, and foster a more circular and resource-efficient economy.

Table 8. List of DOST's RandD Projects[1]

Year	No. of Projects	RandD Projects
2019	3	Aerobic treatment of anaerobically pre-digested swine wastewater using activated sludge and subsequent polishing using biological filters, trickling filter system
		Nutrient removal of anaerobically treated piggery wastewater
		Development of a bench-scale biological wastewater treatment design facility
2020	4	Utilization of Chicken eggshell wastes as biomaterial for hydroxyapatite synthesis
		Post-treatment of food processing wastewater effluent for nutrient removal
		Strengthening the Municipal Solid Waste Management Program: A Guide on Preparation of Waste Analysis and Characterization Study (WACS) Plan for the National Capital Region Local Government Units
		Pilot-Scale Biogas Production of Biodegradable Solid Waste for Muntinlupa City
2021	1	Dissolved Copper Removal from Semiconductor Wastewater Effluent by Electrowinning Process
2022	8	Integrated Mapping, Monitoring, Modelling and Management System for Manila Bay and Linked Environments (IM4ManilaBay) Project 3: Management of Dredge Material: Characterization, Treatment and Disposal (CharTed DreaM)
		Waste Analysis and Characterization Study (WACS) in Public Markets: Support to Effective Solid Waste Management of Selected Public Markets in Manila
		Economic and Life Cycle Analysis of Single-use Plastic in the Philippines
		Design, Modeling, and Simulation of an Improved In-vessel Composting System
		Development of Air Biofilters for the Control of Ammonia
		Development of an Algal-Bacterial (ALBA) Wastewater Treatment System
		Pilot-Scale Treatment of Fruit Waste for Biogas Production using Trichoderma harzianum
		Detection of Enteroviruses (EnV) in Wastewater System using Polymerase Chain Reaction (PCR)

1 DOST-ITDI (2023). Environment.
https://www.itdi.dost.gov.ph/index.php/what-we-do/research-and-development/environmental

Year	No. of Projects	RandD Projects
2023 (ongoing)	6	Operation of the DOST Sewage Treatment Plan (STP) and Development of Strategies for Water Reuse
		Qualitative and Quantitative Assessment of Microplastics along the key sites of Laguna de Bay, Philippines
		Utilization of Septic Sludge for Biogas and Compost Production using a Portable Biogas Digester
		Utilization of Coffee Beans Waste for Enzyme Production Using Isolated Fungal Strain
		Implementation of an Effective Solid Waste Management Program for ITDI: Part 1 – Assessment and conduct of Waste Analysis and Characterization Study (WACS)
		Development of Algal-Bacterial (ALBA) Wastewater Treatment System for Swine Industry (Phase 2)
	22	Total
Source: DOST-ITDI Research and Development		

By initiating these projects, the Philippines demonstrates its commitment to advancing CE concepts and practices. These research and development efforts play a vital role in identifying viable strategies for transitioning towards CE. Their outcomes and findings are expected to contribute valuable insights – informing policies, shaping best practices, and encouraging wider adoption of CE principles.

7. Number of awareness-raising activities for waste prevention carried out

The Metro Manila Solid Waste Management Project 2003 Community Awareness Strategy Report provided a partial inventory of Information, Education, and Communication (IEC) materials/activities on solid waste management from 1997 to 2003. However, no updated inventory is available at present. As a substitute, two proxy variables were used to determine households' perceptions of waste generation in their city and the success of awareness-raising activities on waste prevention.[1]

When asked about their city's issue with waste generation, about half (49percent) of households perceived it as "serious/very serious." Among the five ACE cities, Quezon City had the highest proportion of respondents (86percent) who viewed their city's waste generation issue as "serious." In contrast, only a fifth (18percent) of respondents in Caloocan perceived their city's waste generation issue as "serious." (See **Table 9**)

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1 Asking the amount of wastes carried out is appropriate for LGUs or other implementers of awareness-raising activities. However, with households being the unit of analysis in the survey, the proxy question "How serious is your city's issue with waste generation?" was instead used.

Table 9. Households' perception on the seriousness of their city's issue with waste generation

ACE City	Total (n)	Perception on the seriousness of their city's issue with waste generation (percent)					
		Not serious at all	Not serious	Serious	Very serious	Undecided	Missing
Overall	**279**	**14.3**	**32.6**	**25.8**	**23.7**	**2.5**	**1.1**
Caloocan	44	43.2	36.4	9.1	9.1	2.3	-
Cotabato	62	4.8	37.1	21.0	33.9	3.2	-
Manila	28	3.6	25.0	46.4	17.9	7.1	-
Pasig	89	18.0	42.7	19.1	14.6	2.2	3.4
Quezon City	56	1.8	12.5	44.6	41.1	-	-

There was no significant difference between the perceptions of waste generation issues among males and females. Regardless of sex, households in Caloocan and Pasig mostly viewed their city's issue with waste generation as "not serious," while those in Cotabato, Manila, and Quezon City considered it "serious/very serious" (see **Table 10)**.

Table 10. Households' perception on the seriousness of their city's issue with waste generation by sex

ACE City	Perception on the seriousness of their city's issue with waste generation (percent)		
	Not serious at all/ Not serious	Serious/ Very serious	Undecided
Overall			
Male	**47.5**	**50.0**	**2.5**
Female	**47.5**	**50.0**	**2.5**
Caloocan			
Male	80.0	18.2	2.3
Female	79.4	20.6	-
Cotabato			
Male	42.2	55.6	5.9
Female	41.2	52.9	2.2
Manila			
Male	40.0	60.0	-
Female	26.1	65.2	8.7
Pasig			
Male	64.5	35.5	
Female	61.8	34.5	3.6
Quezon City			
Male	5.9	94.1	-
Female	17.9	82.1	-

Overall, about half of young and older adults perceive their city's issue with waste generation as "not serious" while about three-fifths of middle-aged adults perceive it as "serious." Across different age groups, respondents in Caloocan and Pasig were more likely to perceive the waste generation issue as "not serious at all/not serious," while those in Manila and Quezon City were more likely to view it as "serious." Interestingly, the perception was consistent among different age categories, except for older adults in Cotabato who viewed the issue as "serious/ very serious."

Table 12. Households' perception on the seriousness of their city's issue with waste generation by self-rated poverty

ACE City	Perception on the seriousness of their city's issue with waste generation (percent)		
	Not serious at all/ Not serious	Serious/ Very serious	Undecided
Overall			
Poor	**37.0**	**59.8**	**3.3**
On the line	**54.1**	**44.0**	**1.9**
Not poor	**44.0**	**52.0**	**4.0**
Caloocan			
Poor	75.0	25.0	-
On the line	82.4	14.7	2.9
Not poor	50.0	50.0	-
Cotabato			
Poor	30.3	63.6	-
On the line	54.5	45.5	-
Not poor	57.1	42.9	-
Manila			
Poor	28.6	57.1	14.3
On the line	30.0	65.0	5.0
Not poor	-	100.0	-
Pasig			
Poor	59.1	40.9	0.0
On the line	63.6	34.5	1.8
Not poor	66.7	22.2	11.1
Quezon City			
Poor	13.6	86.4	-
On the line	17.9	82.1	-
Not poor	-	100.0	-

Almost all households interviewed (98.3percent) agreed that protecting the environment stimulates economic growth. In Cotabato, Manila, and Quezon City, all respondents shared this belief. However, in Pasig, a small percentage (2.2percent) held a different view, and in Caloocan, a few households (2.3percent) did not respond to this question.

Table 13. Households' agreement on the statement that of environment protection can stimulate economic growth

ACE City	Total (n)	Agreement on the statement that environment protection can stimulate economic growth (percent)					
		Strongly agree	Agree	Disagree	Strongly disagree	Undecided	Missing
Overall	**279**	**55.6**	**42.7**	**0.7**	**-**	**-**	**1.1**
Caloocan	44	70.5	27.3	0.0	0.0	0.0	2.3
Cotabato	62	71.0	29.0	0.0	0.0	0.0	0.0
Manila	28	64.3	35.7	0.0	0.0	0.0	0.0
Pasig	89	23.6	71.9	2.2	0.0	0.0	2.2
Quezon City	56	73.2	26.8	0.0	0.0	0.0	0.0

Findings from the survey provide valuable insights into households' perceptions of waste generation and the link between environmental protection and economic growth. Understanding these perspectives is crucial in shaping effective awareness-raising initiatives and policies that promote CE principles. The data highlights varying perceptions across different cities and income levels, indicating the need for tailored information, education, and communication strategies.

8. Awareness campaigns to reduce food waste

Food waste reduction is a critical aspect of CE practices. By minimizing food waste, households contribute to resource efficiency, reduce environmental impact, and promote sustainable consumption. Lacking a recent inventory[1] on awareness campaigns, a survey was conducted in UNDP ACE cities to estimate the percentage of households practicing food waste reduction. A proxy variable derived from the question asking respondents to estimate the amount of food waste they either compost or feed to animals was used to measure the indicator.

The survey revealed that about two-thirds (68.5percent) of household respondents engage in practices to reduce food waste, such as composting or feeding it to animals. Among the five ACE cities, Caloocan had the highest proportion of household respondents (86.2percent) actively reducing their food waste through composting or feeding animals. In contrast, Pasig had the lowest share (59.6percent) of households doing this.

Across the ACE cities, the proportion of food waste being composted or fed to animals was approximately 55 percent, meaning almost half of the waste generated still end up in landfills or disposed in other ways. Caloocan households reported the highest proportion (86.2percent) of food waste reduction.

Strategies suggested by scholars to reduce food waste include training and information dissemination among members of the community, a policy requiring households to recycle food waste, and local governance closely monitoring food waste disposal practices.[2]

Photo: Jilson Tiu/UNDP Philippines

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1 A partial inventory of IEC materials/Activities on SWM from 1997 to 2003 is in Annex J. Considering the households as the unit of the analysis, the survey used a proxy measure instead to assess practices on food waste management.

2 Limon, M. R. and Villarino, C. B. J. (2020). Knowledge, attitudes and practices on household food waste: Bases for formulation of a recycling system. Global Journal of Environmental Science and Management, 6(3), 323-340. https://doi.org/10.22034/gjesm.2020.03.04

Table 14. Households that practice food waste reduction

ACE City	Total (n)	HHs (n)	Engages in practices that reduce food waste (percent)		Food waste generated in the past week (in kg)	Food waste (in kg) in the past week composted or fed to animal	Food waste reduced
			Yes	No	Yes	No	Undecided
Overall	**279**	**243**	**68.5**	**31.5**	**715.6**	**393.3**	**55.0**
Caloocan	44	43	90.9	9.1	65.2	56.2	86.2
Cotabato	62	59	71.0	29.0	214.5	90.4	42.1
Manila	28	27	67.9	32.1	112.8	55.5	49.2
Pasig	89	64	59.6	40.4	182.2	108.2	59.4
Quezon City	56	50	62.5	37.5	140.8	82.8	58.8

Survey data provides valuable insights into the behavior of households in different ACE cities, highlighting the importance of awareness-raising campaigns and educational initiatives to further encourage food waste reduction practices. The significant variation in food waste reduction rates across cities also underscores the need to target these campaigns. Encouraging more households to adopt composting and animal feeding practices can contribute to a more circular and sustainable approach to food consumption and waste management.

Capacity Building

Nine indicators pertain to capacity building. Of these, eight have secondary data available, while the remaining one required new primary data collection (see **Table 15**).

Table 15. List of Indicators on Capacity Building

No.	Indicator	Primary Data	Secondary Data
16	Development of new laws and regulations that discourage linear practices		✓
17	Circular economy vision documents		✓
18	Public procurement procedures including ecological and circular criteria		✓
19	Financial assistance granted to companies related to the circular economy		✓
20	Institutions willing to collaborate on a circular economy initiative	✓	✓
21	Circular economy researchers		✓
22	Training courses on the circular economy		✓
23	Community-driven associations		✓
24	Citizen participation in an Inclusive Recycling Program	✓	

16. Development of new laws and regulations that discourage linear practices

This indicator focuses on laws that discourage linear practices: resource taxes, public circular procurement, and resource passports. At present, the country has only enacted one new law specifically targeting the promotion of CE principles.

Since the 15th Congress (2010–2013), the Philippines has seen a surge in legislative efforts to address issues related to closely linked to circular economy such as plastics and waste management. From 2010 to 2022, a total of 114 house bills have been proposed with the aim of prohibiting linear practices in the country. These indicate a growing recognition of the importance of transitioning to a more sustainable and circular economic model.

Table 16. House Bills that discourage linear practices in the Philippine Congress

Year	Category			
	Plastics	Waste and Waste Management	Circular Economy	Total
House of the Representatives				
15th Congress (2010-2013)	21	28	0	49
16th Congress (2010-2016)	17	33	0	50
17th Congress (2016-2019)	S26	52	0	78
18th Congress (2019-2022)	43	79	2	124
TOTAL	**107**	**192**	**2**	**301**
Senate				
15th Congress (2010-2013)	9	21	0	30
16th Congress (2010-2016)	7	20	0	27
17th Congress (2016-2019)	6	12	0	18
18th Congress (2019-2022)	9	30	0	39
TOTAL	**31**	**83**	**0**	**114**

While the number of bills is encouraging, passing just one reflects the challenges in translating proposals into actual policy. Nevertheless, it was a step forward in aligning the country's policies with CE principles.

During the 18th Congress (2019-2022), though, the House of Representatives took significant steps to promote CE principles and sustainability. House Bill 7609 is an Act to promote CE and a whole-of-nation transition toward a sustainable future while House Resolution 0794 directs the committee on climate change to study the integration the CE concept into the country's low- emissions development strategy and the minimization of waste generation through prevention, reduction, recycling, and reuse towards ecological integrity and a clean and healthy environment.

A significant legislative milestone is the enactment of the Extended Producer Responsibility (EPR) Law of 2022 (RA 11898). This law amends the Ecological Solid Waste Management Act of 2000 (RA 9003) to institutionalize a scheme that holds producers accountable for their products throughout their life cycle. In particular, the law mandates large enterprises that produce or generate plastic packaging to recover 80 percent of their plastic product footprint by 2028.

Following enactment, DENR issued its implementing rules and regulations (IRR) through Administrative Order 2023-02 on January 24, 2023.[1] The IRR provides detailed guidelines and procedures, outlining the responsibilities of producers, establishing recovery targets, and setting a framework for proper waste management and recycling practices to meet CE objectives.

The Philippines has taken significant strides

1 DENR (2023). Implementing Rules and Regulations of Republic Act No. 11898. https://emb.gov.ph/wp-content/uploads/2023/01/DAO-No.-2023-02-re-IRR-of-RA-No.-11898.pdf

in recent years to incorporate CE principles into its legislative framework. Legislation plays a crucial role in creating an enabling environment for CE practices. Laws and regulations that encourage resource efficiency, promote sustainable consumption, and incentivize circular business models are needed in the transition towards a circular economy. It is increasingly important for the Philippines to build upon existing legislative efforts and enact more laws that do so.

House Bill 7609 and House Resolution 0794 indicate that people are aware of the need to transition to a more sustainable economic model. The enactment of the EPR Law and issuance of its IRR mark an important milestone. These legislative efforts allow the country to further embrace CE principles and work towards a more sustainable and environmentally responsible future.

Continued cooperation and collaboration between government agencies, industries, and civil society are required to pass additional legislation for this. Public-private partnerships, stakeholder engagement, and capacity-building initiatives further support the successful implementation of CE laws and demonstrate the country's commitment to sustainable practices and CE concepts.

17. Circular economy vision documents

This indicator refers to the availability of any policy or document that supports the development of CE. Two of three documents were identified by the Center of International Relations and Strategic Studies of the Department of Foreign Affairs (DFA) Foreign Service Institute (FSI) in its 2022 review[1] of CE-related laws and policies in the Philippines:

• **The Philippine Green Public Procurement Roadmap: Advancing GPP until 2022 and beyond**[2]

Published in 2017 by the Government Procurement Policy Board (GPPB), this roadmap outlines five strategies to systematically and gradually implement GPP in the Philippines: (1) policy commitment, (2) GPP for commonly sourced and expendable products (CSE), (3) GPP for non-CSE products, (4) communication and awareness for GPP, and (5) monitoring and evaluation of GPP implementation. The roadmap aims to encourage government agencies and institutions to adopt sustainable procurement practices that prioritize eco-friendly products and services.

• **Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP)**

NEDA's PAP4SCP is a comprehensive framework to influence sustainable behavior and practices across sectors and government levels. It lays down a set of programmatic policy reforms and actions to be implemented over the short- (2020–2022), medium- (2022–2030), and long term (2030–2040). It aligns with the country's long-term vision, Ambisyon Natin 2040, aiming to secure a matatag (strongly rooted), maginhawa (comfortable) at panatag na buhay (secure life) for present and future generations. Key policies and actions are categorized into four nodes: (1) policy and regulation; (2) research and development, innovation, and technology; (3) infrastructure; and (4) promotion and

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1 Katigbak, J. J. (2022). A Review of Circular Economy-related Laws and Policies in the Philippines [PowerPoint slides]. https://pidswebs. pids.gov.ph/CDN/document/Presentation_May17_Katigbak.pdf

2 GPPB-TSO (2017). The Philippine Green Public Procurement Roadmap: Advancing GPP until 2022 and beyond. https://www.gppb.gov. ph/wp-content/uploads/2023/06/GPP_roadmap_print.pdf

education. The PAP4SCP emphasizes the importance of internalizing social and environmental impacts in the market system and adopting CE principles to achieve resource efficiency and climate-smart practices.

Among the key programs prioritized is the institutionalization of Natural Capital Accounting (NCA) to enable a comprehensive measurement of the value of the country's natural resources and the impacts of economic activities on the environment. This will be supplemented by carrying capacity and assimilating capacity assessments to determine ecological limits towards sustainable use and management of natural resources. A program to scale up the assessment of the environmental impact of commercial products over their life cycle is also being pursued to facilitate a shift to more resource-efficient technologies and processes.

The other document is from the Board of Investments (BOI).

• Strategic Investment Priority Plan (SIPP) [3]

The 2022 SIPP positions the Philippines as a regional hub for carbon-reducing activities. It encourages investments in priority activities related to the environment and climate change, such as motor vehicle inspection centers, scrapping and disposal of old PUVs, industrial waste treatment, green ecosystems, energy efficiency projects, renewable energy, and integrated waste management, disposal, and recycling. Qualified businesses engaged in these priority activities may qualify for tax incentives to promote industry development and inclusive economic growth.

These CE vision documents signify the Philippines' commitment to sustainable development and resource efficiency. The Philippine Green Procurement Roadmap aims to promote sustainable public procurement while the PAP4SCP provides a comprehensive action plan to encourage green consumption and production practices. The SIPP by BOI targets investments in carbon-reducing activities and projects related to the environment and climate change. Collectively, these documents support the integration of CE principles into the country's policies and strategies.

3 Office of the President (2022). Memorandum Order No 61: Approving the 2022 Strategic Investment Priority Plan. https://www.officialgazette.gov.ph/downloads/2022/05may/20220524-MO-61-RRD.pdf

18. Public procurement procedures including ecological and circular criteria

The Philippines implements green public procurement (GPP) practices, ensuring that government offices acquire goods and services with lower environmental impacts. Circularity criteria is included in the procurement of goods and services through guidelines issued by the Government Procurement Policy Board (GPPB)[1] in 2017.

This includes specifications for 10 commonly sourced and expendable (CSE) products and 10 non-CSE products (see Table 17). These guide the procurement process, ensuring that the government bureaucracy considers environmental impact and sustainabilit factors in purchasing.

1 GPPB-TSO (2017). Green Public Procurement Technical Specifications for Priority Product Groups. https://www.gppb.gov.ph/wp-content/uploads/2023/06/GPP-Technical-Specifications-Doc-Final.docx

Table 17. Priority Product Groups with GPP Technical Specifications[1]

Common-Use Supplies and Equipment (CSEs)	Non-Common-Use Supplies and Equipment (non-CSEs)
Toilet Paper	Computers, Monitors, and Laptops
Record Books	Copiers
Multicopy Paper	Refrigerators and Freezers
Plastic Trash Bag	Air Conditioners
Chairs	Paints and Varnishes
LEDs	Textiles
Cleaner (Toilet bowl and urinal cleaner)	Toilets and Urinals
Detergent Powder	Vehicles
Liquid Hand Soaps	Food and Catering Services
Disinfectant Spray	Training Facilities/ Hotels/ Venues

1 Ibid.

19. Financial assistance granted to companies related to the circular economy

This refers to the number of financial instruments, such as bonds, that support sustainable operations. The Philippines recognizes the importance of supporting sustainable operations. To achieve this goal, the country has taken significant steps in the realm of sustainable finance and, since 2019, has issued a total of US$10,346.7 million Green, Social, and Sustainability Bonds. These play a crucial role in financing projects that offer both environmental and social benefits, aligning with the principles of CE and sustainable development.

The shift to a CE is bolstered by the Philippine Sustainable Finance Roadmap[1], published by the Bangko Sentral ng Pilipinas (BSP) in 2022. A comprehensive strategy to mobilize funding and investments that support sustainable operations and development, the roadmap outlines specific ways in which the Philippine government will facilitate and promote the growth of the sustainable finance ecosystem.

The SEC reports the issuance of ASEAN Green, Social, and Sustainability Bonds by Philippine companies, in alignment with the ASEAN Capital Markets Forum. ASEAN Sustainability Bonds encompass bonds and sukuk that comply with both the ASEAN Green Bond Standards (GBS) a nd ASEAN Social Bond Standards (SBS). As defined in SEC MC 2019-08,[2] the proceeds from these are exclusively applied to finance or refinance a combination of Green and Social Projects that offer environmental and social benefits. See **Figure 3** for the total ASEAN-labelled Green, Social, and Sustainability Bonds issued by Philippine companies.

1 BSP (2022). Circular Letter No. CL-2022-11: Philippine Sustainable Finance Roadmap and Guiding Principles. https://www.bsp.gov.ph/Regulations/Issuances/2022/CL-2022-011.pdf

2 SEC (2019). Memorandum Circular No. 08 s.2019: Guidelines on the Issuance of Sustainability Bonds under the ASEAN Sustainability Bonds Standards in the Philippines. https://www.sec.gov.ph/wp-content/uploads/2019/10/2019MCNo08.pdf

Figure 3. Philippine Green, Social, and Sustainability (GSS) Bonds Issuances (2019-Present)
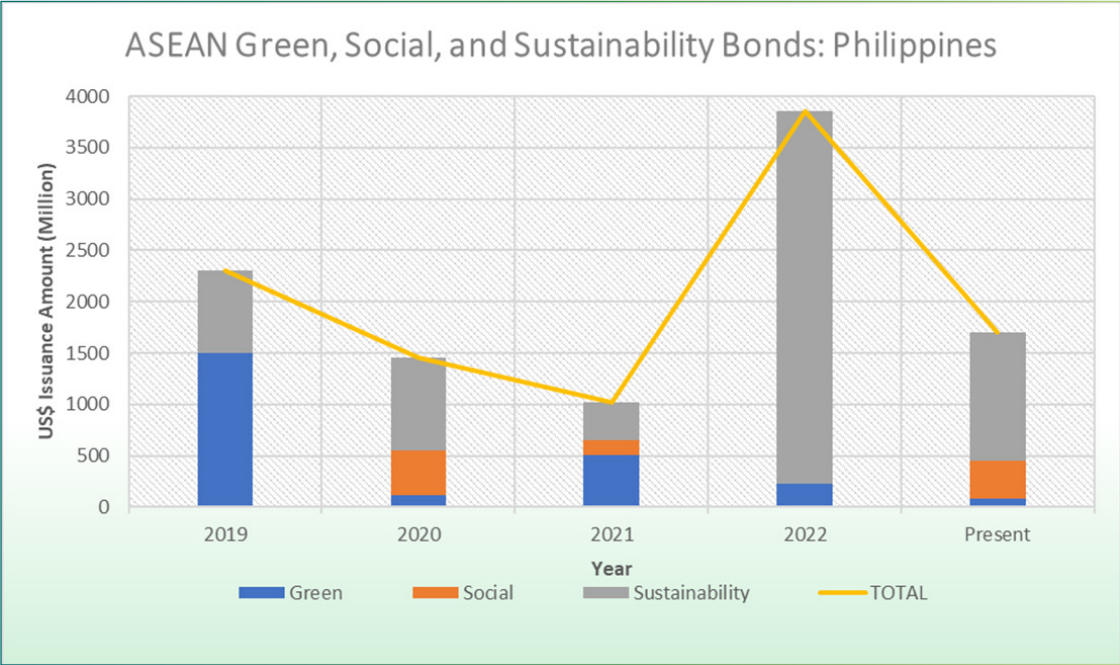
ASEAN Green, Social, and Sustainability Bonds: Philippines

Source: Securities and Exchange Commission, ASEAN-labelled Green, Social, and Sustainability Bonds

20. Institutions willing to collaborate on a CE initiative

The "institutions willing to collaborate on a circular economy initiative" indicator refers to the institutions funded by the government to conduct research on CE initiatives. The Philippines has provided funding to various Higher Education Institutions (HEIs) for projects related to this field. These cover a wide range of topics within the CE domain, addressing critical areas such as solid waste management, agricultural and agro-industrial wastes, organic wastes, wood wastes, and renewable energy, among others.

According to the Commission on Higher Education (CHED), 20 HEIs have been selected to receive funding for their research projects related to CE from 2008 to 2022. These institutions represent key stakeholders in advancing the principles of the CE within the country.

The projects (see **Table 18**) contribute to developing innovative solutions and practices for more sustainable resource management, waste reduction, and the integration of CE principles into various sectors of the economy.

Table 18. List of funded CE-related research projects from 2008 to 2022

Region	Year	Higher Education Institutions
CAR	2014	Benguet State University
NCR	2009	Universidad de Sta. Isabel
Region II	2008	Cagayan State University
Region III	2022	Nueva Ecija University of Science and Technology
	2010	Pampanga State University of Agriculture (Pampanga State Agricultural University)
CALABARZON	2008	Adventist University of the Philippines (AUP)
	-	Lyceum of the Philippines-Batangas
	2009	Saint Joseph College-Cavite
	2010	University of Rizal System (URS)
	2018	University of the Philippines Los Baños (UPLB)
MIMAROPA	2008	Western Philippines University
Region V	2010	Aquinas University of Legaspi (currently University of Santo Tomas- Legazpi)
	2010	Camarines Norte State College
	2010	Divine Word College of Legaspi
Region VII	2013	Silliman University
	2012 2013 2015	University of San Carlos
Region X	2013	Xavier University-Ateneo de Cagayan
Region XI	2011	University of Mindanao
Region XII	2016	Mindanao State University – General Santos
	2010	University of Southern Mindanao

Photo: Jilson Tiu/UNDP Philippines

The diverse range of research topics shows the multidimensional approach required to foster a circular economy and highlights the country's emphasis on finding holistic and practical solutions to environmental challenges.

Through these research initiatives, the government aims to promote collaboration between academia, industry, and relevant government agencies, fostering knowledge exchange and the implementation of evidence-based CE strategies. The engagement of HEIs in CE research exemplifies the Philippines' dedication to building a more sustainable future and underscores the importance of research in driving informed policy decisions and practical solutions for a CE transition.

Junkshop Survey: Willingness to collaborate on a CE initiative

The junkshop survey aimed to gauge the sentiments of junkshop owners on the potential benefits of collaborating with local government and other stakeholders. The questions were designed to assess their willingness to collaborate and explore the perceived advantages of such partnerships. The responses were categorized into five: strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree.

Overall, most junkshops agreed that collaborating with the LGU would be beneficial to them. This indicates a positive outlook on potential advantages of working with local government authorities. However, when comparing the figures across cities, a slightly lower proportion of junkshops in Quezon City (80percent) demonstrated agreement. Similarly, many (80percent) believed that collaborating with other stakeholders would be advantageous for their business. This suggests a general inclination among junkshop owners to recognize the potential benefits from partnerships with stakeholders other than local government. Interestingly, Caloocan exhibited a slightly lower proportion of junkshops (75percent) expressing agreement with the benefits of collaborating with other stakeholders. This may indicate varying perceptions among junkshop owners in different cities regarding the advantages of engaging with non-governmental entities and organizations.

Table 19. Percent of junkshop respondents who perceive that collaboration with LGU or other stakeholders will benefit them

ACE City	Total (n)	percent of junkshop respondents who believe that collaborating with LGU is beneficial			percent of junkshop respondents who believe that collaborating with other stakeholders is beneficial		
		Strongly agree/ Agree	Disagree/ Strongly disagree	Undecided	Strongly agree/ Agree	Disagree/ Strongly disagree	Undecided
Overall	**49**	**87.8**	**-**	**12.2**	**79.6**	**4.1**	**16.3**
Caloocan	24	87.5	-	12.5	75.0	-	25.0
Cotabato	3	100.0	-	-	100.0	-	-
Manila	6	100.0	-	-	100.0	-	-
Pasig	11	81.8	-	18.2	72.7	18.2	9.1
Quezon City	5	80.0	-	20.0	80.0	-	20.0

Overall, the survey results indicate a positive disposition from junkshops towards collaboration with both the LGU and other stakeholders. The findings suggest a general willingness among (responding) junkshop owners to engage in partnerships that can potentially enhance their business operations, foster sustainable practices, and contribute to the CE objectives in their respective cities.

21. Circular economy researchers

The "circular economy researchers" indicator counts the number of researchers conducting studies relevant to CE in the Philippines. To gather this, the project team used Google Scholar search engine to compile a list of CE publications with the Philippines as the study site. The search yielded 29 publications that met the criteria. These publications involved 108 authors in total, including Filipino and non-Filipino collaborators. On average, each publication had approximately 4 authors contributing to the research.

The researchers involved in these publications have been actively studying various aspects of CE, contributing to the growing body of knowledge in this field within the Philippines. For a detailed list of the researchers and the abstracts of the studies, please refer to **Annex F.** The list shows the diversity of topics and interests within the CE research landscape in the Philippines.

22. Community-driven associations (junkshops association or group)

The survey also aimed to determine the number of junkshops that are members of community-driven associations related to waste management. Owners were asked, "Are you a member of any organization or group related to waste management, other junkshops?" and requested to provide the name of the organization/s they are members of.

Based on the responses, nine groups were identified. These play an important role in fostering collaboration and coordination among junkshops and other stakeholders involved in waste management activities.

As members, they can benefit from shared knowledge, resources, and opportunities for growth and improvement in their waste management practices.

Table 20 lists the associations and the number of members among the interviewees. This shows the junkshops' level of engagement and participation in community-driven initiatives and networks. It also gives an idea for potential collaborations and partnerships that can be facilitated by UNDP to further enhance waste management efforts.

Table 20.Number of junkshops with membership and the names of their respective associations

ACE City	Total (n)	Names of association or organization
Caloocan	16	Bagong Silang Junkshop Credit Cooperative (n=12) Honor's Credit Cooperative (n=1) Junkshop ng Caloocan (n=1) Samahan ng Junkshop sa Bagong Silang (n=1) Cannot recall (n=1)
Cotabato	0	-
Manila	2	FB scrapper's group (n=1) TGP (scrap) (n=1)
Pasig	3	Pasig MRF UMAPEC or UMAP (n=2) Samahan ng Junkshop sa Pasig (n=1)
Quezon City	5	Linis Ganda Cooperative of Quezon City (n=5)

Of the 49 junkshop respondents, about half (53.1percent) reported being members of associations or groups related to waste management. The survey showed a variation in membership rates in different cities. In Manila and Caloocan, a higher proportion of junkshops reported being members. For instance, in Caloocan, 12 out of 16 are members of the Bagong Silang Junkshop Credit Cooperative, while the remaining belong to other associations such as Honor's Credit Cooperative, Junkshop Caloocan, and Samahan ng Junkshop ng Bagong Silang. Conversely, Cotabato, Manila, and Pasig had a higher proportion of non-member junkshops .

Table 21. Junkshop membership in community associations and disaggregation by sex

ACE City	Total (n)	Member of associations or groups (percent)	Associations or group member (percent)			
			Male		Female	
			Yes	No	Yes	No
Overall	**49**	**53.1** (n=26)	**40.9**	**59.1**	**63.0**	**37.0**
Caloocan	24	66.7 (n=16)	75.0	25.0	62.5	37.5
Cotabato	3	- (n=0)	-	100.0	-	-
Manila	6	33.3 (n=2)	25.0	75.0	50.0	50.0
Pasig	11	27.3 (n=3)	16.7	83.3	60.0	40.0
Quezon City	5	100.0 (n=5)	100.0	-	100.0	-

The data on membership status provides valuable insights into the level of engagement and participation of junkshops in community-driven initiatives and networks related to waste management. It highlights the importance of fostering collaboration and networking opportunities among junkshops to enhance waste management practices and promote sustainable approaches in the Philippines. Junkshops can benefit from collective efforts, shared knowledge, and support in their waste management endeavors through membership in such associations.

23. Training courses on the circular economy

This indicator refers to the number of training courses with a CE component.

The Philippine Green Jobs Act of 2016 emphasizes the importance of identifying needed skills, developing training programs, and certifying workers for jobs that contribute to environmental benefit, natural resource conservation, and sustainable development. As part of its commitment to greening the Technical and Vocational Education and Training (TVET) sector, the Technical Education and Skills Development Authority (TESDA) has taken the lead in implementing green training regulations through its Green Technology Center.

According to the Green Skills for Green Jobs report of TESDA published in 2018, there are 20 qualifications with a green

competency component (see Table 22). The training courses for these focus on equipping individuals with the skills and knowledge to participate in green industries, support sustainable practices, and contribute to the country's transition into a green economy.

Table 21. Junkshop membership in community associations and disaggregation by sex

Sector	No.	Qualification Title	Green Competency Component
Construction	1	PV Systems Design NC III	Cover the design, installation, and servicing requirements for solar power systems
	2	PV Systems Installation NC II	
	3	PV Systems Servicing NC III	
Heating, Ventilation, Airconditioning (HVAC) and Refrigeration	4	RAC-PACU/CRE Servicing NC II	Includes the requirements under the Montreal Protocol for shifting to ozone-friendly refrigerants: the recent revision included the revised RAC Code of Practice and the use of low GWP substances as required by the Kyoto Protocol and the UN Climate Change Framework
	5	RAC-PACU/CRE Servicing NC III	
	6	RAC (Window AC/Domestic Refrigeration Servicing) NC I	
	7	RAC (Window AC/Domestic Refrigeration Servicing) NC II	
	8	Ice Plant Refrigeration Servicing NC III	
	9	Transport RAC Servicing NC II	
Agriculture and Fishery	10	Pest Management (Vegetables) NC II	Promotes integrated pest management techniques relying on Argo-Ecosystems Analysis (AESA)
	11	Landscape Installation and Maintenance (Softscape) NC II	Includes competency on the utilization, collection, and dispensation of organic wastes in landscaping work
	12	Landscape Installation and Maintenance (Softscape) NC II	Consists of competencies to operate bamboo nursery, establish and maintain bamboo farm, conduct bamboo clump rehabilitation, and conduct harvesting and post-harvesting operations
	13	Organic Agriculture Production NC II	Involves the production of organic farm products such as chicken and vegetables including production of organic supplements such as fertilizers, concoctions, and extracts

Sector	No.	Qualification Title	Green Competency Component
Automotive and Land Transportation	14	Automotive Servicing NC I	Includes environmental conservation procedures (3 Rs) and knowledge and skills requirements on maintaining vehicle systems in good running condition and efficiency
	15	Automotive Servicing NC II	
	16	Automotive Servicing NC III	Includes servicing of engines using LPG as alternative fuel
	17	Automotive Servicing NC IV	Includes servicing of emission control systems in accordance with the IRR of the Philippine Clean Air Act of 1999
Utilities	18	Garbage Collection NC I	Means to professionalize occupations to become decent with adherence to occupational health and safety principles
	19	Sanitary Landfill Operations NC II	
	20	Sanitary Landfill Operations NC III	Includes knowledge, skills and attitudes required for garbage collection in accordance with RA 9003 Cover competencies involved in direct dumping/disposal of incoming wastes at sanitary landfills
Source: TESDA, Green Skills for Green Jobs: Preparing the Filipino Workforce for the Green Economy[1]			

These courses align with CE principles and contribute to building a workforce equipped to address environmental challenges and promote sustainable practices in various industries.

1 ibid.

24. Citizen participation in an Inclusive Recycling Program

The household survey conducted in UNDP ACE cities utilized two proxy variables to measure citizen participation in waste management practices. The first question asked respondents which waste management practices they practice. Choices included composting, recycling, waste segregation, using reusables, and reducing the use of plastics. The responses were then analyzed to determine the prevalence of each waste management practice among households.

The survey results indicate that recycling is the most commonly practiced waste management method, with about three-fifths (57.7 percent) of the responding households engaging in it (see Table 23). Composting is the least common practice, reported by only 26.2 percent of households. Across the five ACE cities, waste segregation is the most common, with more than half of the respondents in Caloocan, Manila, Pasig, and Quezon City

engaging in it. For Cotabato, recycling is the most common practice reported. Conversely, composting is the least common waste management practice in Caloocan, Manila, and Quezon City. In Manila and Pasig, reusing is the least common practice reported.

Relative to the rest of the ACE cities households, a high percentage of households in Cotabato and Pasig practice composting. In Poblacion IV, Cotabato City (survey site), the prevalence of composting could be due to the training on natural composting offered by the City Environment and Natural Resources Office (CENRO) and the community vermicomposting beds provided by World Vision. Poblacion IV households either have their own composting pits or segregate their biodegradables for the community beds. In Pasig, households compost their kitchen waste in pots or recycled containers.

Table 21. Junkshop membership in community associations and disaggregation by sex

ACE City	Total (n)	Associations or group member (percent)				
		Composting	Recycling	Waste segregation	Reusing	Reducing plastic use
Overall	**279**	**26.2**	**57.7**	**55.6**	**32.3**	**39.8**
Caloocan	44	9.1	56.8	70.5	54.5	59.1
Cotabato	62	41.9	72.6	38.7	35.5	46.8
Manila	28	17.9	46.4	71.4	25.0	21.4
Pasig	89	30.3	50.6	51.7	21.3	29.2
Quezon City	56	19.6	58.9	60.7	32.1	37.5

Note: Column totals of third to seventh columns exceed 100 percent due to multiple responses

The second question tries to determine the respondents' knowledge of the waste bought by junkshops in their locality. They were asked, "Based on your observation, which of the following are bought by junkshops in your city?" The respondents were allowed to select multiple options from a list of items.

Results showed that household respondents are generally aware that junkshops buy various items, the most mentioned being plastic bottles. Items less commonly known to be sold to junkshops include appliances, biodegradables, newspapers, other plastics (e.g. broken plastic chairs), and batteries (see **Table 24**).

Table 24. Items Households Observed that Junkshops Buy

Items	Percent of HH respondents
Plastic bottles	32.5
Aluminum, cans, metals	27.1
Papers and cartons	22.5
Glass and containers	16.4
Broken appliances	0.6
Biodegradables	0.5
Newspaper	0.1
Other plastics	0.1
Battery	0.1

The survey revealed a high awareness among household respondents (98.6percent) regarding the items they can sell to junkshops. Despite this, only a relatively low percentage actually sell items. Manila has the highest percentage of respondents (57.1percent) who sell items, while Caloocan has the least number of households (18.2percent). This suggests that a high level of environmental knowledge and awareness does not necessarily translate into action or practices. This highlights the need for further strengthening of IEC campaigns to bridge the gap between awareness and action.[1]

Previous studies[2] have similar findings, saying many households consider garbage collection and disposal as the responsibility of the government. This perception might be contributing to the lower participation of households in selling items to junkshops, as they probably rely on government for waste management services. To promote better waste management practices and encourage participation in recycling and CE initiatives, it is important to assess the impact of IEC campaigns and find effective ways to engage and motivate households to take active roles in waste reduction and recycling efforts. These findings from previous studies reinforce the importance of measuring the impact of IEC campaigns.

1 Jeremias, H.M. and Fellizar, F. R. (2019). Knowledge, Awareness, Perceptions, and Practices on Solid Waste Management of Households in Selected Urban Barangays in Sorsogon City, Sorsogon, Philippines. Journal of Human Ecology, Vol 8, No 1. https://ovcre.uplb.edu.ph/journals-uplb/index.php/JHE/article/view/425

2 Bernardo, E. C. (2008). Solid-Waste Management Practices of Households in Manila, Philippines. Annals of the New York Academy of Sciences, 1140, 420-424. http://dx.doi.org/10.1196/annals.1454.016

B. Environment

Photo: Jilson Tiu/UNDP Philippines

Greening the Economy

The six indicators on greening the economy have available secondary data (see **Table 26**), with two also having new primary data resulting from this study.

Table 26. List of Indicators on Greening the Economy

No.	Indicator	Primary Data	Secondary Data
33	Illegal dumping		✓
34	Quantities of waste sent to landfill		✓
35	Food waste	✓	✓
36	Mapping of existing sites for reuse and recycling and needs	✓	✓
37	Local composting plants created		✓
38	Circular innovation projects		✓

33. Illegal dumping

The "illegal dumping" indicator, which refers to measures against disposal of garbage in open dumpsites, has been addressed in the Philippines through the implementation of the Ecological Solid Waste Management Act of 2000 (RA 9003).

Section 3 of RA 9003 defines an open dump as "a disposal area wherein the solid wastes are indiscriminately thrown or disposed of without due planning and consideration for environmental and health standards." Section 37 explicitly prohibits the establishment and operation of open dumps and any practice or disposal of solid waste that constitutes the use of open dumps.

In compliance, DENR completed the closure of all open dumpsites in the country in 2021 – twenty years after the effectivity of the Act.[1] This is a significant milestone in the country's efforts to address the problem of illegal dumping and improve solid waste management practices.

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1 Commission on Audit (2023). Performance Audit Report: Solid Waste Management Program. PAO-2023-01. https://www.coa.gov.ph/reports/performance-audit-reports/2023-2/solid-waste-management-program/

Figure 4. Number of Illegal Dumpsites and Sanitary Landfill in the Philippines from 2012 to 2021
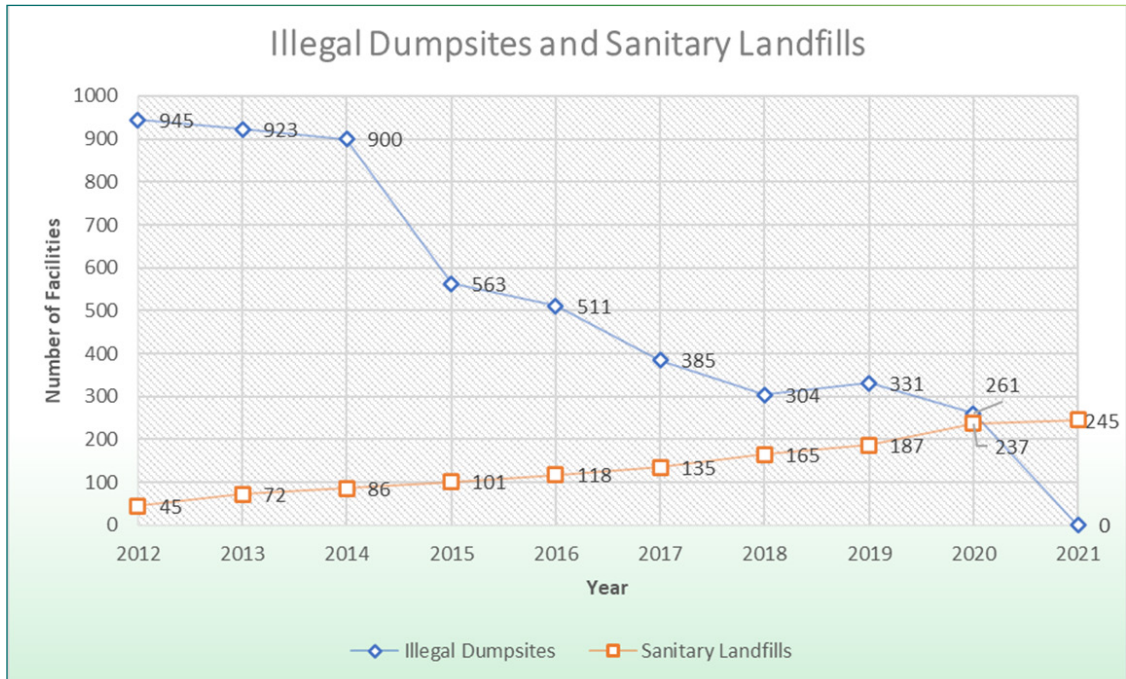
Source: DENR-EMB, COA Performance Audit Report 2023

By closing all open dumpsites, the Philippines has taken a crucial step towards promoting proper waste management and protecting the environment and public health. This is an essential measure in transitioning towards more sustainable waste management practices and supporting CE principles.

34. Quantities of waste sent to landfill

The "total waste sent to landfill" indicator refers to the overall amount of waste, including biodegradable waste, recyclable waste, special waste, and residual waste, that is disposed of in sanitary landfill facilities (SLFs). As of 2022, these sanitary landfills receive approximately 20,537.71 tons of waste per day. This indicator is closely related to "total waste treatment: landfill."

The Environmental Management Bureau Solid Waste Management Division (EMB SWD), which serves as the secretariat of National Solid Waste Management Commission (NSWMC), manages the database of SLFs operating in the country. It contains information about the SLF operator, general locations of the facilities, their category, year of establishment, and the LGUs they serve, among other relevant data.

Region IV-A (CALABARZON) receives the highest volume of waste, with approximately 10,841.28 tons per day (see **Figure 5)**. This region serves 105 LGUs with its sanitary landfills. **Figure 6** shows the locations of these SLFs.

Photo: Jilson Tiu/UNDP Philippines

Figure 5. Waste Received (Ton/Day) Per Sanitary Landfill
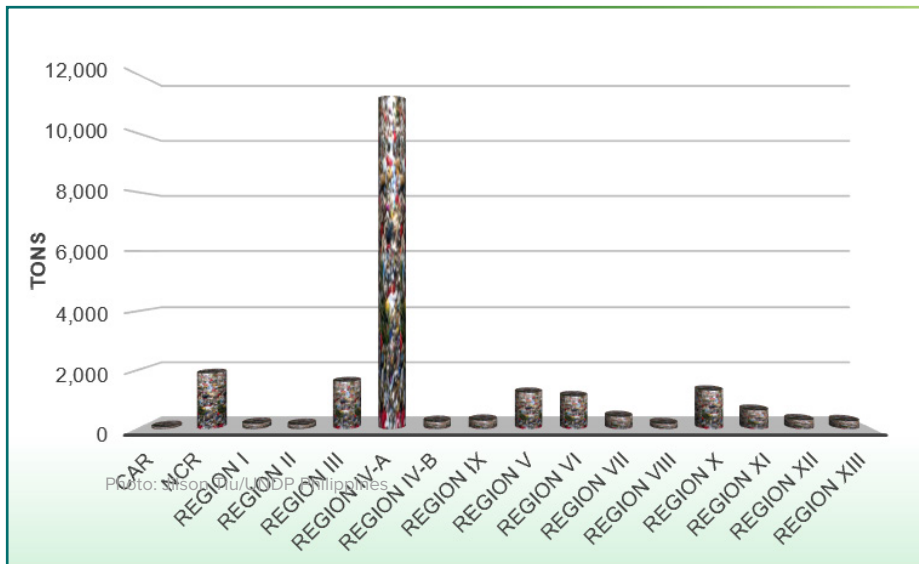
WASTE RECEIVED (TON/DAY) PER SANITARY LANDFILL

Source: DENR-SWMC

The indicator "total waste sent to landfill" is significant because it provides insight into waste disposal practices and the reliance on landfilling for waste management in the Philippines. High volumes of waste sent to landfills raises concerns about environmental impacts, such as potential pollution and resource depletion. It also underscores the importance of waste reduction, recycling, and other sustainable waste management practices, including the adoption of CE principles, to minimize the burden on landfills and promote more environmentally friendly waste management strategies.

Figure 6. Volume of waste sent to landfills in the Philippines
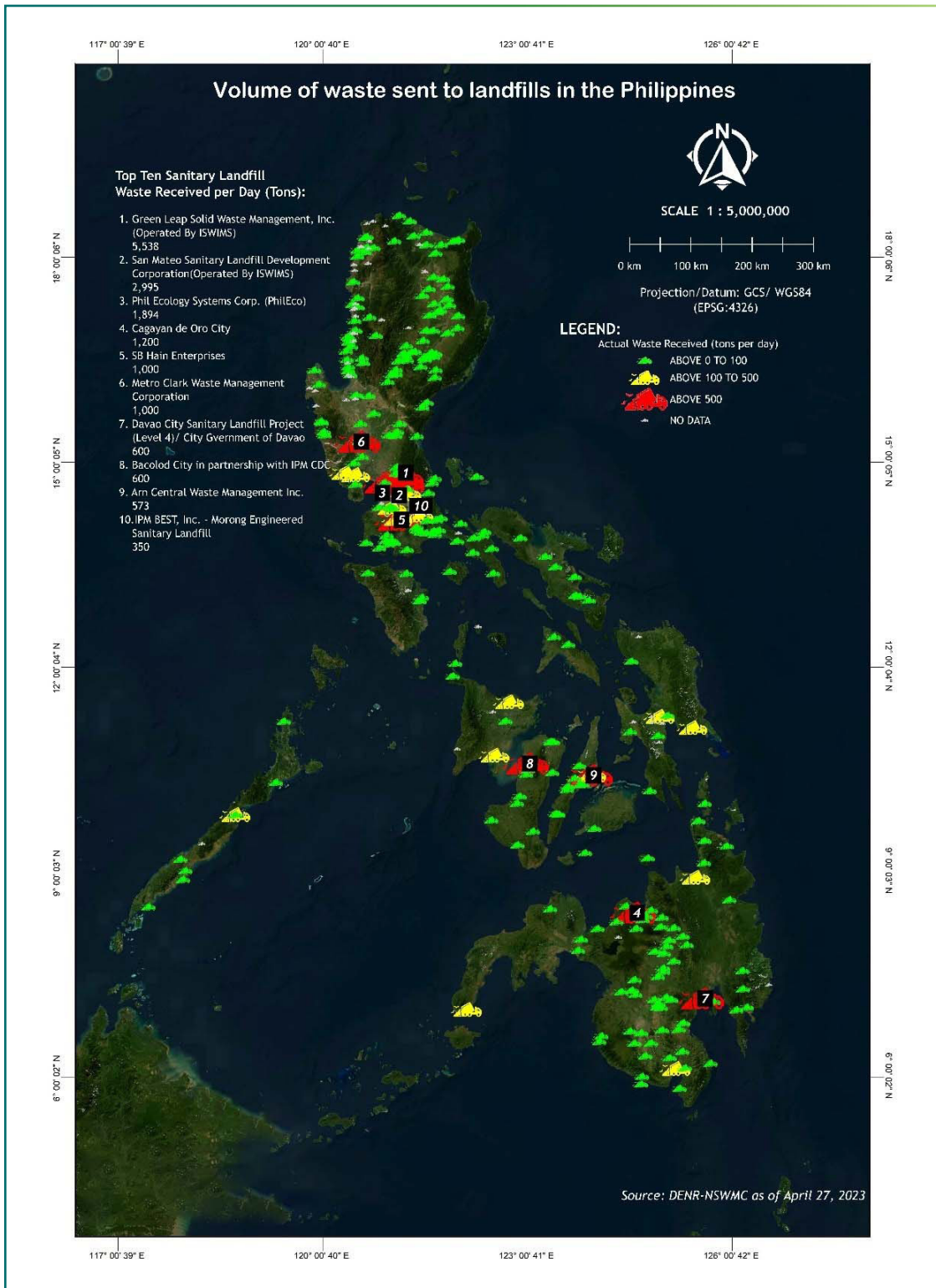
35. Food waste

The "food waste" indicator refers to the amount of waste from food generated in grams per household per day in the Philippines. With approximately 26,393,906 households in 2020, the country generates an estimated 2,000 tons of food waste per day.

Data on food waste in the Philippines is available from various sources, including the Philippine Center for Postharvest Development and Mechanization (PhilMech), the Food and Nutrition Research Institute (FNRI) under the DOST, and the PSA. However, data from these sources is limited in scope.

For this study, the FNRI data on food consumption loss per plate of rice and other commodities was used to estimate the average plate waste per household per day. According to the FNRI's 2018–2019 Expanded National Nutrition Survey (ENNA), the average plate waste of households in a day based on one-day food weighing was approximately 76 grams, (around 5 tablespoons). The highest amount of wastage was from cereals and cereal products (56g per day) contributing 73.7 percent of the total household food waste.

Food waste from fish, meat, and poultry amounted to 8g (11.1percent) while vegetable wastage was also 8g per day (10.9percent). The remaining food groups, including starchy roots and tubers, fats and oils, eggs, dried beans, nuts and seeds, fruits, and miscellaneous foods, each contributed to less than 1 percent of the mean total food wastage of households.

Figure 7. Average Plate Waste of Households (2018-2019)

AVERAGE PLATE WASTE OF HOUSEHOLDS (2018-2019)

Source: DOST-FNRI, Expanded National Nutrition Survey 2018-2019

Food waste is a significant issue globally, with economic, environmental, and social impacts. Reducing food waste through awareness campaigns, education, and sustainable practices can help conserve resources, reduce greenhouse gas emissions, and address food security challenges in the Philippines.

Household Survey

The "household food waste generation" indicator refers to the amount of food waste generated by households in kilograms per week. The household survey collected self-reported data from respondents by asking the question, "In the past week, how much food waste (e.g., peelings, excess food, expired food) in kilograms has your household thrown away?"

According to the survey, the estimated overall total household food waste generated in one week by the respondents is 715.6 kg (see Table 27). The minimum amount generated in a week was reported as 0.20 kg, while the maximum was 25 kg. On average, households generate approximately 2.9 kg of food waste per week. Among the ACE cities, Manila has the highest with an average of 4.2 kg, while Caloocan has the lowest at 1.5 kg. The mean amount of household food waste generated per member in the ACE cities ranges from 0.3 to 0.8 kg per week, with an overall average of 0.6 kg per week per member.

Table 27. Household food waste generated in the past week

ACE City	Total (n)	HHs (n)	Associations or group member (percent)					Mean per day per HH
			Sum	Minimum	Maximum	Mean per HH	Mean per HH member	
Overall	**279**	**243**	**715.6**	**0.20**	**25**	**2.9**	**0.6**	**0.42**
Caloocan	44	43	65.25	0.25	10	1.5	0.3	0.22
Cotabato	62	59	214.5	0.25	25	3.6	0.7	0.52
Manila	28	27	112.8	0.25	20	4.2	0.6	0.60
Pasig	89	64	182.2	0.20	15	2.8	0.7	0.41
Quezon City	56	50	140.85	0.20	20	2.8	0.8	0.40

Reducing household food waste is important for promoting sustainable consumption and minimizing environmental impacts. Raising awareness and implementing waste reduction strategies can help households and communities take steps towards more sustainable practices in food consumption and waste management.

36. Mapping of existing sites for reuse and recycling and needs

The "locations of Material Recovery Facilities (MRFs) or junkshops" indicator aims to identify the places where these facilities are present within the ACE cities. Table 28 presents the total number of identified junkshops. Please see the full report (Annex E.1) for the detailed information and five maps showing the existing sites for "reuse, recycling, and needs" per ACE City.

Table 28. Identified Junkshops, ACE Cities

ACE City	Number of Junkshops
Cotabato City	18
Caloocan City	3
Manila City	65
Pasig City	36
Quezon City	25
Total	**147**

Material recovery facilities (MRFs) and junkshops play a crucial role in waste management by facilitating the collection, segregation, and recycling of recyclable materials. They are important components of a sustainable waste management system as they help divert waste from landfills and promote resource recovery.

Identifying MRFs and junkshops can help local governments and stakeholders understand the existing infrastructure for waste management and identify areas that may require improvement or expansion. It can also be a useful resource for citizens who want to participate in recycling and waste reduction efforts.

The country has a total of 11,637 MRFs. MRFs are crucial components of solid waste management, as these facilities are where waste materials are separated for recycling.

37. Local composting plants created

The "number of local composting plants" indicator refers to the count of composting facilities present within the municipality or city. Among the ACE cities, the study team identified only one documented composting facility in Pasig.

Composting is an essential waste management practice that involves the decomposition of organic waste materials, such as food scraps and yard waste, into nutrient-rich compost. Composting facilities help divert organic waste from landfills, reduce greenhouse gas emissions, and produce valuable compost that can be used to enrich soil and promote sustainable agriculture. Having composting facilities in a municipality or city is a step towards sustainable waste management and CE practices. These facilities contribute to reducing the environmental impact of waste

disposal and promote the reuse of organic materials, closing the loop in the waste management process.

38. Circular innovation projects

The "circular innovation projects" indicator refers to projects initiated or funded by the government that are related to CE principles. There are 25 CE innovation projects documented.

Among these, eight examples of green engineering and circular innovation technologies that are open to commercialization have been identified. Names and details of these projects are provided in Table 29. Green engineering and circular innovation technologies typically involve the development of new processes, products, or services that contribute to the efficient use of resources, waste reduction, and environmental sustainability.

Table 29. List of RandD for Commercialization

Technology	Description	Technology Generator
Bioreactor	The ITDI-developed bioreactor, designed with a capacity of 500kg or 1,000kg can transform biodegradable household wastes into soil-enriching compost.	DOST-Industrial Technology Development Institute (ITDI)
Charcoal Briquette from Fruit and Root Crop Peels	A method of production of charcoal briquettes made from select fruit and root crop peels of high quality to traditional charcoal commonly sold in the market. These can be used as alternative fuel for heating and cooking purposes in homes and even in production facilities.	DOST-ITDI Environment and Biotechnology Division
Chitosan CaCO3 Composite (4C) Technology for Oil Spill Remediation	The production of adsorbent material made of chitosan and calcium carbonate composite from waste materials like shrimp skins and eggshells for oil spill clean-up	DOST-ITDI Environment and Biotechnology Division
Compact Wastewater Treatment System	A low-cost, sustainable, compact wastewater treatment system that can be used to treat food, oil, and grease wastewater coming from standalone quick service restaurants (QSR)	DOST-ITDI Environment and Biotechnology Division

Technology	Description	Technology Generator
Dual Drum Composter	A small-scale (100kg capacity) motorized dual-drum composter developed for the management of biodegradable solid wastes following a standardized process with compost as end product	DOST-ITDI Environment and Biotechnology Division
Electric Plastic Densifier	A spin-off from ITDI's previous melting oven densifier that uses waste cooking oil, this new design is a single-screw electric densifier that requires no oil. Alternative products from the melted consumer plastic waste, such as sando bags, can be developed.	DOST-ITDI Environment and Biotechnology Division
Plastic Densifier	An ITDI-developed equipment for plastic recycling that converts waste Styrofoam /plastics, especially foamed Polystyrene and plastic sando bags and laminates into useful products such as tables, chairs, plastic planters, pails, boards, bricks, and synthetic timber plank	DOST-ITDI Environment and Biotechnology Division
Portable Biogas Digester	The ITDI Portable Biogas Digester is an air-tight, oxygen free vessel, fed with organic material where the microbial digestion takes place to produce biogas. The Portable Biogas Digester converts the wastes into two useful products: gas for cooking and sludge as soil conditioner.	DOST-ITDI Environment and Biotechnology Division
Source: DOST-ITDI, DOST List of Technologies (For Commercialization)		

The "CE products" refer to products that align with CE principles, such as those designed for durability, recyclability, and reduced environmental impact throughout their life cycles. The study team identified 17 products from Google and Facebook searches that showcase CE principles. Specific details and names of these products are in Annex H.

Green engineering focuses on designing products and processes that have minimal environmental impact and promote resource conservation. Circular innovation projects, on the other hand, often involve ideas and practices that support the principles of a circular economy, such as designing products for durability, recyclability, and extended life cycles, implementing waste-to-resource initiatives, and fostering collaborative and circular business models.

The government's support for circular innovation projects signifies a commitment to promoting sustainable practices and encouraging economic growth through CE principles. These projects can play a crucial role in driving positive change and fostering a more sustainable future.

C. Business and Technology

Sustainable Consumption and Production

Twenty indicators on SCP have available secondary data (see Table 30). New primary data was collected for this report on two of these indicators, as well as for five other SCP indicators.

Table 30. List of Indicators related to Sustainable Consumption and Production

No.	Indicator	Primary Data	Secondary Data
47	Energy from renewable sources		✓
48	MW installed from renewable sources		✓
49	Amount of renewable electricity available to each household	✓	✓
50	Energy consumption (final)		✓
51	Diesel consumption (transport sector)		✓
52	Gasoline consumption (transport sector)		✓
53	Use of private vehicle in cities		✓
54	Car-sharing	✓	✓
55	Water consumption		✓
56	Percentage of urban wastewater treated / total wastewater generated		✓
57	Solid waste generated		✓
58	Total amount of waste produced by commerce and industry		✓
59	Total amount of waste produced by households	✓	✓
60	Tons of waste avoided		✓
61	Total waste treatment: Landfill		✓
62	Total waste treatment: Recycling	✓	✓
63	Household waste recycled	✓	
64	Non household waste recycled	✓	
65	Recovery of fisheries waste		✓
66	Number of collection points for reuse of materials		✓
67	Recycling rate of plastic packaging waste		✓
68	Percentage of recyclable plastic packaging placed on the market		✓

69	New circular products		
70	Number of companies or products with tax benefits to incentivize the circular economy		
71	Ecolabel holders		

47. Energy from renewable sources

This indicator focuses on renewable energy (RE) projects in the Philippines. As of 2023, the country has 160 RE plants categorized into different types based on the sources they utilize:

• **Biomass Plants** are power plants that generate electricity from organic materials, such as agricultural residues, animal manure, and dedicated energy crops.

• **Geothermal Plants** harness heat from the Earth's interior to generate electricity.

• **Hydropower Plants** use flowing or falling water to drive turbines and produce electricity.

• **Solar Plants** generate electricity by converting sunlight into energy using photovoltaic cells or solar thermal technology.

• **Wind Plants** use wind turbines to convert wind energy into electricity.

Table 31 shows the breakdown of RE plants while Figure 8 and Figure 9 show their locations. These play a crucial role in diversifying the country's energy sources and reducing dependency on fossil fuels. They contribute to the Philippines' efforts to transition to a more sustainable and climate-friendly energy system.

Table 31. Number of Renewable Energy Plants, 2022[1]

Plant Type	Number of Plants
Biomass	37
Geothermal	7
Hydropower	41
Solar	68
Wind	7
TOTAL	**160**
Source: DOE, Consolidated Eligible RE Power Plants for RPS Compliance as of 31 March 2023	

The development and expansion of renewable energy infrastructure are essential for promoting energy security, reducing greenhouse gas emissions, and driving economic growth through the creation of green jobs and investments in the clean energy sector. As the world moves towards a more sustainable future, the Philippines' focus on renewable energy projects is a positive step towards a greener and more resilient energy landscape.

1 DOE (2023). Eligible RE Power Plants for Renewable Portfolio Standards (RPS) Compliance for On-Grid and Off-Grid Areas as of 31 March 2023. https://www.doe.gov.ph/sites/default/files/pdf/renewable_energy/Consolidated_Eligible-RE-Power-Plants-for-RPS-Compliance-as-of-31percent20Marchpercent202023.pdf

Figure 8. Renewable energy in the Philippines – type and production capacity (per province)
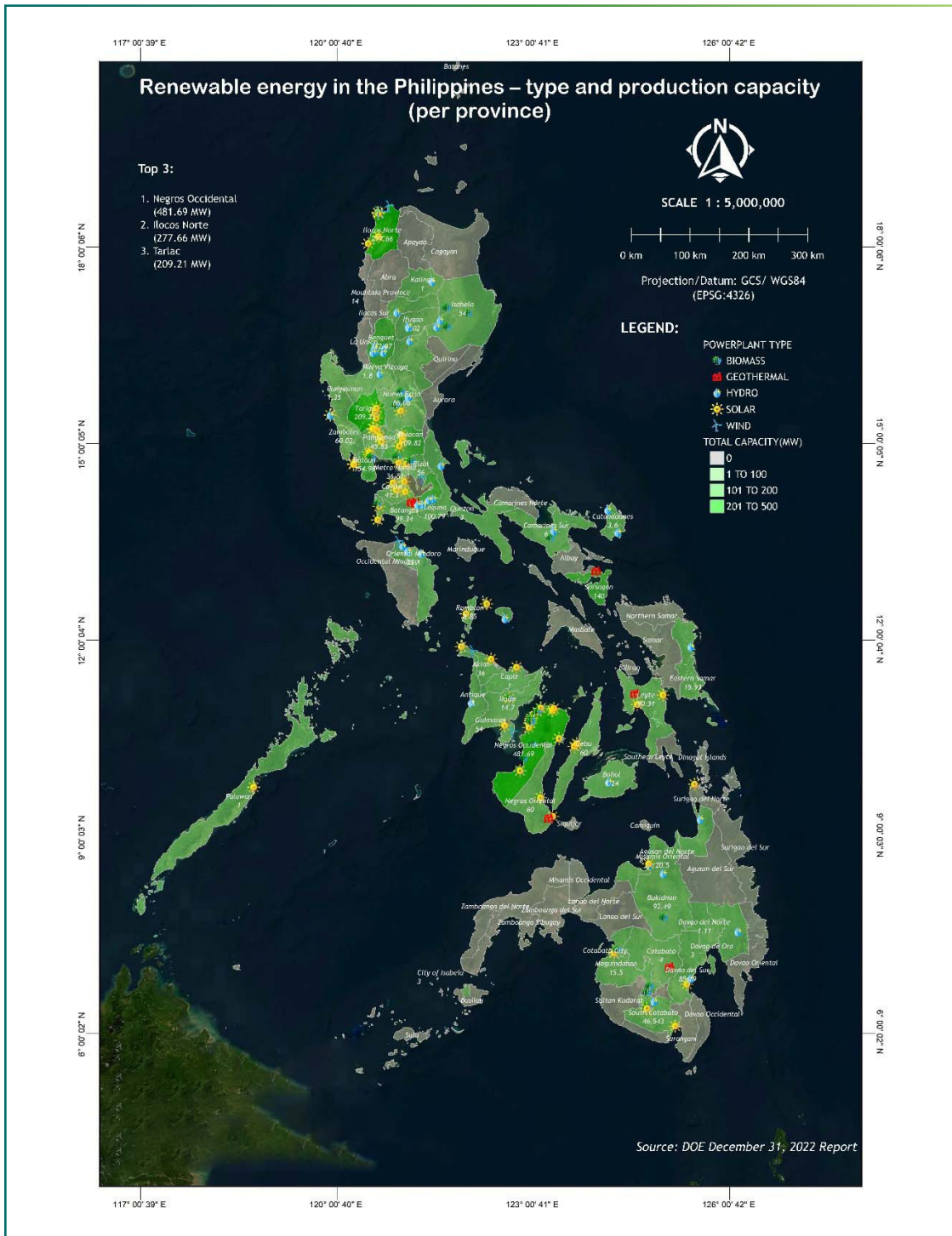
RENEWABLE ENERGY IN THE PHILIPPINES – TYPE AND PRODUCTION CAPACITY
(PER PROVINCE)
Source: Department of Energy, December 31, 2022

Figure 9. Renewable energy in the Philippines – type and production capacity (per region)

Source: Department of Energy, December 31, 2022

48. MW installed from renewable sources

CE Indicator 48 tracks the amount of energy (in megawatts) produced through renewable resources in the Philippines. The data indicates a significant increase in the total installed capacity from RE sources. In 2003, the total installed capacity was recorded at 4,799 MW. Over the next 18 years, there was substantial growth in RE infrastructure and capacity, leading to an increase in the total installed capacity to 7,914 MW by 2021. **Figure 10** illustrates this trend, showing the continuous efforts and investments made in RE projects over the years. This growth reflects the country's commitment to transitioning to a more sustainable energy mix and reducing its carbon footprint.

Figure 10. Renewable Energy- Installed Capacity by Plant Type

Source: Department of Energy

Renewable energy sources, such as geothermal, hydropower, solar, wind, and biomass, are playing an essential role in diversifying the energy portfolio of the Philippines. They contribute to mitigating climate change, improving energy security, and promoting a more environmentally friendly and resilient energy sector. As the country continues to invest in and harness the potential of renewable energy, it can further accelerate its transition towards a greener and more sustainable energy future.

49. Amount of renewable electricity available to each household

The household survey aimed to determine the percentage of households in the Philippines that use solar power as a source of electricity and identify the common appliances powered by solar energy.

A significant portion (11.5percent) of households have adopted solar power as an alternative energy source to meet their electricity needs (see **Table 32)**. Among the ACE cities, Pasig had the highest proportion of households using solar at 13.5 percent. When asked to specify, the most reported appliances that run on solar energy are lights and electric fans.

Table 32. Household solar power use

ACE City	Total (n)	HHs with solar power (percent)	Solar power use and appliances on solar power (percent)	
			Light	Electric fan
Overall	**279**	**11.5 (n=32)**	**10.8**	**3.6**
Caloocan	44	2.3 (n=1)	2.3	0.0
Cotabato	62	12.9 (n=8)	12.9	0.0
Manila	28	10.7 (n=3)	7.1	3.6
Pasig	89	13.5 (n=12)	13.5	10.1
Quezon City	56	11.5 (n=8)	12.5	0.0

Note: Appliances that run on solar power are in multiple responses.

The adoption of solar power by a notable percentage of households indicates a growing interest in renewable energy solutions and a willingness to embrace sustainable practices. Solar power as an alternative energy source contributes to reducing carbon emissions and dependence on traditional fossil fuels, promoting environmental sustainability and resilience in the face of climate change. As solar technology continues to advance and become more accessible and affordable, it is likely that more households will choose solar power as a clean and sustainable option. This shift towards solar aligns with the country's commitment to RE and its efforts to transition towards a low-carbon and environmentally responsible energy sector.

The city-level data on the proportion of households with solar power can be validated once the community-based monitoring system (CBMS) household profile questionnaire, led by the PSA, is implemented by LGUs.

50. Energy consumption (final)

This indicator aims to determine the annual total energy consumption in the Philippines.

Key Energy Statistics published by the Department of Energy (DOE) provide valuable data on the final energy consumption in the Philippines from 2007 to 2021. According to the report, the final energy consumption in the Philippines has increased steadily over the years (see Figure 11). In 2007, the country

this increasing energy demand is met sustainably and efficiently. Adopting energy-efficient technologies, promoting renewable energy sources, and implementing energy conservation measures are some of the strategies that can help manage energy consumption and reduce its environmental impact.

By closely monitoring and understanding energy consumption patterns, the Philippine

Figure 11. Final Energy Consumption (2007-2021)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Non-Energy Use	0	0	0	0	0	0	0	0	0	0	0	0	1,137	1,372	1,642
AFF	502	571	501	347	302	318	352	354	401	450	516	440	473	437	661
Commercial	1,989	2,044	2,413	2,663	2,739	2,830	3,038	3,397	3,370	3,865	4,404	4,668	4,936	4,611	4,848
Residential	7,251	7,377	7,633	7,878	7,991	8,171	8,386	8,488	8,731	9,035	9,192	9,431	9,711	10,028	10,179
Transport	7,870	7,292	7,743	8,035	7,983	8,364	9,133	9,133	10,557	11,425	11,807	12,238	12,697	9,809	10,983
Industry	5,262	5,778	5,369	5,948	5,948	5,806	6,312	6,529	6,750	7,449	7,941	7,523	7,306	6,336	6,819
Total	22,874	23,060	23,659	24,872	24,963	25,489	26,872	27,901	29,809	32,224	33,861	34,300	36,260	32,593	35,132

FINAL ENERGY CONSUMPTION (2007-2021)

Source: Department of Energy, Key Energy Statistics

consumed approximately 22,874 kilotonnes of oil equivalent (kTOE) of energy. However, by 2021,[1] it had risen to 35,132 kTOE. This significant increase over a 14-year period indicates a growing demand for energy. Factors contributing to this rise may include population growth, urbanization, economic development, and increased access to modern energy services.

The challenge for the Philippines, like many other countries, is to ensure that

government and relevant stakeholders can develop effective energy policies and plans to support the country's energy needs while minimizing greenhouse gas emissions and promoting sustainable development.

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1 DOE–Energy Policy and Planning Bureau (2021). Key Energy Statistics. https://www.doe.gov.ph/energy-statistics/2021-key-energy-statistics-kes

51. Diesel consumption (transport sector)

The indicator on the amount of diesel consumed annually by the transport sector provides valuable insights into the energy consumption patterns of the transportation industry in the Philippines. Key Energy Statistics shows the changes in diesel consumption by the transportation sector between 2007 and 2021.

In 2007, Philippine transport consumed approximately 32,516 thousand barrels (MB) of diesel (see **Figure 12**) reaching 38,221

the data indicates a subsequent decrease in diesel consumption, particularly in 2020 and 2021. This reduction in consumption is attributed to the impact of lockdowns and travel restrictions imposed during the COVID-19 pandemic.

The COVID-19 pandemic highlighted the interconnection between energy consumption and human activities, especially in the transport sector. As mobility patterns change in response to external factors, it

Figure 13. Gasoline Consumption (2007-2021)
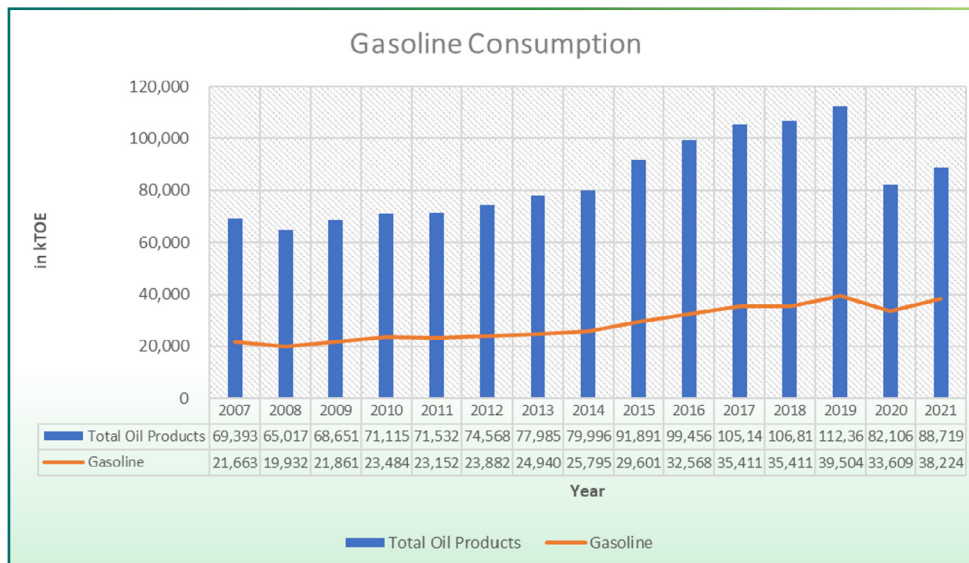
GASOLINE CONSUMPTION (2007-2021)

Source: Department of Energy, Key Energy Statistics

MB by 2021.[1] This steady increase in diesel consumption is likely driven by population growth, economic development, and increased mobility demands. The peak diesel consumption in the transportation sector was observed in 2019 at 48,205 MB. However,

underscores the importance of understanding and managing energy consumption to align with changing demands.

Efforts to reduce diesel consumption in the transport sector can include promoting more

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1 ibid.

fuel-efficient vehicles, adopting cleaner and greener transport technologies like electric and hybrid vehicles, investing in public transportation systems, and encouraging alternative modes of transportation such as cycling and walking.

By monitoring and analyzing diesel consumption trends, the Philippine government and policymakers can make informed decisions and develop strategies to promote sustainable and efficient energy use in the transport industry, contributing to environmental protection and energy security.

52. Gasoline consumption

Like the previous indicator, gasoline consumption in the Philippines provides crucial information on the energy consumption patterns of the transport sector and sheds light on the usage of gasoline as a fuel source over the years.

According to Key Energy Statistics, gasoline consumption in the transport sector has experienced significant changes between 2007 and 2021 (see Figure 13). In 2007, the transportation sector consumed approximately 21,663 MB of gasoline, increased steadily over time to 38,224 MB by 2021. Like diesel, it also peaked in 2019 at 48,122 MB. Similarly, there was a notable decline in in 2020 and 2021 due to COVID lockdowns and travel restrictions.

The fluctuations in gasoline consumption in response to the pandemic reflect the close relationship between energy consumption and human activities, particularly in the transport sector. As mobility patterns change due to external factors like the pandemic, it becomes evident that monitoring and managing energy consumption in the transportation sector is crucial to adapting to changing demands.

Promoting more fuel-efficient vehicles, adopting alternative fuels, and investing in cleaner and greener transportation technologies can help reduce gasoline consumption in the transport sector. Additionally, enhancing public transportation systems and encouraging alternative modes of transportation can further contribute to

Figure 13. Gasoline Consumption (2007-2021)
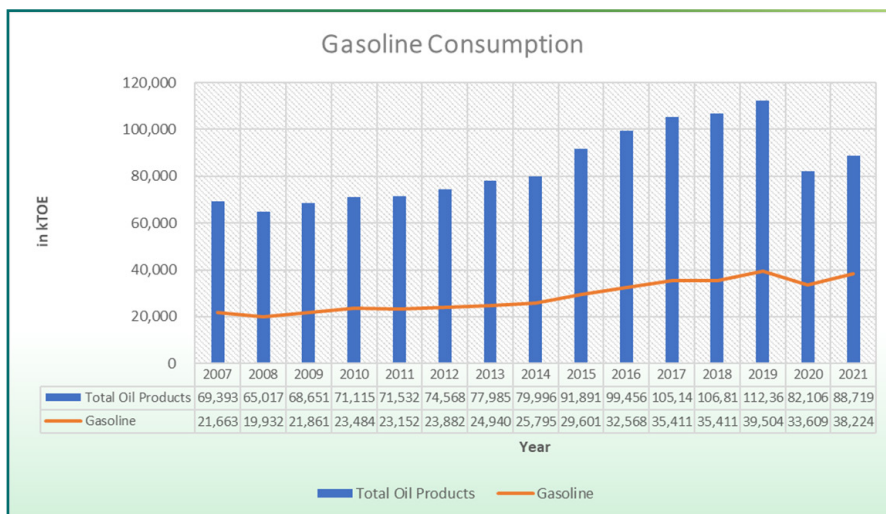
GASOLINE CONSUMPTION (2007-2021)

Source: Department of Energy, Key Energy Statistics

sustainable energy use and environmental protection.

By closely monitoring gasoline consumption trends in the transport sector, the Philippine government and policymakers can develop effective strategies to promote energy efficiency and sustainability, leading to a more resilient and environmentally friendly transportation system.

53. Use of private vehicles

The number of private vehicles provides valuable insights into the size and growth of the country's motor vehicle fleet, representing the level of motorization and its impact on various aspects of transportation and the environment.

According to the Department of Transportation (DOTr), particularly the Land Transportation Office (LTO), the total number of registered private vehicles in the Philippines reached 5,318,700 as of 2021. This includes various types of motor vehicles, such as cars, utility vehicles (UV), sport utility vehicles (SUV), trucks, buses, motorcycles (without sidecar, with sidecar, and three-wheeled motor vehicles), and trailers.

Over the past decade (2010–2020), there was a significant increase in the number of motor vehicle registrations, both new and renewal (see **Figure 14**). This trend indicates a substantial growth in motorization and the rising demand for private vehicles. However, 2021 experienced a notable decline in car registrations. This can be attributed to the impact of the COVID-19 pandemic, which led to mobility restrictions, reduced economic activity, and changes in consumer behavior. Lockdowns and travel restrictions during the pandemic limited people's movement and discouraged non-essential travel, resulting

in a decrease in vehicle purchases and registrations.

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By closely monitoring gasoline consumption trends in the transport sector, the Philippine government and policymakers can develop effective strategies to promote energy efficiency and sustainability, leading to a more resilient and environmentally friendly transportation system.

Figure 14. Motor Vehicle Registration (2010-2021)

Motor Vehicle Registration: New

Motor Vehicle Registration: Renewal
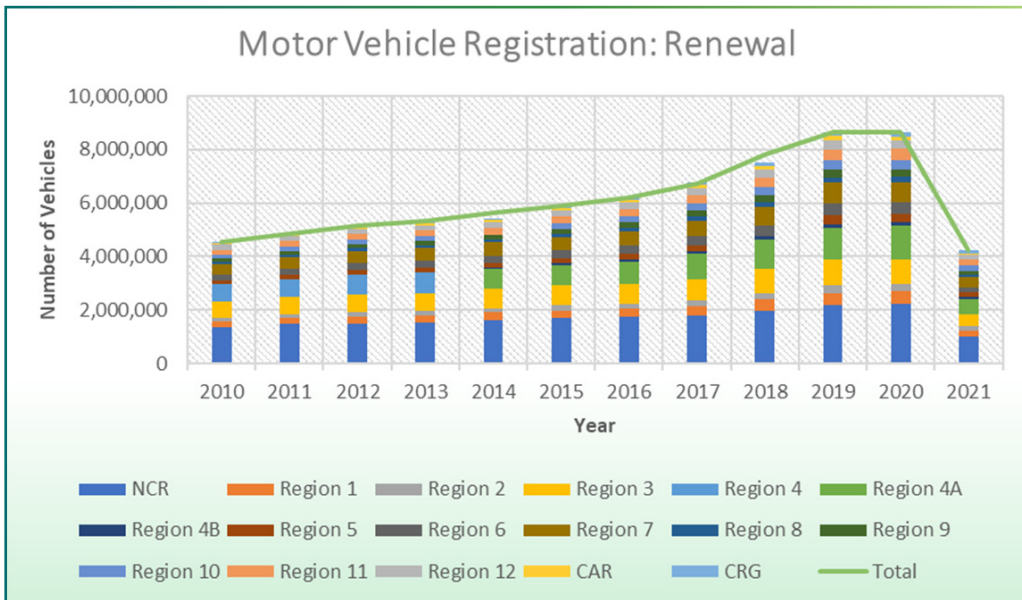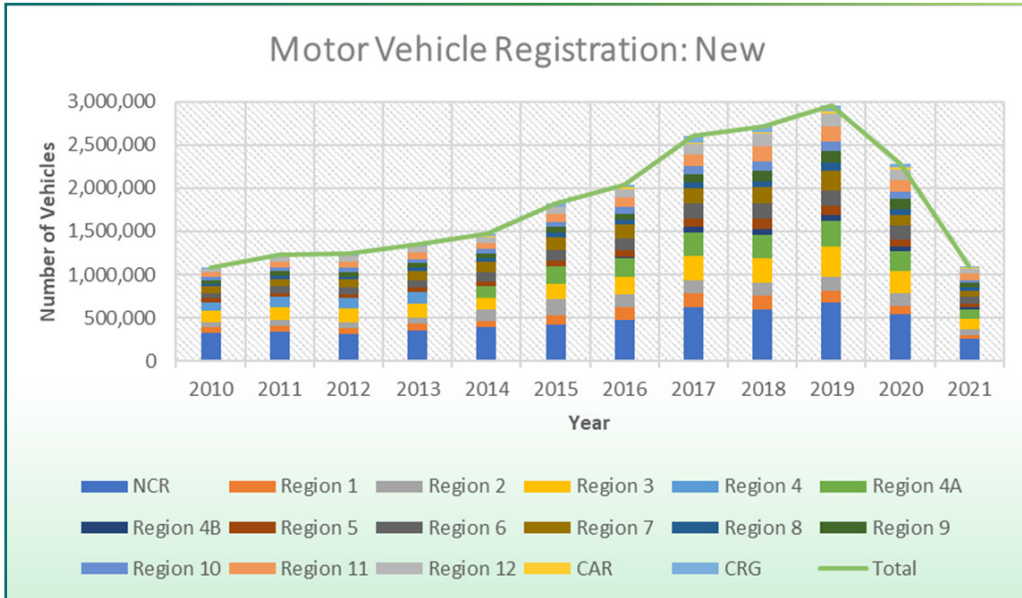
MOTOR VEHICLE REGISTRATION (2010-2021)

Source: Department of Energy, Key Energy Statistics

54. Car sharing

The household survey conducted to measure car sharing and carpooling provides valuable insights into the adoption of innovative transportation modes in the Philippines.

Carpooling involves sharing a single vehicle with multiple passengers for a common destination, while car sharing provides access to a fleet of vehicles for short-term use. Each of these options offers distinct benefits and can contribute to more efficient and sustainable mobility solutions in urban areas, leading to reduced fuel consumption, lower transportation costs for participants, and possibly fewer vehicles on the road during

interviewed reported that they engage in innovative modes of transport, specifically car sharing or carpooling (see Table 33). This indicates a notable level of interest in and adoption of alternative transportation options. Among the five ACE cities, Quezon City had the highest proportion of households that reported engaging in car-share or carpool services, suggesting they may be more receptive to and actively using these alternative transportation modes. Between car sharing and carpooling, the survey found that carpooling was more common, with around 13 percent of households participating in this practice. The findings of the household

Table 33. Households that have rented a car or carpooled in the past year

ACE City	Total (n)	HHs (n)	HHs (n)	Rented a car	Carpool
Overall	**279**	**53**	**19.0**	**7.9**	**13.3**
Caloocan	44	9	20.5	-	20.5
Cotabato	62	8	12.9	12.9	1.6
Manila	28	6	21.4	14.3	14.3
Pasig	89	15	16.9	6.7	13.5
Quezon City	56	15	26.8	7.1	19.6

peak hours. Car sharing and carpooling are essential components of the sharing economy,[1] offering potential benefits[2] in terms of reducing individual car ownership, promoting more efficient use of vehicles, and contributing to reduced traffic congestion and better air quality.[3]

Approximately one-fifth of the households

survey highlight the growing interest in and adoption of innovative transportation modes in the Philippines.

Car sharing and carpooling can play a crucial role in addressing urban mobility challenges, promoting sustainable transportation practices, and reducing environmental impacts. Policymakers can use this information

1 Esposito, M., Tse, T., and Soufani, K. (2018). Introducing a Circular economy: New Thinking with New Managerial and Policy Implications. California Management Review, 60(3), 5-19. https://doi.org/10.1177/0008125618764691

2 There are some debates, though, as to whether the theoretical benefits of 'sharing economy' is indeed a good model to achieving sustainable urban transport. A model estimation conducted by Diao, Kong, and Zhao found that transportation network companies (TNCs) in the United States have: (a) increased road congestion in terms of both intensity and duration and (b) caused a decline in public transport ridership. In this report, this indicator is nevertheless retained as it is included in the OECD inventory of circular economy indicators.

3 Diao, M., Kong, H., and Zhao, J. (2021). Impacts of Transportation Network Companies on Urban Mobility. Nature Sustainability, 4(6), 494-500. https://www.nature.com/articles/s41893-020-00678-z

to develop strategies and incentives to further encourage the adoption of car sharing and carpooling schemes, promote public awareness of their benefits, and invest in transportation infrastructure that supports these alternative modes of transport.

55. Water consumption

The National Water Resource Board (NWRB) has been reporting water consumption per region since 2013 through the Listahang Tubig[1] (Water Register). This nationwide survey covers all water service providers and includes data from all service levels: Level I (point source), Level II (communal faucets), and Level III (piped connections). Out of 1,634 cities/municipalities, 1,490 participated in the water service providers in Listahang Tubig from 2013 to 2023 is 6,857,012,228 m3. This volume indicates significant water demand and usage patterns across the country. As presented in **Figure 15** and **Figure 16**, regions with the highest billed water consumption are Region VII (Central Visayas), Region V (Bicol), and Region IV-A (CALABARZON).

Figure 15. Billed Water Consumption Per Region (2013-Present)
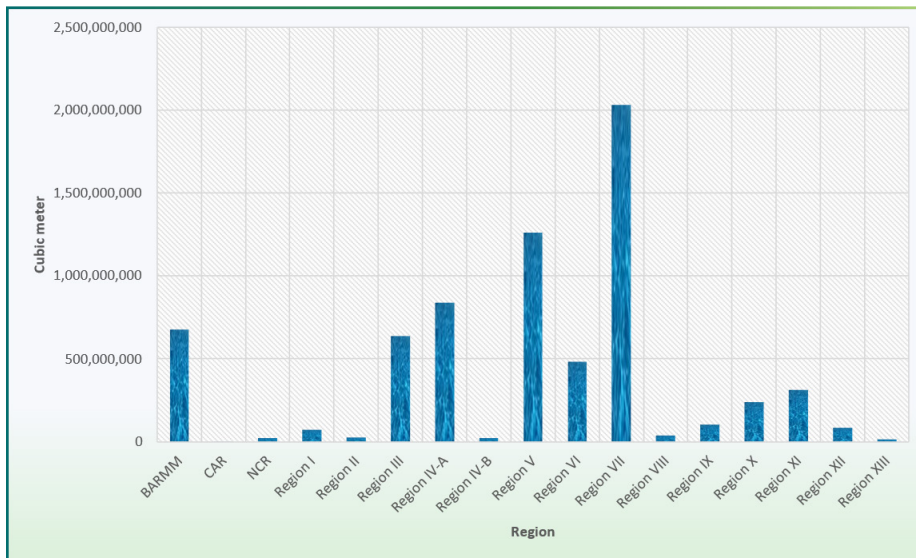
BILLED WATER CONSUMPTION PER REGION (2013-PRESENT)

Source: NWRB – Listahang Tubig

survey by submitting their data to the water utilities in 2013.

Figure 15 illustrates the water consumption per region, highlighting the variations in water usage across different areas. NWRB data[2] shows the total volume billed by all By understanding water consumption patterns at the regional level, policymakers and water authorities can make informed decisions to ensure sustainable and equitable access to water resources for all communities. Through Listahang Tubig, the NWRB plays a crucial role in monitoring and analyzing

1 National Water Resource Board. (n.d.). Listahang Tubig: A National Water Survey. NWRB Listahang Tubig. http://listahangtubig.cloudapp. net/

2 ibid.

water consumption trends, enabling effective water resource management, and planning. It is worth noting that access to reliable and clean water is vital for various sectors, including domestic, industrial, and agricultural purposes. The data provided serves as a valuable resource in assessing the nation's water needs and promoting efficient water use practices.

Figure 16. Water consumption in the Philippines (per region)
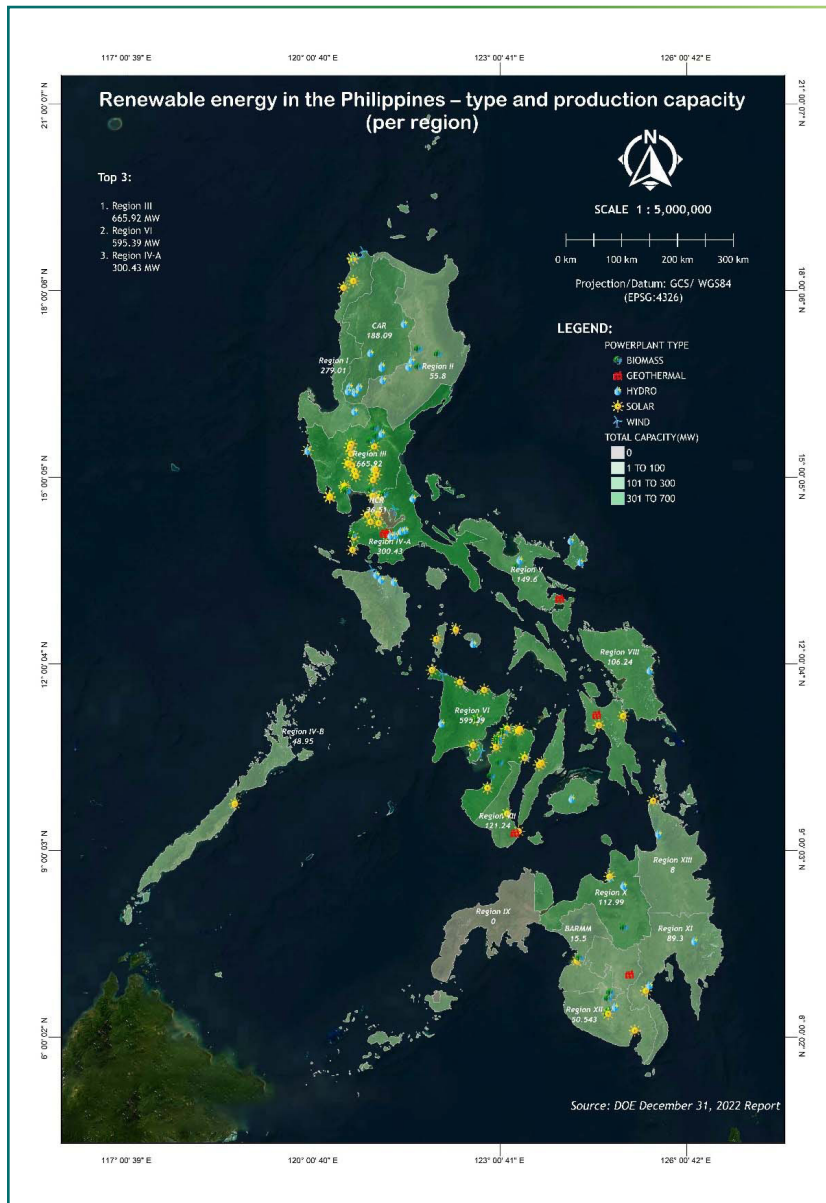
WATER CONSUMPTION IN THE PHILIPPINES (PER REGION)
Source: NWRB May 15, 2023

On the other hand, the household survey's approach to estimating water consumption using the respondents' water bill costs provides valuable insights into water usage patterns across ACE cities. While the cubic meter measurement offers a standardized measure of consumption, asking for the estimated cost per month as a proxy was a practical decision considering the familiarity of households with the requested data. It is important to note that water prices can vary between different water district providers, so caution should be exercised when interpreting results.

According to the survey, households across ACE cities consume an average of 3.1 m3 of water per month (see **Table 34**). This provides a useful overview of the general water consumption levels. When considering cost,

respondents reported spending an average of PhP 620 per month. This encompasses various factors, including price per cubic meter, water usage patterns, and the specific water district provider. Manila stands out with the highest reported average of PhP 992.80. This higher cost could be due to higher water prices or different consumption patterns. Conversely, Cotabato reported the lowest average monthly household cost of PhP 503.50, which might be attributed to more affordable rates or conservative water usage.

The survey findings highlight the importance of water conservation efforts and equitable water pricing across cities. By understanding the average cost, policymakers and stakeholders can gain insight into the affordability of water services and potential financial burdens on households.

Table 34. Household water consumption in the past month

ACE City	Total (n)	Monthly household water consumption (in m^3)			Total (n)	Monthly household water expense (in pesos)		
		Mean per HH	Mean per HH member	Total		Mean per HH	Mean per HH member	Total
Overall	**24**	**16.6**	**3.1**	**399.0**	**231**	**620.0**	**141.0**	**143,228.0**
Caloocan	3	12.7	2.7	38.0	36	535.0	118.5	19,261
Cotabato	-	-	-	-	59	503.5	90.0	29,706.0
Manila	2	20.5	4.0	41.0	24	992.8	199.0	23,827.0
Pasig	4	2.1	0.7	8.5	81	659.0	176.6	53,390.0
Quezon City	15	20.8	3.8	311.5	31	549.8	139.8	17,044.0

56. Percentage of urban wastewater treated/total wastewater generated

The PSA compiled essential data from Maynilad Water Services, Inc., and Manila Water Company, Inc., regarding the amount of wastewater generated, collected, and treated in the East and West Zones of Metro Manila from 2010 to 2019. **Figure 17** shows the encouraging trend of an increasing percentage of urban wastewater being treated relative to the total wastewater generated. In 2010, only 13.53 percent of the total wastewater generated underwent treatment. Over the course of a decade, this figure steadily rose, reaching 17.47 percent by the end of 2019.

Figure 17. Generation and Management of Wastewater (2010-2019)

MOTOR VEHICLE REGISTRATION (2010-2021)

Source: Department of Energy, Key Energy Statistics

While the gradual increase in treated wastewater is a positive development, it is important to note that over 80 percent of wastewater generated in the region is still discharged into the environment without proper treatment. This untreated wastewater can have severe environmental consequences, posing a significant threat to water bodies, ecosystems, and public health. The challenge of wastewater management requires continued efforts and investments in expanding treatment infrastructure and implementing effective treatment technologies.

By enhancing the capacity of wastewater treatment facilities and enforcing stricter regulations on wastewater discharge, the country can work towards reducing its environmental impact and promoting a cleaner and healthier environment. The data provided by PSA helps in understanding the current state of urban wastewater management in Metro Manila and serves as a basis for policymakers and stakeholders to develop targeted interventions and strategies to improve wastewater treatment and overall water quality. Collaborative efforts from various sectors are essential in achieving sustainable and responsible wastewater management.

57. Solid waste generated

The "solid waste generated" indicator provides insights into the total segregated waste collected – biodegradable wastes, recyclable wastes, special wastes, and residual wastes.

The DENR-National Solid Waste Management Commission (DENR-NSWMC) has developed a platform that presents the projected solid waste generation for each city/municipality from 2021 to 2030. This offers users the ability to examine the projected solid waste generation data at various levels, including by region, province, and city/municipality.

Figure 18 illustrates a continuous increase in the amount of solid waste generated over the years. The projected amount of solid waste generated in 2021 is expected to reach 20,801,376.2 metric tons per year and is projected to further rise to 24,813,501.5 metric tons per year by 2030. It is important to note that data on actual solid waste generated may have gaps due to varying levels of reporting from different municipalities. Hence, the solid waste projections from the Environmental Management Bureau Solid Waste Management Division (EMB SWMD) were utilized to address this indicator.

Figure 19 shows that the National Capital Region, Region III (Central Luzon), and Region IV-A are projected to generate the most solid waste.

The steady growth in solid waste generation highlights the urgent need for comprehensive and effective waste management strategies. Local governments, in collaboration with relevant stakeholders and communities, must prioritize waste reduction, recycling, and the adoption of sustainable waste management practices. Additionally, promoting public awareness and encouraging individual responsibility in waste disposal can play a significant role in curbing the escalating volume of solid waste.

Efforts to minimize solid waste generation and promote environmentally conscious practices are crucial in achieving a more sustainable and eco-friendly future. By implementing innovative waste management solutions, fostering recycling initiatives, and encouraging responsible consumption patterns, we can move towards a cleaner and more resilient environment.

Figure 18. Solid Waste Generated (Projected); 2022[1]
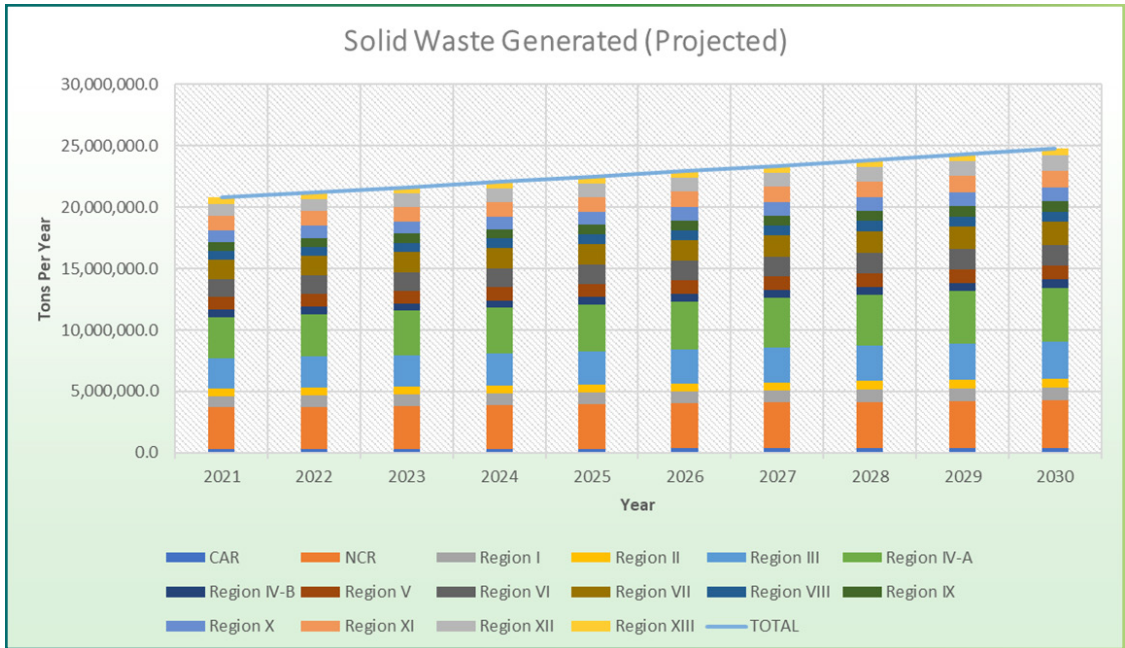
Solid Waste Generated (Projected)

Legend: CAR, NCR, Region I, Region II, Region III, Region IV-A, Region IV-B, Region V, Region VI, Region VII, Region VIII, Region IX, Region X, Region XI, Region XII, Region XIII, TOTAL

Source: DENR- National Solid Waste Management Commission

Photo: Jilson Tiu/UNDP Philippines

1 DENR-NSWMC. Projected Waste Generation from 2020 to 2025. http://tinyurl.com/wastegen2020-2025

Figure 19. Volume of solid waste in the Philippines (per region)
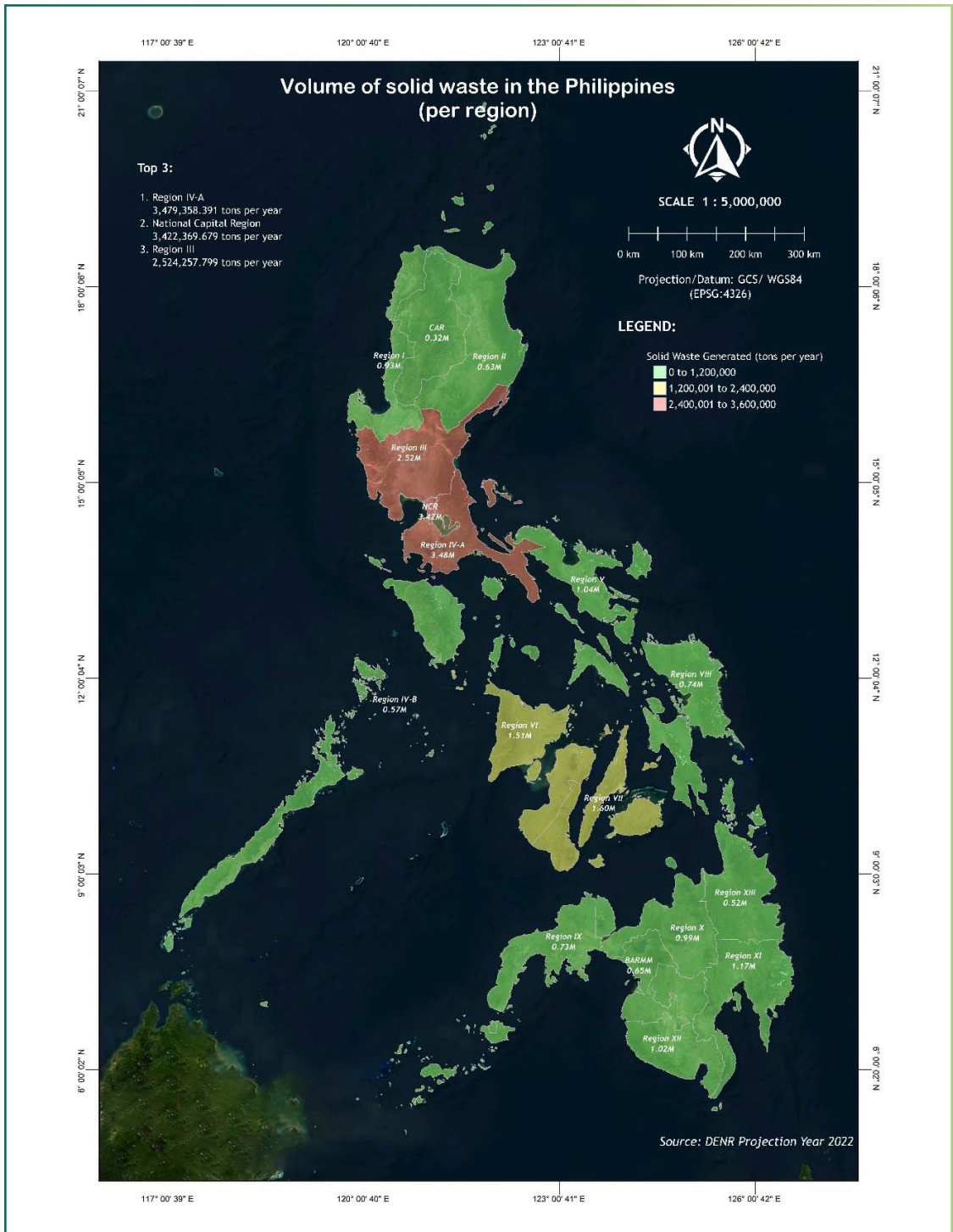
VOLUME OF SOLID WASTE IN THE PHILIPPINES (PER REGION)

Source: DENR PROJECTION FOR YEAR 2022

58. Total amount of waste produced by commerce and industry

This indicator focuses on the waste collected from commercial and industrial establishments within the LGU. This encompasses various types of waste, including biodegradable, recyclable, special, and residual wastes.

At present, there is no updated data on the total amount of waste produced specifically by commerce and industry. The most recent data available in the National Solid Waste Management Status Report, which covers 2008 to 2018, provides percentages of waste from different sources in the Philippines:

- Residential waste contributes 56.7 percent of the total waste.
- Institutional waste constitutes 12.1 percent of the overall waste.
- Waste generated by commercial establishments, such as general merchandise stores and restaurants, accounts for 27.1 percent of the total waste.
- Industrial waste, originating from industrial facilities, comprises 4.1 percent of the total waste.

Unfortunately, the reference does not disclose the actual amount of solid waste produced. To estimate the waste generated by commercial and industrial establishments, the 2022 projections of solid waste generated in the entire country can be used, which is 22.2 million tons. Based on this projection:

- Commercial establishments produce an estimated 6.01 million tonnes of waste per year.
- Industries generate approximately 0.91 million tonnes of waste per year.

It is essential to recognize the significance of waste management and reduction efforts in commercial and industrial sectors. Effective waste management strategies, including waste segregation, recycling initiatives, and responsible disposal practices, can significantly contribute to minimizing the environmental impact of these establishments.

59. Total amount of waste produced by households

The household survey provides valuable insights into the total amount of waste produced by households, excluding waste sorted for recycling. By asking respondents to self-report the amount of garbage generated in the past week, including food waste, the survey paints a clear picture of household waste generation patterns.

The estimated total amount of household waste generated in one week by the respondents is 1,473 kg, ranging from 0.20 kg to 50 kg. On average, households generate approximately 5.9 kg of waste per week. Across the ACE cities, Cotabato has the highest household waste generation per week, averaging 10 kg per household. Caloocan reports the lowest household waste generation, with 3.5 kg per week. The mean

amount of household waste generated per member ranges from 0.7 to 1.8 kg per week. On average, each member generates 1.2 kg of waste per week.

Further analyzing the daily waste generation across ACE cities, respondents produce an average of 0.85 kg of waste per household per day (see Table 35). The data varies across cities, ranging from 0.50 to 1.43 kg per household per day.

This data underscores the importance of waste management and reduction efforts at the household level as minimizing waste generation and promoting responsible disposal practices can significantly contribute to environmental sustainability and resource conservation.

Table 35. Household waste generated in the past week

ACE City	Total (n)	HHs (n)	Household waste generated in the past week (in kg)					Mean per day
			Sum	Minimum	Maximum	Mean per HH	Mean per HH member	
Overall	**279**	**45**	**1473.0**	**0.2**	**50.0**	**5.9**	**1.2**	**0.85**
Caloocan	44	44	153.2	0.2	10.0	3.5	0.7	0.50
Cotabato	62	60	600.0	1.0	50.0	10.0	1.8	1.43
Manila	28	27	161.1	0.5	23.0	6.0	0.8	0.85
Pasig	89	68	276.7	0.2	25.0	4.1	0.8	0.58
Quezon City	56	49	282.0	1.0	50.0	5.7	1.3	0.82

60. Tons of waste avoided

The waste diversion indicator is crucial in assessing the effectiveness of waste management efforts in the country. As of 2020, the amount of waste diverted per day is 3,222,313.67 kg out of the total of 6,910,521.81 kg. While this waste diversion rate of 46.6 percent means nearly half of the total waste is being diverted from disposal facilities such as landfills, it is important to note that the national waste diversion target is 68.7 percent – there is still significant progress needed. As of the reporting period, the country still falls short, signaling the need for further efforts and initiatives to increase waste diversion rates.

Despite the overall shortfall at the national level, there are regions that have successfully met their respective waste diversion targets (see **Table 36**). The Cordillera Administrative Region (CAR) and Region VIII (Eastern Visayas) have been able to achieve their waste diversion goals. These regions can serve as examples and provide valuable insight into effective waste diversion strategies that can be adopted and scaled up in other areas.

The data from the Performance Audit Report on Solid Waste Management Program conducted by the Commission on Audit (COA) is a valuable resource for assessing the progress of waste diversion efforts in the country. It highlights areas that need further attention and improvement to enhance waste management practices and move closer to achieving the national waste diversion target. Sustainable waste diversion practices can play a significant role in reducing environmental impacts and promoting a more circular economy, making them an essential aspect of overall waste management planning and implementation.

Table 36. 2020 Waste Diversion Target vs Actual Accomplishment

Region	percent of MRF with complete data	Waste Generation per day (kg) (A)	Waste Diversion per day (kg) (B)	percent Waste Diversion Actual (C=B/A)	percent Waste Diversion Actual (C=B/A)	percent Waste Diversion Variance (E=D-C)
NCR	58.49	1,148,128.83	543,172.64	47.31	62.70	15.39
CAR	13.41	814,813.48	618,416.54	75.90	67.10	-8.80
1	98.67	408,859.92	234,360.92	57.32	68.40	11.08
2	91.43	677,128.00	330,584.00	48.82	69.20	20.38
3	85.37	912,696.07	584,617.71	64.05	71.60	7.55
4A	76.32	1,161,789.00	435,390.00	37.48	68.20	30.72
4B	18.00	77,849.70	44,964.37	57.76	58.50	0.74
5	11.67	18,370.00	11,759.81	64.02	66.70	2.68
6	47.73	61,019.30	23,475.50	38.47	66.10	27.63
7	80.00	209,159.40	103,209.24	49.34	70.10	20.76
8	65.56	349,808.50	258,194.00	73.81	68.40	-5.41
9	100.00	246,855.28	164,586.57	66.67	82.00	15.33
10	87.01	404,153.63	91,019.21	22.52	62.10	39.58
11	26.56	1,142,878.40	14,372.09	1.26	75.10	73.84
12	64.18	478,565.39	175,868.74	36.75	73.90	37.15
13	69.12	407,545.00	183,937.00	45.13	72.10	26.97
TOTAL	64.05	6,910,521.81	3,222,313.67	46.60	68.70	22.07

The data from the Performance Audit Report on Solid Waste Management Program conducted by the Commission on Audit (COA) is a valuable resource for assessing the progress of waste diversion efforts in the country. It highlights areas that need further attention and improvement to enhance waste management practices and move closer to achieving the national waste diversion target. Sustainable waste diversion practices can play a significant role in reducing environmental impacts and promoting a more circular economy, making them an essential aspect of overall waste management planning and implementation.

61. Total waste treatment: landfill

A platform[1] developed by NSWMC to track data on sanitary landfills is a useful initiative to enhance waste management practices. It provides essential information that can aid in the effective planning and monitoring of waste treatment and disposal activities. As of January 4, 2023, a total of 20,413.23 tons of waste are treated daily in sanitary landfills – a significant volume.

information enables better coordination and collaboration among different agencies and stakeholders involved in waste management. The platform also includes data on various aspects of landfill operations, such as the use of daily soil cover, the presence of discharge permits, methane recovery, the type of leachate treatment, the presence of hazardous waste generator ID, permits for equipment

Figure 19. Volume of solid waste in the Philippines (per region)[2]

PPP
0.70%

PRIVATE
6.62%

LGU
92.68%
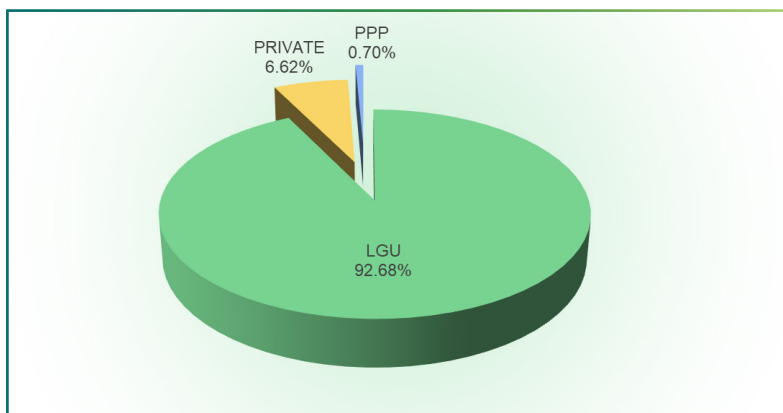
TOTAL WASTE TREATMENT: LANDFILL

Source: DENR-National Solid Waste Management Commission

Figure 20 shows 92.7 percent of landfills are operated by local government units (LGUs). This highlights the important role of LGUs in waste management and underscores their responsibility in ensuring proper waste disposal and treatment within their jurisdictions. Around 6.6 percent are privately operated, while only 0.7 percent are accomplished through public-private partnerships (PPP). This distribution of landfill operators indicates the involvement of various stakeholders in waste management efforts.

The platform provides the sanitary landfills' project name/operator, category, location (region, province, city/municipality), year of establishment, and LGUs served. This

or generator sets, permits for transport, and the presence of a material recovery facility (MRF) and separate cells for hazardous waste. These data points play a vital role in ensuring compliance with environmental regulations and the safe handling of waste materials.

The presence of wastewater treatment facilities and information on expansion plans demonstrates a commitment to sustainable waste management practices. By continuously monitoring and updating the data on the platform, relevant authorities can make informed decisions on future waste management strategies, including the expansion and improvement of existing sanitary landfills.

1 DENR-NSWMC. Sanitary Landfills. http://tinyurl.com/SLandfills
2 Ibid.

The platform developed by NSWMC is a valuable tool that facilitates data-driven decision-making, enhances waste management efforts, and promotes transparency and accountability in waste disposal and treatment practices. It serves as an essential resource for various stakeholders involved in waste management, providing critical information to achieve more efficient and sustainable waste treatment and disposal in the Philippines.

62. Total waste treatment: recycling

The NSWMC solid waste profile database is a valuable resource for understanding the waste management practices of each city/municipality. It provides insight into the amount mechanisms.

The recycling rate, which is the percentage of waste recycled relative to the total waste generated, is an important indicator of a city/

Figure 21. Total Waste Treatment: Recycling

261.43 TONS FROM 203 (12%) LGUs

NO DATA FROM 1,432 (88%) LGUs
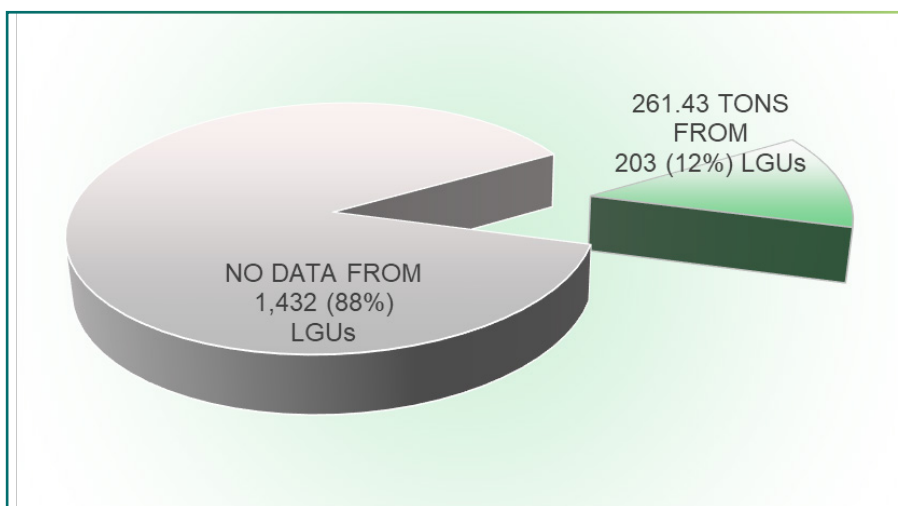
FIGURE 21. TOTAL WASTE TREATMENT: RECYCLING

Source: DENR-National Solid Waste Management Commission

of waste generated and the amount being recycled, which is essential for assessing the effectiveness of waste management efforts.

As of 2020, the data shows that out of the total 1,432 LGUs, 203 (around 12percent) reported the amount of waste (261.43 tons) they recycle (see Figure 21). This is the amount of waste diverted from disposal facilities, contributing to waste reduction and environmental conservation efforts. While it is good that some LGUs are providing data, the low reporting rate indicates room for improvement in data collection and reporting

municipality's commitment to sustainable waste management practices. Unfortunately, the data on recycling rates is only available for a limited number of LGUs due to the low reporting rate.

To enhance waste management practices and promote recycling efforts, more LGUs need to report their solid waste profiles and recycling activities. This can be achieved through awareness campaigns, capacity building, and streamlining data reporting processes. By increasing the reporting rate and obtaining data from a larger number of

LGUs, policymakers and stakeholders can gain a more comprehensive understanding of recycling efforts across the country and identify areas that need improvement.

While the NSWMC's solid waste profile database provides data on waste generation and recycling practices in different cities and municipalities, the reporting rate for recycling data is currently too low to make the data representative. This underscores the need for greater participation and commitment from LGUs in reporting their waste management efforts. By addressing this information gap, the database can become an even more powerful tool for promoting sustainable waste management practices and achieving higher recycling rates in the Philippines.

63. Household waste recycled

National data on the total household waste recycled is not available. Estimating this can be challenging due to factors such as individual recycling habits and practices. The household survey, which relies on self-reported data, provides insights into the recycling behavior of households in ACE cities. However, its ability to accurately capture all recycling activities is limited.

According to the survey, approximately one-third of household respondents (33.3percent) sell recyclables to junkshops or give them to collectors (see **Table 38**). This shows the contribution of households to recycling efforts, but also highlights the potential for further improvement. Manila stands out with the highest percentage of respondents (57.1percent) who actively sell their recycled waste, indicating a more proactive recycling culture. For total household waste recycled, Quezon City reports 120 kg of waste sold to junkshops in the past week.

On average, each household recycles 5.7 kg of waste with an average of 1.3 kg per household member. The daily household recycling rate is estimated to be 4.1 kg with Cotabato leading at 7.7 kg per day per household, indicating robust recycling practices within the city. On the other hand, Pasig records a lower daily recycling rate of 2.0 kg per day per household, suggesting opportunities for increasing recycling efforts.

Table 38. Household waste recycled in the past week

| ACE City | Total (n) | HHs (n) | Household waste generated in the past week (in kg) | | | | | Mean per day |
			Sum	Minimum	Maximum	Mean per HH	Mean per HH member	
Overall	**279**	**33.3**	**88**	**359.2**	**0.2**	**40.0**	**4.1**	**4.1**
Caloocan	44	18.2	8	35.0	2.0	10.0	4.4	4.4
Cotabato	62	24.2	13	100.5	0.5	17.0	7.7	7.7
Manila	28	57.1	16	44.0	0.2	10.0	2.7	2.7
Pasig	89	37.1	30	59.7	0.2	7.0	2.0	2.0
Quezon City	56	37.5	21	120.0	1.0	40.0	5.7	5.7

Photo: Jilson Tiu/UNDP Philippines

It is important to recognize that accurately estimating household recycling can be challenging due to various practices, such as storing recyclables over an extended period before selling them or picking up waste from other households. Despite these limitations, the survey provides valuable insight into household recycling behavior and serves as a basis for formulating targeted strategies to further promote recycling and waste reduction across ACE cities. Education, awareness, and accessibility of recycling facilities can help boost recycling rates and move towards a more sustainable waste management approach.

64. Non-household waste recycled

Comprehensive data on the amount of non-household waste recycled is currently unavailable at the national level due to gaps from various cities and municipalities in reporting to DENR-EMB.

In the survey, only one junkshop was able to provide an estimate of the amount of waste collected from non-household sources, and only for one specific item. This reflects the challenges of accurately quantifying and tracking non-household waste recycling practices. Junkshops often deal with a mixture of waste sources, making it difficult to distinguish between waste originating from households and non-household sources.

The lack of data on non-household waste recycling is a concern, as it limits understanding of overall waste diversion efforts and hinders the formulation of effective waste management strategies. Accurate and comprehensive data on both household and non-household waste recycling is critical for policymakers and stakeholders to identify gaps, measure progress, and implement targeted interventions to promote sustainable waste management practices.

To address these information gaps, there is a need for improved data collection and reporting mechanisms at the local and national levels. Encouraging participation and cooperation from all relevant stakeholders, including junkshops and waste service providers, can help enhance data collection and provide a more comprehensive picture of waste recycling efforts across the country. Furthermore, implementing educational campaigns and awareness programs among businesses, industries, and other non-household waste generators can promote responsible waste management practices, including recycling. By fostering a culture of waste reduction and recycling, the country can make significant strides towards achieving its waste diversion goals and advancing sustainability initiatives.

65. Recovery of fisheries waste

The "recovery of fisheries waste" indicator refers to waste from fisheries that may be reused instead of disposed. It provides valuable insight into how fish waste generated in wet markets is managed and reused by various stakeholders, promoting CE practices in the fisheries sector.

A 2022 study called Circular Economy in Fisheries: How is Fish Market Waste Managed in the Philippines published by De La Salle University sheds some light on the amount of fish waste produced in wet markets within Metro Manila and rural areas, along with its utilization and disposal. Purposive sampling of 8 wet markets within Metro Manila and 20 additional rural wet markets was undertaken for the study.

Innards, gills, and scales make up most of the fish waste produced in the wet market, both in Metro Manila and rural areas. The dead fish parts with little to no economic value are typically referred to as "fish waste" in the fisheries sector.

The study reported that, on average, Philippine wet markets produce approximately 70.3 ± 65.4 kg of fish waste daily, with no significant differences observed across locations. Of this, 45.9 percent is disposed of, indicating a considerable portion is not fully utilized. However, 26.9 percent of this fish waste is sold and 27.2 percent distributed to stakeholders who reuse it. This suggests some level of recovery and reuse, contributing to CE practices in the fisheries sector.

The study highlights the importance of exploring opportunities to increase the recovery and reuse of fish waste to further promote sustainability and reduce waste. By identifying and implementing strategies to maximize the value of fish waste, such as converting it into value-added products or by-products, the fisheries sector can contribute to more efficient resource utilization and environmental conservation.

Since the data collected from the study shows no significant differences across locations, the findings may be applicable to wet markets throughout the country. However, further research in different regions and contexts would be beneficial for a more comprehensive understanding and to inform targeted interventions for enhancing CE practices in the fisheries sector.

66. Number of collection points for reuse of materials

The "number of collection points or MRFs" indicator provides important information on the availability and accessibility of material recovery facilities in the country. MRFs play a crucial role in the proper management of recyclable materials from municipal solid waste, facilitating their collection and segregation for recycling and reuse.

According to the 2023 COA Performance Audit Report on Solid Waste Management, the Philippines has made significant progress in establishing MRFs over the years (see Figure 22). In 2010, there were 6,957 MRFs across various barangays. By 2021, the number had increased to 11,637, reflecting a substantial growth in collection points for recyclable materials.

The establishment of more MRFs is a positive development, signifying government's efforts to improve solid waste management practices and promote recycling initiatives at the local level. MRFs play a crucial role in diverting

recyclable materials away from landfills, reducing the volume of waste that needs disposal, and contributing to environmental sustainability.

While the increase in the number of MRFs is commendable, it is essential to ensure that these facilities are well-maintained, properly equipped, and efficiently managed. Adequate training and education of personnel involved in waste management is vital in ensuring the effective functioning of MRFs and maximizing the recovery of recyclable materials.

Continuous monitoring and evaluation of MRFs' performance is necessary to identify areas for improvement and optimize their contributions to waste diversion and recycling efforts. The data on the number of MRFs helps in assessing the progress of solid waste management practices in the country and serves as a foundation for identifying potential strategies to enhance recycling and CE practices at the local and national levels.

Figure 22. Established MRFs in the Philippines (2010-2021)
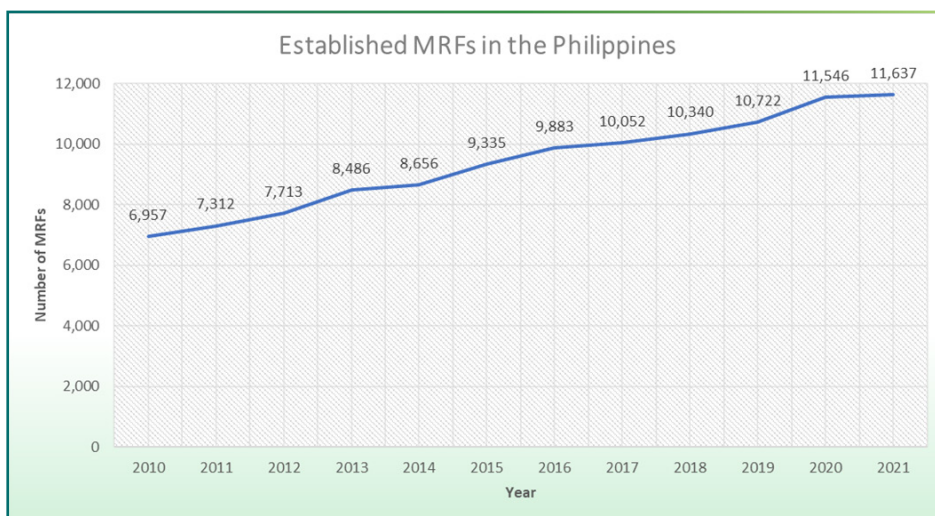
ESTABLISHED MRFs IN THE PHILIPPINES (2010-2021)

Source: COA Performance Audit Report; DENR and LLC Macrotrends

67. Recycling rate of plastic packaging waste

The WWF-Philippines report on the Extended Producer Responsibility (EPR) Scheme Assessment for Plastic Waste in the Philippines[1] provides valuable insight into the flow and management of plastic packaging waste in the country. The assessment is a significant step towards understanding the current situation and identifying areas for improvement in plastic waste management. As of 2019, total annual consumption of plastic in the Philippines is reported to be 2.15 million tonnes. The report presents a breakdown of how this plastic waste is managed:

• **Refuse-Derived Fuel (RDF).** Two percent of the plastic waste is recovered and processed as refuse-derived fuel – a form of energy recovery where non-recyclable waste materials, including plastics, are processed into a fuel source.

• **Export.** Five percent of the plastic waste is exported. This means a small portion of the plastic waste is sent to other countries for recycling or disposal.

• **Recycling.** Approximately 183,000 tonnes (9percent) of plastic waste is recycled. Recycling involves the conversion of plastic waste into new products or raw materials, reducing the need for virgin plastic production.

• **Stored and In Use.** About 16 percent of the plastic waste is stored and currently in use. This refers to plastic materials still in circulation, such as plastic products and packaging that have not yet reached their end of life.

• **Disposal.** The largest portion of the plastic waste (33percent) is disposed of. This indicates that a significant amount of plastic waste ends up in landfills or incineration facilities, contributing to environmental and public health concerns.

• **Leakage to the Open Environment.** A concerning 35 percent of the plastic waste is leaked to the open environment. This includes plastic pollution in rivers, oceans, and other natural habitats, posing significant threats to marine life and ecosystems.

The assessment sheds light on the need for improved waste management practices and the implementation of effective EPR schemes to address plastic pollution and promote a more circular approach to plastic use and disposal. Extended Producer Responsibility schemes aim to hold producers accountable for the entire life cycle of their products, including managing the waste generated from those products. By implementing robust EPR systems, the Philippines can work towards reducing plastic leakage to the environment, increasing recycling rates, and transitioning towards a more sustainable and circular plastic economy.

1 WWF-Philippines (2022). Extended Producer Responsibility (EPR) Scheme Assessment for Plastic Waste in the Philippines. https://wwf.org.ph/wp-content/uploads/2022/01/NP21.115.014-WWF-EPR-Project-EN-Final-Report-R2-2022.01.19.pdf

Photo: Jilson Tiu/UNDP Philippines

68. Percentage of recyclable plastic packaging placed on the market

The *Market Study for the Philippines: Plastics Circularity Opportunities and Barriers*[1] published by The World Bank Group in 2021, provides valuable insight into the market dynamics and material flows of recyclable plastic packaging in the Philippines. The study focuses on specific types of recyclable plastic packaging and their respective annual amounts in the market. However, it does not include data on non-recyclable plastic packaging.

The study identifies the following types of recyclable plastic packaging and their respective annual amounts in the market:

as single-use or hard-to-recycle plastics, is not discussed. The latter poses significant challenges in waste management and environmental conservation due to limited recycling options. Addressing the issue of non-recyclable plastic packaging requires comprehensive strategies and policies such as EPR schemes, bans or restrictions on certain types of plastics, and the promotion of alternative eco-friendly packaging materials.

While the study offers valuable insight into the recyclable plastic packaging market, it is essential to consider the broader context of plastic waste management and CE

Type of plastic packaging	Amount per year
PET (Polyethylene Terephthalate)	**195,000**
PP Resin (Polypropylene)	**239,100**
HDPE (High-Density Polyethylene)	201,300
LLDPE/LDPE (Linear Low-Density Poly-ethylene/ Low-Density Polyethylene)	235,600

It is worth noting that the data in the study is specific to recyclable plastic packaging. Non-recyclable plastic packaging, also known

approaches to address the challenges posed by non-recyclable plastics and work towards a more sustainable and circular plastic packaging system in the Philippines.

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1 World Bank Group (2021). Market Study for the Philippines: Plastics Circularity Opportunities and Barriers. East Asia and Pacific Region Marine Plastics Series. http://hdl.handle.net/10986/35295

69. New circular products

The "circular products" indicator refers to products that operate within the CE model, such as those that have reduced or completely eliminated the need for virgin resources and are designed with the end of their lives in mind. These are typically made from recycled materials and designed to be durable, repairable, and easily recyclable or upcycled at the end of their useful lives.

To identify circular products, a search was conducted in Facebook and Google with the initial keyword "circular products," which did not yield successful returns. Next, the keywords "recycled" and "zero-waste" were used, leading to 17 circular products (see Annex H). The types of products found in the search encompass a range of items, including:

- **Upcycled Furniture.** Furniture items that are creatively made from repurposed or reclaimed materials, reducing the need for new resources.

- **Bags, Wallets, and Carriers.** Accessories made from recycled materials, offering a sustainable alternative to conventional products.

- **Clothing and Towels.** Apparel and textile products made from recycled fibers, contributing to a circular approach in the fashion industry.

- **Housing Materials.** Construction materials that incorporate recycled content, supporting sustainable building practices.

- **Stationery.** Office and writing supplies made from recycled materials, promoting eco-friendly office practices.

- **Other Household Goods.** A diverse category that includes various household items made from recycled materials, further promoting circular consumption.

The identification and promotion of circular products are crucial steps towards fostering CE and reducing the environmental impact of consumer goods. By encouraging the use of these products, consumers can actively participate in sustainable practices and contribute to a more resource-efficient and waste-reducing society. However, continuous efforts are needed to expand the availability and awareness of circular products and encourage their adoption on a broader scale.

70. Number of companies or products with tax benefits to incentivize the CE

There is no data that measures this indicator at the national level.

Photo: Jilson Tiu/UNDP Philippines

On number of junkshops that have received incentives in the past year

The "number of junkshops that have received incentives in the past year" serves as a proxy measure for the broader indicator "number of companies or products with tax benefits to incentivize the CE." One of the survey's objectives was to assess whether junkshops received any incentives from the government for their contributions to waste management. The survey asked if each city's LGU provided tax benefits or incentives elated to waste management in the past year. Survey results are shown in **Table 39**, which also compares the junkshops by organizational membership.

Non-member junkshops reported receiving no form of incentive during that period. However, more than one-tenth of the junkshops that are members of associations or groups reported receiving some incentives, including loans from DTI, which could have supported their operations and investments in waste management. Members also received information on where to deliver or sell the recyclable materials they collected, which likely facilitated more efficient and effective waste recycling processes.

While the number of junkshops that received incentives was relatively low, it is still notable that some establishments were recognized and supported through incentives. These incentives could have played a role in promoting and enhancing their engagement in sustainable waste practices and CE initiatives.

None of the junkshops mentioned receiving any tax benefits from the government. This suggests opportunities to explore additional mechanisms to further incentivize and reward junkshops and other waste management establishments for their environmental efforts. During the phone interviews, some junkshop operators expressed their inability to afford the required business registration fees, indicating possible barriers to formalization and access to incentives.

Non-members received no incentives of any form in the past year while a small proportion of junkshops that are members of associations or groups reported receiving incentives from the local government related to waste management during the same period.

Overall, the findings highlight the importance of incentivizing junkshops and waste management establishments for

their crucial role in waste recycling and the circular economy. By providing tax benefits and other forms of support, governments can encourage and reward these businesses for their contributions to waste management and environmental sustainability. Additionally, streamlining registration processes and reducing fees could help improve formalization rates among junkshops, fostering greater participation in waste management efforts.

Creating a conducive environment for junkshops to formalize their operations and participate more actively in the circular economy could yield positive outcomes for waste management and sustainability in the country. Further efforts to incentivize them may be required to unlock their full potential in advancing CE and promoting more sustainable waste practices.

Table 39. Junkshops that received incentives in the past year

ACE City	Total (n)	Junkshops who are member of organizations (n)	Junkshops who are member of organizations (n)		Type of incentive
			Received incentives	Did not receive incentives	
Overall	**49**	**23**	**11.5**	**88.5**	**-**
Caloocan	24	16	-	100.0	-
Cotabato	3	0	-	-	-
Manila	6	0	-	-	-
Pasig	11	3	33.3	66.7	Loan from Department of Trade and Industry
Quezon City	5	5	40.0	60.0	Information on where to deliver or sell junk

71. Ecolabel holders

The Philippine Center for Environmental Protection and Sustainable Development, Inc. (PCEPSDI) is the administrator of the National Ecolabelling Program–Green Choice Philippines (NELP-GCP) – a voluntary, third-party ecolabelling program that follows guidelines set by ISO 14020 and ISO 14024. NELP-GCP has granted its seal of approval to various green products under the categories of laundry detergent, cement, ceramic tiles, and natural infill material, among others. **Table 40** lists the 30 products with ecolabels.

NELP-GCP plays a vital role in promoting and supporting the adoption of green products in the Philippines and contributing to the country's efforts towards sustainability and environmental protection. Product ecolabels indicate that they have been independently assessed and verified to meet certain environmental performance standards, which may include aspects like reduced resource consumption, lower greenhouse gas emissions, or reduced environmental impact throughout their life cycle.

Table 40. List of Products with Ecolabels[1]

Product Category	Company	Products
Ceramic Tile	Mariwasa Siam Ceramics, Inc.	● Ceramic Tile
Tissue Paper Products	Quanta Paper Corporation	Bathroom Tissue ● Fresh ● Dear Green ● Eco-hygiene ● Eco-Hygiene Jumbo Roll ● Ecopal Table Napkin ● Harmony ● Eco-hygiene Paper Kitchen Towel ● Harmony ● Fresh ● Eco-hygiene paper towel ● Eco-hygiene Handroll towel ● Kitchen Towel
	Starkson Packaging Corporation	● Happy Table Napkin
Fiber Cement Board	SCG Marketing Philippines, Inc.	● SCG Fiber Cement Board
Synthetic Laundry Detergent	Unilever Philippines, Inc.	● Surf Laundry Detergent Powder ● Surf Laundry Detergent Bar
Food Service Establishment	SM Prime Holdings, Inc.	● Veranda Restaurant at Taal Vista Hotel
	Pico de Loro Beach and Country Club, Inc.	● Pico Restaurant ● Sun Coral Cafe
	La Cosa é Nostra Inc.	● Anzani New Mediterranean Cuisine

1 PCEPSDI (n.d.). About Green Choice Philippines.
https://pcepsdi.org.ph/programme/green-choice-philippines/about-green-choice-philippines/

Packaging Products	Starkson Packaging, Inc.	● Happy Flexible Films ● Kraft Paper ● Uncoated Paper + LDPE Film ● Uncoated Cupstock (Paper) + LDPE Film ● PP Cups with Coated Paperboard Sleeves ● Coated Carrier Board + Chipboard ● Coated Carrier Board ● Coated Carrier Board with Windows ● Coated Carrier Board with LDPE Liner

The Philippine Center for Environmental Protection and Sustainable Development, Inc. (PCEPSDI) is the administrator of the National Ecolabelling Program–Green Choice Philippines (NELP-GCP) – a voluntary, third-party ecolabelling program that follows guidelines set by ISO 14020 and ISO 14024. NELP-GCP has granted its seal of approval to various green products under the categories of laundry detergent, cement, ceramic tiles, and natural infill material, among others. **Table 40** lists the 30 products with ecolabels.

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Closing the Loop

Ten indicators on closing the loop have available secondary data (see **Table 41**). New primary data was gathered for one of these indicators, together with three other indicators.

Table 41. List of Indicators related to Closing the Loop

No.	Indicator	Primary Data	Secondary Data
83	Investment in RandD over the GDP		✓
84	Weight of the green economy in GDP		✓
85	Number of green jobs created and secured		✓
86	Number of places devoted to repair		✓
87	Objects collected and diverted for reuse	✓	
88	Objects recovered in reuse centres	✓	
89	Objects redirected/repaired from recycling centres	✓	
90	Evolution of the tonnage of plastics used in the city	✓	✓
91	Evolution of the tonnage of plastics recycled in the city		✓
92	Adequate environmental management of plastic packaging waste		✓
93	Water extraction, direct		✓
94	GHG Emissions		✓
95	Greenhouse gas reduction		✓

83. Investment in RandD over the GDP

The indicator "percentage of investment in research and development (RandD) over the GDP of the country" reflects the country's commitment to fostering science, technology, and innovation. It indicates the proportion of the nation's economic output dedicated to RandD activities, which are vital for driving economic growth, enhancing competitiveness, and fostering innovation.

Based on the 2018 Survey on RandD Expenditures and Human Resources in Government, Higher Education, and Non-Profit Sectors published by DOST, the country's gross expenditure on RandD (GERD) amounted to 0.32 percent of GDP. This means almost one-third of the total value of goods and services produced in the country was invested in RandD initiatives. The survey also reveals that RandD expenditure is divided between the government (39percent) and the private sector (61percent).

These indicators were also covered in DOST's Research and Development Survey Report 2018 providing additional insights into the country's GERD.[1] According to this report, GERD has been gradually increasing. In 2011, the percentage of GDP devoted to RandD was 0.112, and by 2018 had climbed to 0.194. This upward trend demonstrates an increasing focus on RandD and innovation in the country. Investment in RandD is a critical factor in driving sustainable economic growth, fostering technological advancements, and addressing societal challenges. It enables countries to stay competitive in the global market and create solutions to complex problems.

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1 DOST and UPLB INSTAT (2021). Research and Development Survey Report 2018. https://instat.uplb.edu.ph/wp-content/uploads/2021/05/RD-Survey-Report-2018.pdf

84. Weight of the green economy in GDP

The indicator "percentage of the green economy over the GDP of the Philippines" assesses the contribution of the green subsector to the country's overall economic output. The green economy refers to economic activities that are environmentally sustainable, promote resource efficiency, and contribute to the reduction of carbon emissions and environmental degradation.

According to the Green Skills for Green Jobs: Preparing the Filipino Workforce for the Green Economy-Labor Market Report[1] of TESDA published in 2018, the green subsector was estimated to contribute an average gross value added (GVA) of PhP 2.6 trillion between 2016 and 2030. GVA represents the value of goods and services produced in an economy after accounting for the cost of inputs and raw materials.

To calculate the share of the green economy in the GDP, the estimated GVA of the green subsector is divided by the country's GDP for the same period.

The green economy is not limited to a single sector but encompasses various industries and activities that promote sustainability and environmental responsibility. As such, tracking the contribution of the green economy to the overall GDP is essential in understanding the country's progress in transitioning to a more sustainable and environmentally friendly economic model.

1 TESDA, op. cit.

85. Number of green jobs created and secured

The indicator "number of workers involved in the green sector" assesses the employment impact of activities aimed at promoting sustainability, resource efficiency, and environmental protection. Green sector jobs are those that contribute to improving energy and raw material efficiency, limit GHG emissions, minimize waste production, protect and restore ecosystems, and support climate change adaptation.

According to the 2021 Greening the Philippine Employment Projections Model: New Estimates and Policy Options of the Philippine Institute for Development Studies (PIDS),[1] approximately 7 million Filipinos were employed in the green sector in 2016, distributed across various industries and sectors. Out of these, around 4.3 million are employed in the service sector. This includes activities related to environmental services, renewable energy, sustainable tourism, waste management, and other services that support green initiatives. Green industry, which encompasses manufacturing and production processes that prioritize sustainability and resource efficiency, employs around 1.6 million people. These may include renewable energy production, eco-friendly manufacturing, and other sustainable production practices. Green agriculture, employing approximately 1.3 million people, focuses on sustainable and eco-friendly agricultural practices that minimize environmental impacts, reduce GHG emissions, and promote biodiversity conservation.

The significant number of workers employed in the green sector reflects the growing recognition of the importance of sustainability and environmental protection in the country's economic development. As the Philippines

1 Abrigo, M., et. al. (2021). Greening the Philippine Employment Projections Model: New Estimates and Policy Options. Discussion Paper Series No. 2021-26.https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidsdps2126.pdf

continues to prioritize green and sustainable initiatives, the number of workers involved in the green sector is expected to grow, contributing to a more environmentally conscious and resilient economy.

Employment generated by junkshops

The junkshop survey provides valuable insight into the employment patterns in this sector, showing the number of people working in junkshops and their sex distribution. According to the survey, the 49 responding junkshops employ a total of 169 workers (see **Table 42**). Each junkshop has three workers on average, indicating they typically operate with a small workforce. Among the ACE cities, Cotabato stands out with the highest mean number of workers per junkshop with an average of nine per establishment. This suggests junkshops in Cotabato are relatively larger

or have higher demands for labor. In terms of sex disaggregation, junkshops in general, tend to have a higher proportion of male workers. However, an interesting exception is Caloocan, where the gap between male and female workers is relatively low. In Caloocan, around 57.1 percent of junkshop workers are male, while 41.3 percent are female. This is a more gender-balanced representation in the workforce compared to other cities. The data on the number of workers in junkshops provides valuable information about the employment impact of this sector.

Table 42. Junkshop workers

ACE City	Total (n)	Number of junkshop workers				Number of junkshop workers	
		Sum	Minimum	Maximum	Mean per junkshop	Male	Female
Overall	**49**	**169**	**1**	**15**	**3**	**73.9**	**25.4**
Caloocan	24	63	1	5	3	57.1	41.3
Cotabato	3	28	4	15	9	92.9	7.1
Manila	6	24	3	6	4	83.3	16.7
Pasig	11	28	1	4	3	78.6	21.4
Quezon City	5	26	4	8	5	80.8	19.2

Junkshops play an essential role in waste management and recycling efforts and the employment they provide contributes to livelihoods and economic opportunities for many individuals. Understanding the workforce dynamics in junkshops can help policymakers and stakeholders better address labor needs and support the growth

of sustainable and inclusive practices in waste management.

Data from the survey highlights notable gender disparities in compensation and employment within the junkshop sector. Overall, a higher proportion of males (78.6 percent) are compensated for their

work compared to females (53.5percent). This indicates that more men are employed as paid workers while a significant portion of women in the sector are either unpaid or receive minimal compensation. Across cities, the trend generally holds except in Cotabato and Pasig where all the female workers are paid, but the number is relatively low (2 and 6, respectively). This suggests that while some female workers in these cities are compensated for their work in junkshops, the overall representation of women in the workforce is still limited.

The Gender and Waste Nexus Report[1] from other countries also highlights similar trends, where women are often engaged in waste-related activities in the informal sector but tend to have lower levels of compensation compared to men. In the junkshops surveyed in this study, while there are more men engaged in the enterprise, women have a relatively higher proportion of unpaid roles.

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1   UNEP-IETC and GRID-Arendal (2019). Gender and Waste Nexus: Experiences from Bhutan, Mongolia and Nepal. https://wedocs.unep.org/bitstream/handle/20.500.11822/29821/GaWN.pdf

Table 44. Sex of junkshop operator

ACE City	Total junkshop (n)	Operator (percent)	
		Male	Female
Overall	**49**	**44.9**	**55.1**
Caloocan	24	33.3	66.7
Cotabato	3	100.0	-
Manila	6	66.7	33.7
Pasig	11	54.5	45.5
Quezon City	5	20.0	80.0

The variation in sex distribution among junkshop operators across cities suggests that gender roles and dynamics in the waste management sector can differ based on local contexts and factors. These nuances need to be considered when formulating policies and interventions to promote gender equity and social inclusivity in the waste management industry. Overall, having more female junkshop operators is a positive sign. However, it is essential to continue monitoring and addressing gender disparities and challenges faced by women to ensure equal opportunities and fair treatment for all operators and workers in the waste management industry.

86. Number of places devoted to repair

This indicator aims to quantify the number of establishments that offer repair services to reuse items.

Data from the PSA's Annual Survey of Philippine Business and Industry (ASPBI) [1]provides valuable insights into the number of establishments offering repair services in the Philippines. The survey reports a significant increase in the number of establishments involved in repair services over the past decade (see **Table 45**). There were 4,072 establishments engaged in repair services in 2010, which has more than doubled to 9,856 in 2020. This indicates a growing trend of businesses aligned with CE principles through promoting the reuse and extension of the lifespan of products.

1 Philippine Statistics Authority (2021). Annual Survey of Philippine Business and Industry (APSBI). https://psa.gov.ph/statistics/survey/business-and-industry/index

2 Philippine Statistics Authority (2021). Annual Survey of Philippine Business and Industry (APSBI). https://psa.gov.ph/statistics/survey/business-and-industry/index

Table 45. Number of Establishments Providing Repair Services[2]

2009 PSIC Code	Industry	Number of Establishments							
		2010	2013	2014	2015	2016	2017	2019	2020
C	**Manufacturing**								
C331	Repair of fabricated metal products, machinery, and equipment	21	158	253	628	716	635	488	ND
C33110	Repair of fabricated metal products			19	303	342			
C33120	Repair of machinery			16	276	309			
C33130	Repair of electronic and optical equip-ment			4	S	4			
C33140	Repair of electrical equipment			14	4	6			
C33151	Repairing of ships and boats other than sports and pleasure boats			94	38	41			
C33152	Repairing of sports and pleasure boats			71	4	9			
C33159	Repair of transport equipment, except motor vehicles, n.e.c.								

2009 PSIC Code	Industry	Number of Establishments							
		2010	2013	2014	2015	2016	2017	2019	2020
C33190	Repair of other equipment			35	3	5			
G	**Wholesale and Retail Trade; Re-pair of Motor Ve-hicles and Mo-torcycles**								
G452	**Maintenance and repair of motor vehicles**	**1,425**	**2,264**	**2,249**	**1,301**	**1,504**	**2,020**	**2,455**	**1,909**
G45201	Repair of motor vehicles, including overhauling				1,232	1,418			
G45202	Repair of batteries for motor vehicles				69	86			
G454	Sale, mainte-nance and repair of motorcycles and related parts and accessories	1,899	5,547	5,647	98	152	6,222	7,772	6,635
G45402	Maintenance and repair of motorcy-cles and their parts and compo-nents				98	152			
S	Other Service Activities								
S951	Repair of com-puters and communications equipment	62	196	211	170	220	147	220	227
S95110	Repair of comput-ers and peripheral equipment				86	109			
S95120	Repair of commu-nications equip-ment				84	111			
S952	**Repair of per-sonal and household goods**	**665**	**1,135**	**1,133**	**1,048**	**1,210**	**993**	**980**	**1,085**
S95210	Repair of con-sumer electronics				138	153			

2009 PSIC Code	Industry	Number of Establishments							
		2010	2013	2014	2015	2016	2017	2019	2020
S95221	Repair and servicing of household appliances				364	421			
S95222	**Repair and servicing of home and garden equipment**				**3**	**s**			
S95231	**Repair of boots and shoes**				**247**	**270**			
S95232	Repair of luggage and handbags				4	9			
S95241	Repair of wood furniture				42	51			
S95249	Repair of other furniture and fixtures, n.e.c.				3	s			
S95290	Repair of personal and household goods, n.e.c.				247	306			

Note: ND means No Data

The increase in the number of repair establishments is an encouraging sign for sustainable practices and reducing waste generation. Repairing instead of discarding items not only helps conserve resources but also contributes to the reduction of waste going into landfills or incineration facilities.

By encouraging and supporting repair services, the Philippines can foster a culture of repair and reuse, which is vital in achieving a more sustainable and circular economy. This indicator also highlights the potential for job creation in the repair sector, providing opportunities for skilled workers to contribute to sustainable economic development.

87. Objects collected and diverted for reuse; and
88. Objects recovered in reuse centres

The junkshop survey's attempt to determine the types and quantities of waste that are reused is a valuable initiative towards understanding and promoting recycling and reuse practices. Reusing items is a critical aspect of the circular economy, as it helps minimize waste and conserve valuable resources.

However, the challenges in quantifying the overall number of items reused by junkshops highlight the complexity of waste management in the informal sector. Junkshops may collect and reuse various types of items: bottles, metals, PETs, plastic drums, cartons, newspapers, plastic bags, and tin cans. The way these items are quantified

may differ, though, and sometimes they are not quantified at all.

In the absence of a standardized measurement system for quantifying reused items, estimating the total quantity of **reused items becomes difficult.** This lack of standardization may be due to various factors, including the varying capacity and resources of junkshops and the diverse nature of the items they handle.

Table 46. Junkshops that collect items for reuse in the past week

ACE City	Total (n)	Items collected for reuse	Quantity of items collected for reuse
Overall	49	-	
Caloocan	24	Bottles Metal (e.g., steel rods, roof) PET Plastic drum	1 sack 2 kg 10 pieces 13 kg
Cotabato	3	Metal (e.g., steel rods, roof)	-
Manila	6	Cartons Tin Cans	100 kg -
Pasig	11	Metal (e.g., steel rods, roof)	-
Quezon City	5	Cartons Newspaper Plastic bags	10 kg 10 kg -

To effectively promote and monitor recycling and reuse practices in the informal sector, there is a need for better coordination and collaboration among stakeholders, including junkshops, local governments, and waste management authorities. Guidelines and best practices for quantifying and reporting could help improve data collection and provide a more accurate picture of the impact of junkshops in waste reduction and CE practices. Moreover, investing in education and capacity building for operators on sustainable waste management practices and measurement techniques could further enhance their CE contribution and facilitate better tracking of reused items. By addressing these challenges, the Philippines can enhance its waste management strategies.

Disaggregating data on types and quantities

of waste reused by junkshops by ACE cities would provide valuable insight into the recycling and CE practices specific to each city. Understanding the variations in waste reuse patterns can help identify successful practices and potential areas for improvement in each locality. By analyzing the data city-wise, the types and quantities of items reused by junkshops in each ACE city can be compared. This analysis could reveal area-based differences in waste management practices and highlight the impact of local policies and initiatives on waste reduction and recycling.

Additionally, identifying any specific challenges or constraints faced by junkshops in each city can help tailor interventions and support programs to address the unique needs of each locality. If a certain city

has a higher proportion of certain types of waste materials being reused, efforts can be focused on improving recycling infrastructure and capacity for those specific items. Disaggregated data can also serve as a basis for benchmarking and setting targets for each ACE city. By comparing recycling and reuse performance across cities, local governments and waste management authorities can identify best practices and set realistic goals for waste reduction and CE initiatives.

Sharing the disaggregated data with junkshop operators and relevant stakeholders can also foster greater awareness and understanding of the importance of their role in waste management. This can encourage knowledge-sharing and collaboration among them, leading to improved recycling practices and a more sustainable waste management ecosystem. Overall, the availability of this data on can enhance decision-making, policy formulation, and targeted interventions.

89. Objects redirected/repaired from recycling centres

The primary objective of the junkshop survey is to ascertain the types and quantities of waste that undergo recycling. Junkshop operators were asked whether they were aware of any of the wastes they sell being recycled and, if so, to provide the quantity of these recycled wastes in kilograms.

While the number of junkshops engaged in repair activities is relatively low, there are some that collect or purchase items specifically for repair purposes. **Table 47** presents the percentage of junkshops that gather items for repairs and outlines the various items they collect.

Table 47. Objects collected by junkshops for repair

ACE City	Total (n)	Junkshops that collect items for repair (percent)	Items collected for repair
Overall	**49**	22.4 (n=11)	
Caloocan	24	29.2 (n=7)	TV, electric fan, refrigerator, air conditioner, washing machine
Cotabato	3	33.3 (n=1)	Car, motorcycle
Manila	6	(n33.3=2)	Electric fan, refrigerator, air conditioner
Pasig	11	- (n=0)	None
Quezon City	5	20.0 (n=1)	TV, electric fan

Obtaining precise data on the types and quantities of recycled waste can present challenges due to the complexities involved in tracking recycling activities, especially when it comes to downstream processes and recycling facilities. As such, the provided information may not fully cover the entire spectrum of recycling and repair practices within the ACE cities. Further research and data collection efforts may be required to gain a more comprehensive understanding of waste recycling and repair endeavors.

90. Evolution of the tonnage of plastics used in the city

The 2021 World Bank market assessment of plastics[1] revealed that the Philippines consumed a total of 1.1 million TPY (thousand metric tons per year) of the key resins: Polyethylene terephthalate (PET), High-Density Polyethylene (HDPE), Low-Density Polyethylene/Linear Low-Density Polyethylene (LDPE/LLDPE), and Polypropylene (PP).

These four resins were selected for the study because of their significant consumption levels. According to a 2014 publication by the DTI, PPIA, and BOI called *The Philippine Plastics Industry Roadmap*, which projected consumption for 2015, these resins accounted for 80 to 93 percent of all plastic resins consumed in the Philippines, with PVC and PS comprising the remaining 7 to 20 percent. The WWF-Philippines report *EPR Scheme Assessment* for *Plastic Packaging Waste in the Philippines*[2] also affirms that these four

constitute 80 percent of plastic consumption among the six types of key resins studied.

The evolution of the tonnage of plastics used in the city provides valuable insight into the consumption patterns and demand for plastic products. As the tonnage of plastics used increases, it underscores the significance of plastics in various industries and everyday life and highlights the growing challenge of plastic waste management and its impact on the environment.

Addressing the evolution of plastic usage is crucial for transitioning towards a more sustainable future. By promoting responsible plastic consumption, encouraging the use of eco-friendly alternatives, and implementing waste reduction initiatives, cities can actively contribute to reducing the environmental burden posed by plastics.

1 World Bank Group, op. cit.

2 WWF-Philippines, op. cit.

91. Evolution of the tonnage of plastics recycled in the city

According to a 2021 study by the World Bank Group supported by the DENR,[1] the Philippines achieved a recycling rate of approximately 28 percent for the four key plastic resins (PET, HDPE, LDPE/LLDPE, and PP) consumed in 2019. The total amount of these plastics recycled was estimated to be around 292,000 tonnes per year (TPY).

Among the four resins, PET (excluding polyester applications) had the highest collected-for-recycling (CFR) rates. This is mainly due to its widespread use in packaging and its limited applications in other industries, which simplifies the collection process. Post-

consumer PET bottles, in particular, have a relatively high demand from recyclers in the market, enabling more PET packaging to be collected and recycled.

Recycling rates for the other polyolefin resins (PE and PP) were comparatively lower. These are used in various applications, including electronics, automotives, construction, and as rigids and films, and have longer usage cycles. Their functional properties, combined with structural challenges in the country, make the collection process for polyolefins more complicated. Consequently, recycling rates for individual resins and packaging formats

1 World Bank Group, op. cit.

vary significantly depending on factors such as the price of virgin plastic, the end use of recycled resin, and other market dynamics.

The evolution of the tonnage of plastics recycled in the city is a key indicator of progress in sustainable waste management practices. Increasing the tonnage of plastics recycled reflects a commitment to CE principles, where plastics are diverted from landfills and instead transformed into valuable resources through recycling.

Efforts to improve plastic recycling rates can have far-reaching benefits, including reduced environmental pollution, conservation of natural resources, and **economic opportunities in the recycling industry.** The tonnage of plastics recycled serves to evaluate the effectiveness of recycling programs and identify areas for improvement in waste management strategies. Promoting responsible plastic usage, encouraging recycling initiatives, and supporting the growth of the recycling industry are essential steps towards building a more circular and environmentally conscious city. By leveraging these insights, cities can play a significant role in mitigating plastic pollution and advancing the transition to a greener and more sustainable future.

92. Adequate environmental management of plastic packaging waste

The "adequate environmental management of plastic packaging waste" indicator helps address the issue of plastic pollution and its impact on the environment. By focusing on improving the management of plastic packaging waste at the national and local levels, this indicator sets the groundwork for more sustainable practices and effective waste reduction strategies.

At the national level, the implementing rules and regulations (IRR) of the EPR Law of 2022 provides a framework for extended producer responsibility, outlining specific provisions to promote plastic neutrality. This includes measures such as reducing non-environmentally friendly products through the adoption of reusable designs, incorporating recycled content in products, and implementing product refilling systems. Education campaigns and proper labeling also play a vital role in guiding consumers towards proper disposal practices.

The focus on product waste recovery programs is equally critical to preventing waste leakage into the environment. Initiatives that enhance the retrievability and recyclability of waste products, along with the establishment of recycling and waste diversion facilities, contribute significantly to minimizing plastic pollution. Partnerships with local government units, communities, and informal waste sectors create a collaborative effort to manage plastic packaging waste more effectively.

In addition to national efforts, the ordinances by various cities and municipalities further augment the commitment to managing plastic packaging waste at the local level. These complement national policies and provide tailored solutions to address the unique challenges of each locality.

Monitoring the "adequate environmental management of plastic packaging waste" indicator is vital to the pursuit of sustainable waste management practices. By adopting strategies outlined in the national framework, improving product design and recovery programs, and implementing local ordinances, the Philippines takes significant steps towards a more circular and environmentally responsible approach to plastic packaging waste.

93. Water extraction, direct

The "water extraction, direct" indicator checks the volume of water directly sourced from groundwater and surface water. Monitoring this helps in understanding the country's water utilization and highlights the need for sustainable water management practices.

The Water Accounts of the Philippines, as reported by PSA, presents data on the total abstracted water by source from 2010 to 2021. The trend depicted in **Figure 23** shows a consistent increase in water extraction. The volume of water abstracted rose from 194,083.99 million m3 in 2010 to 221,339.50 million m³ in 2021. Such trends help in evaluating the overall state of water

resources. With increasing demand for water, this indicator underscores the importance of efficient water allocation, conservation measures, and responsible water usage practices.

Understanding the dynamics of water extraction is critical in developing sustainable policies and strategies to ensure water security in the future. Addressing the challenges posed by water scarcity and potential impacts of climate change requires a holistic approach that considers the needs of various stakeholders while preserving the integrity of water sources and ecosystems.

Figure 23. Total Abstracted Water by Source, Direct
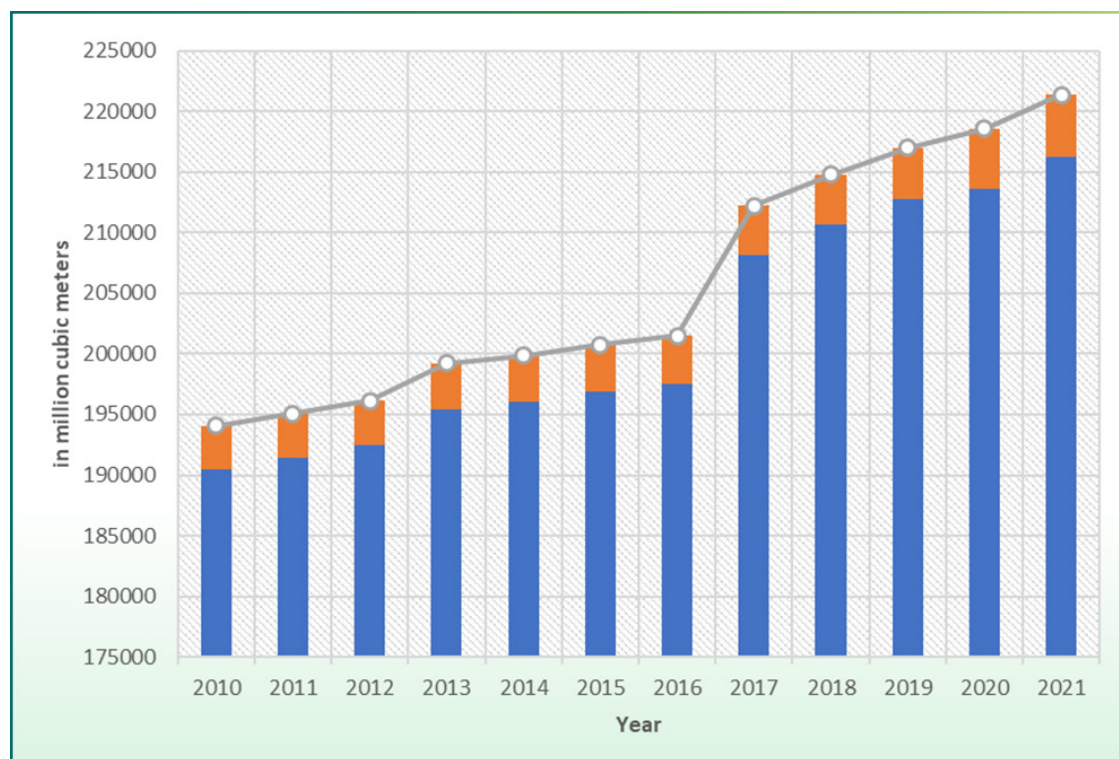
TOTAL ABSTRACTED WATER BY SOURCE, DIRECT

Source: COA Performance Audit Source: Philippine Statistics Authority, Water Accounts of the Philippines, 2010-2021 Report; DENR and LLC Macrotrends

Photo: Jilson Tiu/UNDP Philippines

94. GHG Emissions

The "GHG emissions" indicator monitors greenhouse gas emissions across various sectors. This information is essential in assessing the effectiveness of waste management methods, tracking progress towards climate change goals, ensuring regulatory compliance, and making informed decisions to promote resource efficiency and sustainability.

The Philippine Greenhouse Gas Inventory Report[1] provides valuable insights into emissions from six major sectors – (1) energy, (2) transportation, (3) agriculture, (4) forestry and other land use (FOLU), (5) industrial processes and product use (IPPU), and (6) waste. The report encompasses four GHGs: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and hydrofluorocarbons (HFCs), which are significant contributors to global warming and climate change. [2]

The energy and transport sectors are the largest contributors to GHG emissions, averaging 66.1743 metric tonnes of carbon dioxide equivalent (Mt CO2e) from 1994 to 2010. The agriculture sector follows with an average of 40.3883 Mt CO2e, while waste and industrial processes and product use account for 13.284 Mt CO2e and 9.1923 Mt CO2e, respectively.

By closely monitoring GHG emissions, the country can formulate and implement effective climate change mitigation strategies. This data will be invaluable to the Philippine Climate Change Commission (CCC) as it compiles the GHG Inventory from 2015 to 2020, aiding in the assessment of progress made and identifying areas that require urgent attention and action.

The "GHG emissions" indicator serves as a vital tool in advancing climate change mitigation efforts, promoting sustainable practices, and steering the nation towards a low-carbon and resilient future. By understanding the sources and trends of GHG emissions, the Philippines can take targeted actions to reduce its carbon footprint, contribute to global climate goals, and safeguard the environment for future generations.

1 Philippine Climate Change Commission (2010). 2010 Philippine Greenhouse Gas Inventory Report. https://niccdies.climate.gov.ph/files/documents/Executivepercent20Summary_2010percent20Nationalpercent20GHGIpercent20Report.pdf

2 UN Intergovernmental Panel on Climate Change. (2006). 2006 IPCC guidelines for National Greenhouse Gas Inventories. IPCC. https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

95. Greenhouse gas reduction

The "greenhouse gas reduction" indicator aims to track and assess the progress made in reducing emissions of greenhouse gases like carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons. Monitoring GHG emissions is crucial for evaluating the effectiveness of different environmental policies and waste management practices, reporting climate action progress, and ensuring accountability in reducing the country's carbon footprint. By effectively monitoring GHG emissions, policymakers and stakeholders can make informed decisions to enhance climate change mitigation efforts and promote resource efficiency.

In the 2010 *Philippine Greenhouse Gas Inventory Report,*[1] the forestry and other land use (FOLU) sector net sequestration was 0.126 Mt CO2e in 1994, 105.111 Mt CO2e in 2000, and 37.007 Mt CO2e in 2010, reflecting a reduction in net GHG emissions from 1994 to 2010 (see **Figure 24**). This highlights the significance of land-use practices in sequestering carbon and contributing to overall GHG reduction efforts. Regular monitoring of such indicators provides valuable insight into the impact of environmental initiatives and informs evidence-based policymaking for effective climate change mitigation.

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1 Philippine Climate Change Commission, op. cit.

Figure 24. Philippine Greenhouse Gas Inventory (1994-2010)
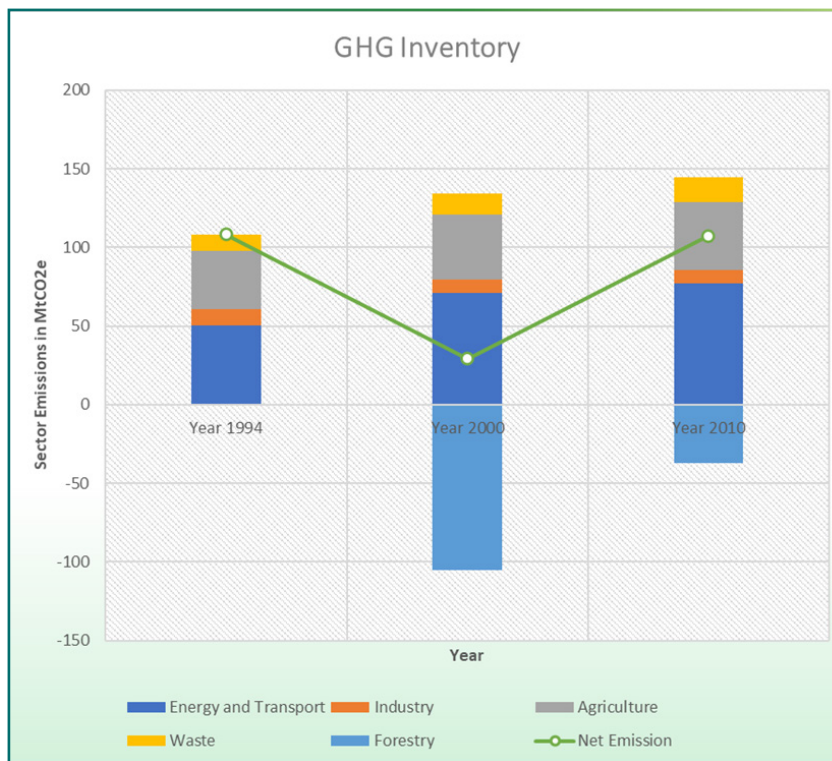
GREENHOUSE GAS INVENTORY

Source: Climate Change Commission, 1994-2010

III.
Analysis of
Indicators Values

Photo: Jilson Tiu/UNDP Philippines

A. Indicators and their reference to the CE Framework

The design of the indicators follows a phased approach, incorporating a time element and considering base capacity in data collection. In the short term, the foundational and critical indicators focus on key aspects of the circular economy (CE) at the community level, emphasizing waste reduction and improvement in waste collection and management systems.

- **Reduction of solid waste** tracks the decrease in the amount of solid waste generated by the economy, reflecting progress in waste reduction efforts.
- **Increase in waste collection** and management measures the effectiveness of waste collection and management systems, suggesting steps towards better waste handling practices.

As communities grasp the foundational aspects of CE, the medium-term phase introduces additional indicators to encourage recycling and enhance resource efficiency:

- **Increase in recycling rate** gauges the increase in the percentage of waste recycled or reused. It is a medium-term indicator as it requires the implementation of policies and practices that promote recycling and the availability of recycling infrastructure.
- **Increase in water use efficiency** assesses the efficiency with which water is used in the economy, reflecting efforts to promote water conservation and responsible water resource management. It requires the implementation of policies and practices that promote water conservation and the efficient use of water resources.
- **Increase in eco-innovation** tracks the development of new products, services, and technologies with sustainability in mind. It requires significant investments in research and development and the availability of funding and support for eco-friendly innovation.

The medium-term phase emphasizes proactive production consciousness and

innovation, encouraging widespread reuse and recycling practices among businesses of all sizes.

Finally, the long-term phase entails comprehensive indicators to address systemic changes and sustainable practices that promote CE.

• **Reduction of greenhouse gas emissions** measures the decrease in the amount of carbon dioxide and other GHGs emitted by the economy. It is a long-term indicator, as it requires the implementation of policies and practices that promote low-carbon and renewable energy sources.

• **Increase in renewable energy use** reflects the growth in the percentage of energy from renewable sources such as solar, wind, and hydropower. It requires substantial investments in renewable energy infrastructure and technologies.

• **Increase in sustainable consumption** measures the extent to which individuals and households are consuming goods and services in a sustainable manner, including reducing the use of single-use plastics, and promoting sustainable fashion and food choices. It requires significant changes in consumer behavior and the availability of sustainable products and services. One example of an indicator that could be used is "direct material consumption." DMC measures the amount of raw material used per unit of gross domestic product (GDP). It is an indicator of resource productivity and can be used to track the efficiency of resource use in the economy.

To support these general indicators, more detailed indicators are utilized, aligned with the three core elements of the CE Framework: governance and infrastructure, environment, and business and technology. **Governance,** encompassing institutions and the rule of law, along with soft and hard infrastructures, sets the stage for widespread CE adoption. The **environment** element signifies the transition towards integrating circular practices into daily behavioral processes in households and businesses. Lastly, the **business and technology** elements focus on implementing CE principles throughout the value chain, from sourcing to end-users. The strategic alignment of indicators within these elements enables the measurement of progress and facilitates evidence-based decision making, promoting a more sustainable and circular economic model.

Photo: Jilson Tiu/UNDP Philippines

Photo: Jilson Tiu/UNDP Philippines

B. Sustainability of Indicators

At the current stage, ensuring standardized capacities for data collection across all levels of governance is paramount. Within the immediate to short term (i.e. the next two years) all indicators in the foundational segments should be readily available to the public, with responsible institutions taking the lead in data collection and contribution efforts.

Given that this set of indicators serves as a baseline, it is anticipated that significant changes will occur over time. To ensure their sustainability, the Organisation for Economic Co-operation and Development (OECD) recommends subjecting indicators to ongoing assessment, openness to challenge, discussion, and modification. This adaptability is essential to reflect changing objectives, emerging issues, and improvements in measurement techniques and data availability.

They should be open to challenge, discussion, and modification to reflect changing objectives, the emergence of new issues and improvement in measurement techniques and data availability.

In fostering data ownership, there must be a collaborative effort among various actors and stakeholders involved in circular economy initiatives. Establishing a formal mechanism or process for reviewing indicators is crucial to facilitate the creation of new indicators

and the revision of existing ones. To this end, the responsibility of managing the CE Indicators is best assigned to the Interagency Committee on Environment and Natural Resources Statistics (IACENRS), chaired by the Department of Environment and Natural Resources (DENR). The IACENRS could form a Work Group initially involving DENR, the National Economic and Development Authority (NEDA), the Department of Trade and Industry (DTI), and the Philippine Statistics Authority (PSA). Considering the cross-cutting nature of CE across sectors and geographical boundaries, this Work Group should also include participants from the private sector, academicians, policy researchers, and representatives of local government units.

The tasks of the Work Group should encompass open consultation with stakeholders, including technical and subject-matter experts, data providers, target audiences for the indicators, interested groups, and the communities. Engaging in public meetings, conducting focus groups, and accepting written submissions are effective ways to gather feedback and criticism. By actively listening and responding to the review process, the Work Group can make necessary adjustments to the CE indicators list, ensuring the accuracy and relevance of the data collected.

With sustained commitment and collaboration among key stakeholders, the CE indicators can become a reliable foundation for monitoring the progress of CE practices in the Philippines, paving the way towards a more sustainable and environmentally responsible future.

Photo: Jilson Tiu/UNDP Philippines

Photo: Jilson Tiu/UNDP Philippines

C. Gaps and Issues on missing values of identified indicators

Out of the 100 indicators identified, 39 lack data, showing that circular economy in the Philippines is a work in progress in terms of MandE. It is essential to delve deeper into the reasons behind the absence of data, considering potential knowledge-based, institutional, structural, and capacity limitations.

One of the reasons for missing data could be the lack of a standardized definition for some indicators, making it challenging to collect and interpret relevant information consistently. Additionally, the complexity of the elements of CE, along with the (lack of) readiness of the system, may contribute to the absence of data. These challenges have led to fragmented, uncoordinated, and non-standardized information, hindering the comprehensive monitoring of CE initiatives. Even for indicators with available data, collection methods are unsystematic, resulting in varying time periods for reckoning. In the baseline report, priority is given to the availability of data, but the focus is on understanding why certain data are not accessible or collected regularly and systematically.

The different subcategories of the CE Framework are considered, while the data gaps and measurement issues of the indicators are analyzed therein.

Photo: Jilson Tiu/UNDP Philippines

Public Awareness and Education

This subcategory of the CE Framework consists of 15 indicators, of which 8 have data available. The remaining 7 indicators (listed in **Table 48)** currently lack data. Strengthening public awareness and education is a foundational element in the short-term strategy for promoting CE principles. Indicators within this subcategory should ideally reinforce each other, and their timely generation relies on aligning and organizing national-level institutional mechanisms. To address the gaps, a nationally organized information campaign on CE is a key strategy. By developing a standardized approach at the national level and cascading it to the local level, all missing indicators can be readily generated, fostering a more informed and engaged public in embracing CE practices.

Table 48. List of Indicators under Public Awareness and Education with No Data

No.	Indicator
9	Creation of a municipal or regional web platform for information on the circular economy
10	Level of traffic on the web platform for information on the circular economy
11	Awareness campaigns on marine litter
12	Creation of the booklet and action sheets on the circular economy
13	Number of economic actors mobilized in an innovation platform for the circular economy
14	Number of awareness- raising activities carried out for plastic use reduction
15	Actions taken to disseminate water efficiency guides

Photo: Jilson Tiu/UNDP Philippines

Capacity Building

The capacity building subcategory comprises nine indicators with some data available and eight lacking data (see **Table 49**). This immediate component of CE is crucial to translating technical concepts into actionable practices at the community, household, and firm levels. The absence of data in this subcategory is primarily due to the lack of a formal institutional mechanism to increase internal awareness of CE.

Presently, local government units (LGUs) and national government agencies (NGAs) face challenges in effectively downloading and translating the technical concepts of CE into practical, daily work-related activities. As a result, capacities for implementing CE principles and practices remain limited. To address this data gap, a phased approach becomes necessary, considering the complexities and cost implications of making all indicators available simultaneously. By adopting a strategic and sequential approach to capacity building, institutions can address absorptive capacity issues and improve their readiness to implement CE initiatives. This approach will ensure that knowledge of CE becomes more than just a technical concept but a tangible and sustainable framework for driving positive change at all levels of society.

Table 48. List of Indicators under Public Awareness and Education with No Data

No.	Indicator
25	People trained in the circular economy fields of activity
26	Good practices on public procurement identified and disseminated
27	Policy process for new circular laws and regulations
28	Study of the establishment of waste disposal charges or other types of financial instruments
29	Protocols developed to incentivize reuse of components, recovered or recycled materials, development and/or use of material passports, promotion of the use of "empty" built space
30	Directives adopted to improve water efficiency and water reuse
31	Directives adopted for research and innovation on the circular economy
32	Number of staff trained on the circular economy

Photo: Jilson Tiu/UNDP Philippines

Greening the Economy

The greening the economy category consists of 14 indicators, with data available only for 8 indicators (see **Table 50**). The gaps in this subcategory are primarily knowledge-based, as data on waste has been collected since the 2000s. The challenge is in the absence of processes to segregate and organize information on waste. This knowledge gap is easily addressed.

Apart from this, another issue is how local governments provide knowledge on CE to businesses operating in their areas. LGUs can enhancing data collection through measures like tagging business permits that support CE activities. By doing so, LGUs can help improve the accessibility and dissemination of relevant information to businesses, promoting a greener and more sustainable economy.

Overall, addressing the knowledge-based data gaps in the greening the economy category will result in a more comprehensive understanding of waste management and sustainable practices. It will empower policymakers, businesses, and communities with valuable insights to drive meaningful change towards a greener and more environmentally responsible economy.

Table 50. List of Indicators related to Greening the Economy with No Data

No.	Indicator
39	Number of waste collection devices installed
40	Separate waste collection
41	Construction waste
42	Life cycle and cost-benefit studies in waste management
43	Percentage of recycled content used in materials
44	Amount invested in circular economy projects
45	Eco-designed products and services included in the regional catalogue
46	Number of restaurants with the ZERO plastic label

Sustainable Consumption and Production

The subcategory of SCP is composed of 37 indicators, with data available for only 11 indicators (see **Table 51**). Surprisingly, several indicators in this segment have no data despite involving large-scale infrastructure such as power, water, and energy. This lack of data is primarily a knowledge gap in how waste is measured and analyzed in the context of CE practices. A comprehensive understanding of which waste materials can be effectively reused and recycled is needed to fill these indicators. This knowledge gap highlights the importance of enhancing waste measurement and analysis methodologies to support sustainable consumption and production practices.

Other missing data in this subcategory are for indicators closely linked to business processes and incentive mechanisms. This data cannot be generated without proactive efforts from local governments to incentivize and prioritize CE-related projects in permit applications. Similarly, the lack of CE context in national government procurement mechanisms indicates a foundational gap in awareness and the need to translate existing policies into practical monitoring mechanisms for CE practices.

Addressing knowledge gaps in sustainable consumption and production indicators can help the Philippines make significant strides towards a more circular and sustainable economy. Closing these data gaps will enable informed decision-making, effective policy implementation, and the successful integration of CE principles into various sectors and industries..

Table 51. List of Indicators related to Sustainable Consumption and Production with No

No.	Indicator
72	Public procurement contracts with a circular economy dimension
73	Recovery rate of construction waste as material
74	Recycling rate of construction waste
75	Number of waste disposal sites with a reuse area
76	Quantity of bio-waste managed by on-site composting
77	Waste recovery through an Inclusive Recycling Program
78	Ratio of products repaired to new products sold (including reused vs. new schoolbooks)
79	Total number of approved water reuse projects / year
80	Use of packaging waste articulated to extended producer responsibility
81	Reduced waste through green public procurement
82	Quantity of bio-waste managed by on-site composting

Photo: Jilson Tiu/UNDP Philippines

Closing the Loop

The subcategory of closing the loop consists of 18 indicators, with only 5 having data gaps (see **Table 52**). As the culmination of circular economy practices, the closing the loop phase requires a more long-term approach for data collection and integration. Some indicators may need significant adjustments and sophisticated technical knowledge before they can be regularly generated. The absence of data for certain indicators reflects the need for foundational components in governance to become part of the regular data generation processes. As CE practices become more embedded in national and local

policies, there will be an increased capacity to generate and track data for these indicators over time.

To successfully close the loop and achieve a fully circular economy, it is essential to continuously improve data collection methods and enhance the knowledge and skills required for sophisticated data analysis. As CE principles become mainstream and institutionalized, these indicators will help in assessing progress, identifying areas for improvement, and informing evidence-based decision-making.

Table 52. List of Indicators related to Closing the Loop with No Data

No.	Indicator
96	Products/services covered by circularity criteria in the public procurement
97	Level of implementation of Biowaste strategy
98	Recycling of biowaste per capita
99	Waste reduction economic savings
100	Construction works with circular design (percent)

Photo: Jilson Tiu/UNDP Philippines

D. Proposed solutions and alternative data sources

To address the data gaps and expedite progress in monitoring CE practices in the Philippines, a collaborative effort among stakeholders is crucial. By pooling existing resources and knowledge on current CE-related activities and processes, valuable data can be generated to fill the information gaps. This encourages institutions and organizations to share their insights and experiences, leading to a more comprehensive understanding of CE practices.

Institutional integration is also essential to streamline efforts and maximize the impact of CE initiatives. Several environment-related laws have established different mechanisms involving the same government agencies, which can create coordination challenges. Reviewing and aligning these can help agencies work cohesively and coherently to collect and report data.

The Philippine Development Plan 2023–2028, with its focus on climate and ecosystem resilience, can serve as a foundation for incorporating CE principles into national strategies. Collaboration among key agencies, such as the National Disaster Risk Reduction and Management Council and the Climate Change Commission, can integrate CE objectives into existing initiatives. By mainstreaming CE in national policies, the country can further strengthen resilience against climate and ecosystem hazards while promoting sustainable practices.

To create a unified approach, the government should hold a national CE summit, inviting different stakeholders from the public and private sectors to collaborate and craft a shared CE framework. A CE framework should align environmental and climate change initiatives towards CE objectives. Through open consultations, stakeholders can contribute insights, resulting in a collective vision for national CE implementation. This approach also ensures CE practices are owned and supported by diverse sectors.

Photo: Jilson Tiu/UNDP Philippines

Private Initiative

In addition to government-led efforts, private initiatives play a significant role in advancing circular economy practices. One example is Circulo, a circular design initiative that focuses on awareness, design thinking workshops, and ecosystem building. It began with a series of workshops in Cebu and Manila in 2019, gathering like-minded organizations committed to sustainable values. From the 89 attendees, 24 CE initiatives were mapped. These projects primarily focus on design, with 75 percent utilizing waste as a resource and 42 percent coming from the food and beverage industry. Circulo has since expanded its reach, mapping 285 initiatives in 2021 covering sectors such as fashion, food waste, plastics, and electronic wastes.

Notably, the food and beverage sector, 30 percent of which are small and medium enterprises, has emerged as a key implementer of CE initiatives. Circulo's active efforts showcase the potential of private sector-led initiatives in generating data and driving CE practices.

By encouraging and supporting more private sector-led initiatives, the Philippines can enhance data collection efforts and promote a culture of CE practices across various industries. Through continuous assessment, ongoing dialogue, and innovative approaches to data collection, the insights for policy formulation and decision making. With sustained commitment and collaboration among key stakeholders, the indicators can become a reliable foundation for monitoring the progress of CE practices in the Philippines, paving the way towards a more sustainable and environmentally responsible future.

IV.

Summative Assessment of Current State of Circular Economy in the Philippines

Photo: Jilson Tiu/UNDP Philippines

A. In response to National Context

Currently, the circular economy in the country is at a foundational level. Although various circular economy-related laws and mechanisms have been established since the 1990s, their impact on consumption and production processes remains limited. This can be attributed to the technical nature of circular economy (CE) concepts, which require a more detailed and practical understanding at the day-to-day level to drive behavioral change. Similar to the challenges in keeping people out of danger zones during natural disasters, achieving a paradigm shift towards CE practices necessitates significant efforts to change mindsets and behaviors. While waste segregation is a critical outcome of the Solid Waste Management Act of 2000, its implementation still presents challenges even within the National Capital Region's cities.

B. In response to NPOA-ML

Photo: Jilson Tiu/UNDP Philippines

The identified CE indicators related to the National Plan of Action for the Prevention, Reduction, and Management of Marine Litter (NPOA-ML) are listed in Table 53. NPOA-ML is focused on policies governing sustainable consumption and production (SCP) and solid waste management. However, many of the identified indicators (e.g. illegal dumping, quantities of waste sent to landfills, solid waste generated) pertain to solid waste management. Indicators specifically addressing SCP practices are lacking.

Notably, there are indicators related to public awareness and education, as well as capacity building, that recognize the presence of publications on CE (e.g. PAP4SCP). However, the absence of concrete actions and quantifiable data on SCP despite having policies and action plans suggests that CE implementation in the Philippines is still in its foundational stages. Existing policies and plans have yet to demonstrate a significant impact on SCP practices, highlighting the need for further effort to convert CE principles into practical application.

As the nation moves forward, there is a need to bridge the gap between policy intentions and on-the-ground implementation, emphasizing the importance of education and capacity-building initiatives to drive CE practices at the community and individual levels. By fostering a deeper understanding of CE benefits and demonstrating how it sustains income generation and environmental stewardship, the Philippines can accelerate its progress towards a more advanced and sustainable circular economy. Continuous monitoring and evaluation of CE indicators will be vital in tracking progress, identifying challenges, and informing strategic decision-making.

Photo: Jilson Tiu/UNDP Philippines

Table 53. List of Indicators related to NPOA-ML

No.	Indicator
33	Illegal Dumping
34	Quantities of waste sent to landfill
57	Solid waste generated
60	Tons of waste avoided
58	Total amount of waste produced by commerce and industry
59	Total amount of waste produced by households
65	Recovery of fisheries waste
61	Total waste treatment: Landfill
62	Total waste treatment: Recycling
67	Recycling rate of plastic packaging waste
68	Percentage of recyclable plastic packaging placed on the market
90	Evolution of the tonnage of plastics recycled in the city
91	Evolution of the tonnage of plastics used in the city
92	Adequate environmental management of plastic packaging waste

Photo: Jilson Tiu/UNDP Philippines

C. In response to EPR

The current state of CE in response to Extended Producer Responsibility (EPR) is still in its infancy, mainly because the implementing rules and regulations of the EPR Act of 2022 were issued only in January 2023. Gathering information on EPR-related indicators proved challenging, as enterprises were hesitant to disclose the amount of plastic packaging they used. Only two indicators, "development of new laws that discourage linear practices" and "adequate environmental management of plastic packaging waste," were directly related to the EPR. As the values supporting these indicators are basically policies, this suggests that EPR in the Philippines is still in its foundational stage. As the EPR Law takes full effect and becomes more established, additional indicators that support SCP and closing the loop, may emerge.

The successful implementation of the EPR Law has the potential to drive significant changes in the management of plastic packaging waste, enhance resource efficiency, and promote circular practices among producers, consumers, and other stakeholders. Monitoring the progress and impact of EPR implementation will be essential to understanding its effectiveness in driving CE practices and achieving sustainable development goals in the Philippines. As the EPR framework matures and awareness increases, more comprehensive data on plastic packaging waste and its management may become available, paving the way for a more robust evaluation of the circular economy's advancement in the country.

V.

Conclusion and Recommendations

A. Institutionalization of the CE Indicators

In 2020, the Asian Development Bank (ADB) published a report on the circular economy in the Philippines[1]. It estimated the country's degree of circularity to be below the global average of 8.6 percent, as estimated by the *Circularity Gap Report 2020*.[2] However, it is essential to note that it is still largely an estimate due to the lack of comprehensive data and formal sources to provide a broader assessment of circularity in the country.

The Circularity Gap Report is a highly technical analysis focusing on key data points such as material extraction, stock build-up, processing, and recycling to estimate circularity levels. It classifies the Philippines as a "Build" country, given its lower middle-income status, ongoing infrastructure requirements, and a significant agricultural sector. The country's robust economic growth, averaging about 6.5 percent, has resulted in an expansion of primary resource extraction, stock-build up due to intensive public infrastructure projects, and challenges in waste management for many local governments.

To align with the Global Circularity Gap and have a more accurate estimate of circularity, specific data needs to be developed. The ADB report presented recommendations that align with the framework developed for this baseline report. In the short term, some of the recommendations, such as updating the Solid Waste Management Act and supporting local government units (LGUs) in waste management, are already being implemented. The report also proposed considering the development of an operational CE framework for the Philippines in the medium term, acknowledging the primary challenge of data collection. It further suggested exploring the use of the Organisation for Economic Co-operation and Development (OECD) framework, which was extensively used in the development of this report.

A.1 Data Collection

Challenges in data collection arise from the lack of a central agency responsible for managing data collection efforts. While the Department of Environment and Natural Resources (DENR) is the primary partner for circular economy in this report, the requirements for a comprehensive CE assessment go beyond the capacity of a single agency. The government needs to expedite the development of a national CE framework and identify necessary institutional arrangements. Currently, data collection is time-consuming and costly due to the absence of a unified ownership structure, leading to dispersed responsibilities among various agencies. At the local government level, data collection is limited mainly to nationally mandated programs. Hence, there is a need to shift the focus towards developing grassroots-level information about CE and formalizing waste management businesses at the local level.

As recommended by the Philippine Statistics Authority (PSA), the Interagency Committee on Environment and Natural Resources Statistics (IACENRS), chaired by DENR, should be designated as the central body for

managing data collection on CE indicators.

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1 Schroeder, op. cit.

2 De Wit, M., et. al. (2020). The Circularity Gap Report 2020. Circle Economy. https://www.circularity-gap.world/2020

B. Next Steps

Developing a baseline without a nationally approved framework is a challenging task that requires standardization and alignment. It is essential to recognize that the data collected at the national level may not be directly comparable annually due to variations in reckoning times and irregular report publications. While the baseline report provides valuable insights into the state of CE in the Philippines, ensuring consistent data availability necessitates the following proposed steps:

a. Develop a comprehensive national CE framework

The government has developed several frameworks related to CE, but there is a need for an overarching framework to align objectives cohesively. Building upon the framework used in this baseline report, the government should enhance and adjust it to ensure consistency with the Philippine Development Plan and other policies and legislation that support CE. The framework should identify institutional duplications and adopt a whole-of-government approach to achieve climate, environmental, and social commitments through CE practices.

b. Develop a statistical framework for CE

To ensure the measurability of CE in the country, national and locally aligned metrics must support the national CE framework. Like other government initiatives, statistical frameworks for implementation and corresponding databases need to be developed. Enhancing the existing PSA mechanisms to align with CE objectives will facilitate the identification of data owners and managers within the statistical framework. This will enable more effective and comprehensive data collection efforts across various sectors and agencies to measure CE in the country.

VI.
Annexes

A. List of Indicators

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observa-tion (proposed)	Definition
1	Publications on the circular economy	Governance and Infrastructure	Public Awareness and Education	Number	Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP) by NEDA	City	Knowledge- and expertise-related activities/ documents
2	Actions to divulge a long-term RandI agenda for speeding up the circular economy in the country	Governance and Infrastructure	Public Awareness and Education	N/A	Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP) by NEDA	National	Steps or measures being done to disseminate documents on Circular Economy
3	Number of companies that publish sustainability reports	Governance and Infrastructure	Public Awareness and Education	Number	90.77percent of publicly listed companies (PLCs) in the Philippines filed sustainability reports for 2019 and 93.3percent submitted sustainability reports for 2020 (as of September 2021).	National	Sustainability reports provide transparency on measures taken by companies on sustainable development.

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
4	No. of partnerships with municipalities/ distribution	Governance and Infrastructure	Public Awareness and Education	Number	The DOST was mandated to execute its programs and initiatives for technology promotion and transfer through the Provincial Science and Technology Offices (PSTOs).	City Firm	Partnerships involving national RandD, e.g., in design, to analyze products with a view to boosting manufacturing innovation Municipalities or urban waste management systems: collaboration to develop guidelines, providing and promoting a network of infrastructures for developing local actions Distribution and EPR companies: collaboration to provide and promote a network of infrastructures for developing local actions

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
5	Mainstreaming education for sustainable development into the curriculum	Governance and Infrastructure	Public Awareness and Education	N/A	The National Environmental Awareness and Education Act of 2008 (Republic Act No. 9512), establishes the policy framework for integrating environmental consciousness into the educational system of the Philippines.	National	Actions to introduce CE in compulsory education
6	Number of experimental projects initiated	Governance and Infrastructure	Public Awareness and Education	Number	Based on the DOST list of RandD projects on the environment, there are 22 identified projects from 2019 to 2023 which are related to circular economy.	National	Includes any research and development or pilot demonstration projects
7	Number of awareness-raising activities for waste prevention carried out	Governance and Infrastructure	Public Awareness and Education	Number or list	The household survey used two proxy variables that could determine the success of awareness-raising activities on waste prevention.	National City	Information, education, and communication (IEC) campaigns on waste prevention

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
8	Awareness campaigns to reduce food waste	Governance and Infrastructure	Public Awareness and Education	Number	Households' that practice food waste reduction	City/ barangay	Information, education, and communication campaigns on reduction of food waste
9	Creation of a municipal or regional web platform for information on the circular economy	Governance and Infrastructure	Public Awareness and Education	YES/NO	No Data	National City	An effective circular economy approach requires an integrated vision of urban systems and consolidated knowledge of material flows. This includes the use of a web platform to promulgate information on circular economy.
10	Level of traffic on the web platform for information on the circular economy	Governance and Infrastructure	Public Awareness and Education	Number	No Data	National City	Number of visitors in the web platform

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
11	Awareness campaigns on marine litter	Governance and Infrastructure	Public Awareness and Education	Number or list	No Data	National	Information, education, and communication (IEC) campaigns on marine litter
12	Creation of the booklet and action sheets on the circular economy	Governance and Infrastructure	Public Awareness and Education	YES/NO	No Data	City	Information, education, and communication campaigns on circular economy
13	Number of economic actors mobilized in an innovation platform for the circular economy	Governance and Infrastructure	Public Awareness and Education	Number	No Data	National	Entities or group of entities with agendas towards circular economy
14	Number of awareness- raising activities carried out for plastic use reduction	Governance and Infrastructure	Public Awareness and Education	Number	No Data	National City	Information, education, and communication campaigns on plastic use reduction
15	Actions taken to disseminate water efficiency guides	Governance and Infrastructure	Public Awareness and Education	Number	No Data	Number	Information, education, and communication campaigns on water efficiency

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
16	Development of new laws and regulations that discourage linear practices	Governance and Infrastructure	Capacity building	N/A	Congress has proposed 114 house bills from 2010-2022 aimed at prohibiting linear practices in the country.	National City	Related to increasing motivation for the circular economy (e.g., resource tax, public circular procurement, resource passport)
17	Circular economy vision documents	Governance and Infrastructure	Capacity Building	N/A	Philippine Green Procurement Roadmap: Advancing GPP until 2022 and beyond published in 2017 by the Government Procurement Policy Board (GPPB) Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP) of NEDA Strategic Investment Priority Plan (SIPP) of the Board of Investments (BOI)	National	Any policies or documents that initiate circular economy

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
18	Public procurement procedures including ecological and circular criteria	Governance and Infrastructure	Capacity building	Number	Priority Product Groups with GPP Technical Specifications	National	Inclusion of circularity criteria in the contracting documents of public administrations for certain goods and services
19	Financial assistance granted to companies related to the circular economy	Governance and Infrastructure	Capacity Building	Number or list	Philippine Green, Social, and Sustainability (GSS) Bonds Issuances (2019-Present)	National	In the Philippine context, these are green bonds issued by companies to support sustainable operations.
20	Institutions willing to collaborate on a circular economy initiative	Governance and Infrastructure	Capacity Building	Number or list	The Commission on Higher Education shared a list of 20 Higher Education Institutions who received funding for their research projects related to circular economy.	National	Institutions funded by the government to conduct research on circular economy initiatives

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
21	Circular economy researchers	Governance and Infrastructure	Capacity Building	Number or list	This report was able to identify 30 publications with Philippines as the study site. These publications have a total of 120 authors, including non-Filipino collaborators, with an average of 4 authors per publication.	National	Entities that conduct research relevant to the circular economy
22	Training courses on the circular economy	Governance and Infrastructure	Capacity building	Number or list	The junkshops interviewed reported 9 associations or groups to which they belong.	National	The training courses on circular economy refer to a number of training courses that have a component on circular economy.
23	Community-driven associations	Governance and Infrastructure	Capacity Building	Number	A total of 20 qualifications having a green competency component that can be achieved through 20 CE training courses.	National	Community-driven associations that promote CE

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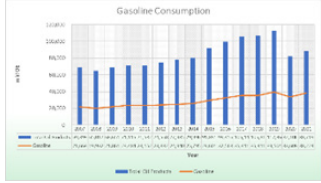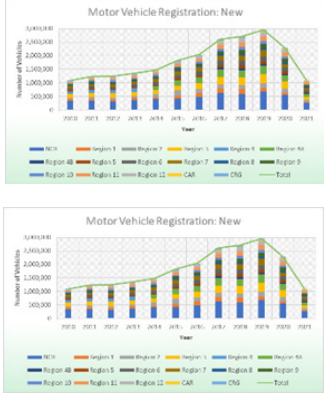| No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
24	Citizen participation in an Inclusive Recycling Program	Governance and Infrastructure	Capacity Building	N/A	The household survey attempts to measure this using two proxy variables that determine citizen participation in waste management. The data was collected through household survey conducted among UNDP ACE Cities.	National City	Entities that conduct research relevant to the circular economy
25	People trained in the circular economy fields of activity	Governance and Infrastructure	Capacity Building	Number	No Data	City Firm	TPeople who have attended formal training on circular economy
26	Good practices on public procurement identified and disseminated	Governance and Infrastructure	Capacity building	Number	No Data	National	No. of good practices identified and disseminated
27	Policy process for new circular laws and regulations	Governance and Infrastructure	Capacity building	N/A	No Data	National	Related to developing circular and changing 'linear' regulations
28	Study of the establishment of waste disposal charges or other types of financial instruments	Governance and Infrastructure	Capacity Building	NA	No Data	National	-

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29	Protocols developed to incentivize reuse of components, recovered or recycled materials, development and/or use of material passports, promotion of the use of "empty" built space	Governance and Infrastructure	Capacity Building	Number	No Data	National	-
30	Directives adopted to improve water efficiency and water reuse	Governance and Infrastructure	Capacity Building	Number	No Data	National	-
31	Directives adopted for research and innovation on the circular economy	Governance and Infrastructure	Capacity Building	N/A	No Data	National	Pilot studies on circular economy
32	Number of staff trained on the circular economy	Governance and Infrastructure	Capacity Building	Number	No Data	National	People with formal training on CE
33	Illegal dumping	Environment	Greening the Economy	N/A	Number of Illegal Dumpsites and Sanitary Landfill in the Philippines from 2012 to 2021		

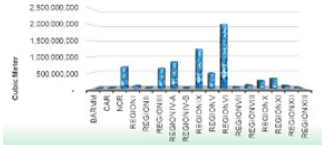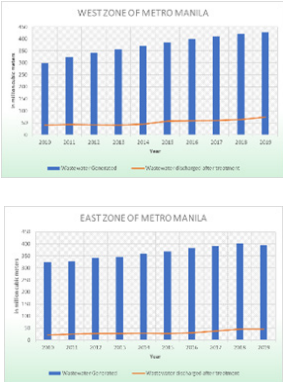| No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
34	Quantities of waste sent to landfill	Environment	Greening the Economy	kg/day or tons/day	As of 2022, the amount of actual waste received by sanitary landfill facilities (SLFs) nationwide is 20,537,709.97 kg per day.	National City	Entities that conduct research relevant to the circular economy
35	Food waste	Environment	Greening the Economy	kg/day	Considering that the country has a total of 26,393,906 households in 2020, the country has approximately 2,000 tons of food waste per day.	City	Waste generated in the production, distribution, and consumption of food (in mass unit)
36	Mapping of existing sites for reuse and recycling and needs	Environment	Greening the Economy	YES/NO	Identified Junkshops, ACE Cities ACE City / Number of Junkshops: Cotabato City 18, Caloocan City 3, Manila City 65, Pasig City 36, Quezon City 25, TOTAL 147	National City Junkshops	Locations of MRFs per barangay
37	Local composting plants created	Environment	Greening the Economy	Number	This report only documented Pasig City with composting facilities.	City/ barangay	Sites that process waste through composting

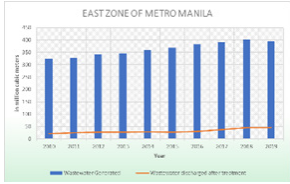| No.	Indicator	Elements	Category	Unit of measure	Data (Note: High-lighted in gray – NO DATA)	Unit of observa-tion (pro-posed)	Definition
38	Circular innovation projects	Environment	Greening the Economy	Number	There is a total of 25 CE innovation projects documented by this report.	National	Projects initiated or funded by the government pertaining to circular economy
39	Number of waste collection devices installed	Environment	Greening the Economy	N/A	No Data	City	Equipment for waste collection may include dumpsters, carts, compactors, trucks, etc.
40	Separate waste collection	Environment	Greening the Economy	percent	No Data	City	Segregated waste collection
41	Construction waste	Environment	Greening the Economy	kg/day	No Data	National City	The indicator is the ratio of construction and demolition waste, which is prepared for re-use, recycled or subject to material recovery, including through backfilling operations, divided by the construction and demolition waste treated as defined in Regulation (EC) No 2150/2002 on waste statistics.

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observa-tion (proposed)	Definition
42	Life cycle and cost-benefit studies in waste management	Environment	Greening the Economy	Number	No Data	National	-
43	Percentage of recycled content used in materials	Environment	Greening the Economy	Percentage	No Data	National	Percentage of recycled (secondary) materials used in products
44	Amount invested in circular economy projects	Environment	Greening the Economy	N/A	No Data	National	Amount invested in circular economy projects
45	Eco-designed products and services included in the regional catalogue	Environment	Greening the Economy	Number	No Data	National	-
46	Number of restaurants with the ZERO plastic label	Environment	Greening the Economy	Number	No Data	City/ barangay	List of restaurants with zero plastic label
47	Energy from renewable sources	Business and Technology	Sustainable Consumption and Production	MW	As of 2023, there are 160 renewable energy plants which are composed of biomass, geothermal, hydropower, solar, and wind plants, based on the eligible RE Power Plants list of the DOE.	National	Renewable energy projects in the Philippines

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48	MW installed from renewable sources	Business and Technology	Sustainable Consumption and Production	MW	The total installed capacity from renewable energy in 2003 is recorded at 4,799 MW and increased to 7,914 MW in 2021.	National	Amount of energy produced through renewable resources
49	Amount of renewable electricity available to each household	Business and Technology	Sustainable Consumption and Production		Household solar power use		
50	Energy consumption (final)	Business and Technology	Sustainable Consumption and Production	toe/ inhabitant	Final Energy Consumption (2007-2021)	National	Total energy consumption in the Philippines
51	Diesel consumption (transport sector)	Business and Technology	Sustainable Consumption and Production	metric ton of oil equivalent (MTOE)	metric ton of oil equivalent (MTOE)	National	Amount of diesel consumed by the transport sector

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
52	Gasoline consumption	Business and Technology	Sustainable Consumption and Production	metric ton of oil equivalent (MTOE)	Gasoline Consumption (2007-2021)	National	Amount of gasoline consumed by the transport sector
53	Use of private vehicle in cities	Business and Technology	Sustainable Consumption and Production	percent	Motor Vehicle Registration (2010-2021)	City	Number of private vehicles in the city

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
54	Car-sharing	Business and Technology	Sustainable Consumption and Production	percent	Households that have rented a car or carpooled in the past year	National	National Frequency of car-sharing by journey type and age The objective is to reduce consumption of fossil fuels (petrol and diesel) and materials (vehicle manufacturing) linked to private transport. Car-sharing favours use over possession, and this practice has been able to develop thanks to the establishment of dedicated platforms by economic players.

The embedded data table reads:

ACE City	Total (n)	HHs (n)	% of HHs	Rented a car	Carpool
Overall	279	53	19.0	7.9	13.3
Caloocan	44	9	20.5	-	20.5
Cotabato	62	8	12.9	12.9	1.6
Manila	28	6	21.4	14.3	14.3
Pasig	89	15	16.9	6.7	13.5
Quezon City	56	15	26.8	7.1	19.6

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
55	Water consumption	Business and Technology	Sustainable Consumption and Production	million m3/ year; NA	Average Water Consumption Per Region (2013-Present)	City	Amount of water consumed in the country
56	Percentage of urban wastewater treated / total wastewater generated	Business and Technology	Sustainable Consumption and Production	percent	Generation and Management of Wastewater (2010-2019)	National	

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
57	Solid waste generated	Business and Technology	Sustainable Consumption and Production	kg/day	Solid Waste Generated	City	It refers to total segregated waste collected. This includes biodegradable wastes, recyclable wastes, special wastes, and residual wastes.
58	Total amount of waste produced by commerce and industry	Business and Technology	Sustainable Consumption and Production	kg/day	Sources of municipal waste in the Philippines: • Residential -56.7percent • Institutional - 12.1percent • Commercial (gen merchandise stores and restaurants) - 27.1percent • Industrial - 4.1percent	National City	Waste collected from commercial and industrial establishments in the LGU. This includes biodegradable wastes, recyclable wastes, special wastes, and residual wastes.
59	Total amount of waste produced by households	Business and Technology	Sustainable Consumption and Production	kg/day	Household waste generated in the past week	National City	Waste collected from households in the LGU. This includes biodegradable wastes, recyclable wastes, special wastes, and residual wastes.

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
60	Tons of waste avoided	Business and Technology	Sustainable Consumption and Production	kg/day	As of 2020, the amount of waste diverted in the country per day is 3,222,313.67 kg out of 6,910,521.81 kg of total waste per day. Based on the total amount of waste diverted, the diversion rate is 46.6percent. The national waste diversion target is 68.7percent.	City	Stated as waste diversion per day in city solid waste profiles
61	Total waste treatment: Landfill	Business and Technology	Sustainable Consumption and Production	kg/day	A total of 20,413.23 tons/day of waste is treated in sanitary landfills as of January 4, 2023.	National City/ barangay	Amount of waste treated at the landfill
62	Total waste treatment: Recycling	Business and Technology	Sustainable Consumption and Production	kg/day	261.43 tons of waste are recycled by 203 out of 1,432 LGUs as of 2020. Only 12percent of the LGUs reported their recycling rate.	City/ barangay	Amount of waste recycled at the barangay MRFs
63	Household waste recycled	Business and Technology	Sustainable Consumption and Production	kg/day	Household waste recycled in the past week	National City	Recycled wastes from households
64	Non household waste recycled	Business and Technology	Sustainable Consumption and Production	kg/day	There was only one junkshop who was able to estimate the number of wastes collected from non-households, and only for one item. Junkshops were either aware that items came from households or mixed (both non-household and households).	City	Recycled wastes from commercial and industrial establishments

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
65	Recovery of fisheries waste	Business and Technology	Sustainable Consumption and Production	percent	Circular economy in fisheries: How is fish market waste managed in the Philippines published by the De La Salle University in 2022	National	Fisheries waste that may be reused by stakeholders as opposed to disposal
66	Number of collection points for reuse of materials	Business and Technology	Sustainable Consumption and Production	Number	Based on the COA 2023 Performance Audit Report on Solid Waste Management, the country increased the number of established MRFs from 6,957 in 2010 to 11,637 in 2021.	National	-
67	Recycling rate of plastic packaging waste	Business and Technology	Sustainable Consumption and Production	percent	As of 2019, 2,150 thousand tonnes of plastic are consumed annually.	National	-
68	Percentage of recyclable plastic packaging placed on the market	Business and Technology	Sustainable Consumption and Production	percent	The amount of recyclable plastic packaging in the market is as follows:	National	

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69	New circular products	Business and Technology	Sustainable Consumption and Production	N/A	There were 17 circular products identified. The types of products include upcycled furniture, bags, wallets, and carriers, clothing and towels, housing materials, stationery, and other household goods.	National	Circular products are those that operate within the circular economy model i.e., those products that have reduced or completely no need for virgin resources and are designed with the end of their life in mind.
70	Number of companies or products with tax benefits to incentivize the circular economy	Business and Technology	Sustainable Consumption and Production	Number	Junkshops that received incentives in the past year	National City	CE companies that benefit from tax benefits
71	Ecolabel holders	Business and Technology	Sustainable Consumption and Production	Number	There were 30 products with ecolabels.	Firm	Companies that were issued ecolabels because of their contributions to sustainable development

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
72	Public procurement contracts with a circular economy dimension	Business and Technology	Sustainable Consumption and Production	Number	No Data	National City	The indicator measures the share of public procurement procedures above the EU thresholds (in number and value), which include environmental elements.
73	Recovery rate of construction waste as material	Business and Technology	Sustainable Consumption and Production	percent	No Data	National	Recovery and reuse of construction wastes
74	Recycling rate of construction waste	Business and Technology	Sustainable Consumption and Production	percent	No Data	National	-
75	Number of waste disposal sites with a reuse area	Business and Technology	Sustainable Consumption and Production	Number	No Data	National	Disposal sites with areas dedicated for reuse of materials
76	Quantity of bio-waste managed by on-site composting	Business and Technology	Sustainable Consumption and Production	kg/day	No Data	City/ barangay	Amount of biodegradable waste composted
76	Quantity of bio-waste managed by on-site composting	Business and Technology	Sustainable Consumption and Production	kg/day	No Data	City/ barangay	Amount of biodegradable waste composted

No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
78	Ratio of products repaired to new products sold (including reused vs. new schoolbooks)	Business and Technology	Sustainable Consumption and Production	Ratio	No Data	National	-
79	Total number of approved water reuse projects / year	Business and Technology	Sustainable Consumption and Production	number	No Data	National	-
80	Use of packaging waste articulated to extended producer responsibility	Business and Technology	Sustainable Consumption and Production	NA	No Data	National	-
81	Reduced waste through green public procurement	Business and Technology	Sustainable Consumption and Production	percent total	No Data	National City	Waste reduction because of agreements or actions taken during procurement
82	Quantity of bio-waste managed by on-site composting	Business and Technology	Sustainable Consumption and Production	percent total biowaste	No Data	National	

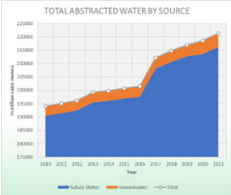| No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
83	Investment in RandD over the GDP	Business and Technology	Closing the Loop	percent	The country's gross expenditure on RandD (GERD) stands at 0.32percent (2018 Survey on RandD Expenditures and Human Resources in Government, Higher Education, and Non-Profit Sectors published by DOST)	National	Percentage of investment in RandD over the GDP
84	Weight of the green economy in GDP	Business and Technology	Closing the Loop	N/A	The contribution of the green sub-sector was estimated at an average Gross Value Added (GVA) of PhP 2.6 trillion between 2016 and 2030 (Green Skills for Green Jobs: Preparing the Filipino Workforce for the Green Economy-Labor Market Report of TESDA)	National	Percentage of green economy over the GDP

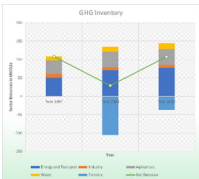| No.	Indicator	Elements	Category	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
85	Number of green jobs created and secured	Business and Technology	Closing the Loop	N/A	Out of the 7 million workers, majority (4.3 million) are employed in the service sector (2021 Greening the Philippine Employment Projections Model: New Estimates and Policy Options of PIDS)	National City	Green jobs may help improve energy and raw materials efficiency, limit GHG emissions, minimize waste production, protect and restore ecosystems, and support climate change adaptation.
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86	Number of places devoted to repair	Business and Technology	Closing the Loop	Number	The PSA reported that there is an increase of 5,784 establishments involved in repair from 4,072 establishments in 2010 to 9,856 in 2020.	National City	Items for reuse may be repaired. Repair centers preferably per barangay.

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87	Objects collected and diverted for reuse	Business and Technology	Closing the Loop	kg/day	Junkshops that collect items for reuse in the past week	City	Reuse refers to using objects again without treatment.
88	Objects recovered in reuse centres	Business and Technology	Closing the Loop	kg/day		City	Reuse refers to using objects again without treatment.
89	Objects redirected/ repaired from recycling centres	Business and Technology	Closing the Loop	kg/day	Objects collected by junkshops for repair	City	Items for reuse may be repaired
90	Evolution of the tonnage of plastics used in the city	Business and Technology	Closing the Loop	kg/day	A total of 1.1 million TPY of the key resins (PET, HDPE, LDPE/LLDPE, and PP) were consumed in the Philippines (2021 World Bank market assessment of plastics)	Firm	Amount of plastic used over a given period of time

No.	Indicator	Elements	Catego-ry	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
91	Evolution of the tonnage of plastics recycled in the city	Business and Technology	Closing the Loop	kg/day	The Philippines recycled about 28percent of the four (4) key plastic resins consumed in the country in 2019, namely Polyethylene terephthalate (PET), High-Density Polyethylene (HDPE), Low-Density Polyethylene/Linear Low-Density Polyethylene (LDPE/LLDPE), and Polypropylene (PP). This translates to a total of 292,000 tonnes per year (TPY).	Firm	The amount of plastic waste recycled over a given period of time
92	Adequate environmental management of plastic packaging waste	Business and Technology	Closing the Loop	Number	IRR of EPR Law of 2022 has a specific provision on the National Framework for Extended Producer Responsibility on Plastic Packaging Waste (Section 11)	NationalCity	Measures taken to improve management of plastic packaging waste
93	Water extraction, direct	Business and Technology	Closing the Loop	million m3/year (MCM); NA	Total Abstracted Water by Source, Direct	National	Amount of water extracted

No.	Indicator	Elements	Catego-ry	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
94	GHG Emissions	Business and Technology	Closing the Loop	Metric Tons per year	The energy and transport sector has the largest GHG emission with an average of 66.1743 Mt CO2e from 1994 to 2010. It was followed by the agriculture sector (ave. 40.3883 Mt CO2e), waste (ave.13.284 Mt CO2e), and industrial processes and product use (ave.9.1923 Mt CO2e).	National	Estimated amount of greenhouse gas emissions in the country
95	Greenhouse gas reduction	Business and Technology	Closing the Loop	Metric Tons per year	Philippine Greenhouse Gas Inventory (1994-2010)	National	Measures taken to reduce greenhouse gas emissions
96	Products/ services covered by circularity criteria in the public procurement	Business and Technology	Closing the Loop	Number	No Data	National	No. of products/services covered by circularity criteria
97	Level of implementation of Biowaste strategy	Business and Technology	Closing the Loop	NA	No Data	National	Implementation of any policies on biowaste handling, treatment, and disposal

No.	Indicator	Elements	Catego-ry	Unit of measure	Data (Note: Highlighted in gray – NO DATA)	Unit of observation (proposed)	Definition
97	Level of implementation of Biowaste strategy	Business and Technology	Closing the Loop	NA	No Data	National	Implementation of any policies on biowaste handling, treatment, and disposal
98	Recycling of biowaste per capita	Business and Technology	Closing the Loop	Number	No Data	National City	Ratio of composted/methanised municipal waste (in mass unit) over the total population (in number). The ratio is expressed in kg per capita. The underlying assumption is that, by and large, the only reasonable treatment of biowaste is composting or anaerobic digestion.
99	Waste reduction economic savings	Business and Technology	Closing the Loop	NA	No Data	National	Savings due to waste reduction
99	Waste reduction economic savings	Business and Technology	Closing the Loop	NA	No Data	National	Savings due to waste reduction

B.   List of CE Research

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Authors	Number of authors	Title	Abstract	Link
Raquel Balanay Rowena P. Varela Anthony Halog	3	Circular economy for the sustainability of the wood-based industry: The case of Caraga Region, Philippines	This work reviews the circular economy initiatives in the East and the Southeast Asian regions for sustainable forestry implications. Japan and China lead in these initiatives, having pursued extensively circular economy in the manufacturing, energy, and agriculture sectors. The CE in the forestry sector has just been initiated in China. Germany and Finland demonstrate circular economy insights for forestry that are highly relevant to the forestry sector of the Philippines' Timber Corridor, while the Philippines is transitioning toward circular economy. The Caraga Region is currently crafting a roadmap where research is at the core to develop a database for the science-based information necessary to advancing circular economy for a sustainable forestry sector. Integration of circular practices into the forestry sector and the innovative reuse of wood waste are the key actions for transitioning toward a forestry-based circular economy in Caraga Region, Philippines.	DOI:10.1016/B978-0-12-821664-4.00016-9
Ivan Henderson Gue Raymond Tan Anthony S.F. Chiu Aristotle Ubando	4	An Environmentally-Extended Input-Output analysis of circular economy scenarios in the Philippines	Conventional economic systems are based on the unsustainable use of natural resources. Circular Economy is a framework for socio-technical regime change that prioritizes material loops to improve resource efficiency. The framework promotes business activities that capitalize on material recirculation pathways and extended product life cycles. Many countries have begun adopting circular economy principles through policies, targets, and action plans, but research in this area has focused largely on developed countries and major emerging economies. The lack of scientific analysis of circular economy implementation in developing countries is a critical research gap with significant implications on global material flows. Fast-growing countries such as the Philippines will benefit from the regime change towards circular economy to resolve sustainability issues from economic and demographic trends. Policy interventions need to be calibrated to enable a smooth transition to circularity. To address this gap, this study uses a 16-sector Environmentally-Extended Input-Output model to simulate four scenarios based on increasing product demand, implementing circular business models, implementing government regulations, and promoting service sectors. GDP growth, material intensity, and regulatory constraints of each scenario are analyzed. Results show a potential of up to 10.05percent increase in GDP and 62.51percent decrease in material footprint relative to business-as-usual. Policy implications on the Philippines' transition to a circular economy are discussed.	DOI:10.1016/B978-0-12-821664-4.00016-9

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Authors	Number of authors	Title	Abstract	Link
James Sherwood Gerardo Tun Gongora Anne Velenturf	3	A circular economy metric to determine sustainable resource use illustrated with neodymium for wind turbines	The finite capacity of the Earth to provide the resources needed to make products is beginning to dictate policy decisions and citizen behaviours. Herein a methodology is proposed that considers the function (i.e., efficiency and durability) of a product as a way of normalising and hence justifying its resource use. Titled 'Performance-weighted abiotic Resource Depletion' (PwRD), this approach allows the resource use of different products to be directly compared, analogous to an absolute sustainability assessment. The PwRD metric quantifies concerns over the supply risk of elements and indicates reasonable actions to sustain a circular economy. This new format of circularity indicator is explained with the case study of neodymium for wind turbine magnets. Individual products as well as larger infrastructure projects such as wind farms can be assessed. It was found that the electrical energy produced by a wind turbine in the USA does not justify the quantity of neodymium required. Demand for the function of products is a variable in PwRD and is equally important as resource use in sustaining a circular economy. In regions of low electricity demand per capita such as the Philippines and Pakistan, the same quantity of neodymium as used in a wind turbine installed in the USA was found to be acceptable for sustaining a circular economy.	DOI:10.1016/j.jclepro.2022.134305
Ivan Henderson Gue Raymond Tan Anthony S.F. Chiu Aristotle Ubando	4	Sector perception of circular economy driver interrelationships	The shift to a circular economy requires careful planning, the first step of which is to understand the drivers of the transition. There have been few papers in the literature that have analyzed and mapped interrelationships of these transition drivers from the perspective of different sectors. This work presents a methodological framework for mapping causality networks for macro-level transition towards circular economy based on sector perceptions. Fuzzy DEMATEL is used to allow linguistic inputs to be quantified. This procedure allows drivers to be characterized as causes or effects based on their position in the causality network. A case study presents the Philippines as a representative developing country for circular economy transition. The inputs of seventeen respondents from retail and trade, manufacturing, construction, water services, food services, electricity services, academic services, and health services were elicited through a survey. These responses were then aggregated into the industry and service sectors. The drivers considered were government support, company culture, social recognition, economic attractiveness, and information to practitioners. Results show that economic attractiveness and consumer demand are unanimously seen as the causal drivers. All sectors identify company culture as an effect driver. The findings also indicate varying perceptions among sectors. Although these findings apply specifically to the Philippines, this methodology itself can be used for mapping driver interrelationships of other countries and regions.	DOI:10.1016/B978-0-12-821664-4.00016-9

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Authors	Number of authors	Title	Abstract	Link
-Jonnel Pabico	1	Bio-based Plastic Circular Economy	Plastics is already an integral part of man's daily lives. Whatever man is doing, wherever man is moving, he will use plastic. The versatility and physical properties of plastics make it superior over other materials like papers, and metal containers. The affordability and availability of plastics lead us to a throwaway culture, that results to severe plastic pollution both in grounds or in waters. In the Philippines alone, 163 million plastic sachet packets, 48 million shopping bags, and 45 million thin film bags is used daily, in which around 0.28-0.75 million tons/year are thrown into the ocean. Plastics cannot be totally replaced with other materials. Transporting goods contained in other containers like metals becomes too heavy, adding costs to transportation cost. In well populated cities and countries with lesser natural resources, replacing plastics with organic materials like papers poses worse environmental footprints. To mitigate the problems on plastics, there are lots of international projects and collaborations that aims to developed technologies and system that will replace fossil-based plastics with biodegradable, recyclable, bio-based plastics and create the circular economy of plastics. ASEAN partners with European Union to acquire pilot projects from the collaboration, that can be utilized in the region to answer the call on plastic waste management. But more than the industry-state-industry cooperation, every individual has big part in the waste management. Changing our lifestyle with plastics can make our world more sustainable.	https://www.researchgate.net/publication/368719167_Bio-based_Plastic_Circular_Economy

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Authors	Number of authors	Title	Abstract	Link
Atty. Ireneo Martinez Rex Llonora -Leovigildo Lito Mallillin	3	Strategic Zero Waste Management Program of Bacoor Cavite, Philippines: Basis for Healthy Environment Campaign	The concept of zero waste advocates the "no waste" practice across societies, from individuals and households to enterprises and industries. There are prevailing issues and challenges in the current system of waste management in local government. Critics of the "plastic ban policy" assert that no significant change and impact was made from the time the local ordinance was implemented. However, interest groups have claimed that to confront the never-ending problem of waste is to strengthen the current policy through the adoption of zero waste management (ZWM). This system offers an alternative solution and remedy to the non-negotiable impacts of waste materials on the environment and public security. This study is designed to develop a proposal on waste management that will be utilized by the local government of Bacoor City, Cavite. It aims to evaluate the effectiveness of the waste management system as well as its problems and constraints in implementation. With the existing implementation of solid waste management, a strategic zero waste management system is offered to strengthen the government's effort in dealing with problems concerning waste. This strategic program covers key phases from the assessment of the current system to the implementation and post-evaluation of the project. Furthermore, a community relations approach was also introduced as an action plan in ZW management focusing on the promotion of sustainable development. Included in this study is the employment of 111 resident-homeowners of Bacoor City who were involved in the conduct of survey and interview through the use of structured questionnaire instruments. Findings of this qualitative-quantitative descriptive research show that issues of waste management centers on public awareness and information campaigns on the dynamics of the program and concerns on measures used in the restriction of plastic waste where institutionalized and standardized policies are needed. Furthermore, priority issues reveal that the local government needs to confront and address the different issues on waste management. Respondents have clearly observed that resources are key requirements if a ZW management is to be implemented. The availability of technology, equipment, and material flow is necessary to handle and manage if ever a ZW management is to be introduced in the city. On the other hand, the current system of waste management in Bacoor was observed as very effective. Its effectiveness is seen in the active community involvement and participation in waste management.	DOI:10.46827/ejes.v10i1.4612

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Authors	**Number of authors**	**Title**	**Abstract**	**Link**
Arlen Ancheta Belinda V. de Castro Ronaldo Maglaqui Castillo Maria Rosario Virginia C. Garcia Moises Norman Z. Garcia	5	Streamlining Waste Handling Approaches to Zero Waste: Community-Based Experiences in The City of San Fernando, Pampanga, Philippines	Solid waste has been a major problem of a throwaway society. Along with fast-paced lifestyle and commodification of goods and services, is enormous waste disposal. Using the case study design, the objective of this study is to illustrate how waste handling approaches were streamlined to attain zero waste. Methods used were interview and community observation with community experiences as the unit of analysis. Transcripts were analyzed by identifying significant statements, reduced them into codes, identified categories, and eventually creating themes on waste practices. Results show that the zero waste practices in the selected barangays of City of San Fernando anchored on RA 9003, city and barangay ordinances, strictly implemented segregation at source and segregated collection. Moreover, every barangay has functional material recovery facility, and composting area for biodegradables. In conclusion, legal framework, partnership with NGO initiatives, holistic approach in solid waste handling had created a circular waste movement that increase waste diversion at the same time reduce landfill disposal.	https://www.researchgate.net/publication/341234115_STREAMLINING_WASTE_HANDLING_APPROACHES_TO_ZERO_WASTE_COMMUNITY-BASED_EXPERIENCES_IN_THE_CITY_OF_SAN_FERNANDO_PAMPANGA_PHILIPPINES
Premakumara Dickella Nobue Amanuma	2	Governing Integrated Solid Waste Management: The Case of San Carlos, Philippines	Main Messages - Policymakers are increasingly looking for waste management solutions that can help achieve multiple development objectives, such as climate change mitigation, ecosystem conservation, improved human health, and the transition to a circular or zero waste economy; - This requires integrated approaches as called for by the Sustainable Development Goals (SDGs). There are many ways to advance an integrated approach in the waste sector, as illustrated by the numerous definitions of integrated solid waste management (ISWM); - The implementation of ISWM in developing countries faces greater challenges than in developed countries due to 1) a lack of existing solid waste management infrastructure, systems and industries; 2) limited resources and capacities; and 3) a lack of political will, strategic directions, appropriate policies, and governance; - This chapter analyses what kinds of governance arrangements—horizontal coordination, vertical coordination, and multi-stakeholder engagement—were needed to make ISWM effective in San Carlos, Philippines and elsewhere in the Asia-Pacific region; - The analysis found that well-functioning horizontal coordination and engagement mechanisms at the city level are important, partly reflecting the need to align and promote interactions between multiple stakeholders at the local level, operating across different stages of waste management; - Strong vertical coordination with national environmental agencies is also needed to meet financing shortfalls, and provide enabling legislation. Other means of implementation (MOI) (particularly appropriate funding, and institutional capacities), political commitment and leadership are also key; - Elsewhere in the Asia-Pacific region, similar vertical and horizontal coordination issues influenced the performance of ISWM.	https://www.researchgate.net/publication/326929375_Governing_Integrated_Solid_Waste_Management_The_Case_of_San_Carlos_Philippines

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Authors	Number of authors	Title	Abstract	Link
Jazztin Jairum P. Manalo	1	Zero Carbon Resorts best practices: a case of Palawan, Philippines	Building energy appropriate solutions for a cleaner environment is a desirable outcome for lesser fossil fuel dependence, thus the objective of "green technology" options. Green Technology is defined as technology that seeks to improve environmental performance, and is use interchangeably as climate-smart, climate-friendly, and low-carbon technology. This technology includes both process and product technologies that generate low or no waste and increase resource-and energy-efficiency. The 3R (Reduce-Replace-Redesign) concept of Zero Carbon Resorts (ZCR)-a European Union SWITCH-Asia Programme aims to promote cross country exchange of best practices through site learning observations coupled with strong policy dialogue for sustainable development and effective ecotourism in the Philippines. This paper presents the best practices and learning's of the ZCR Programme in the province of Palawan. Review of available data and correspondence were utilized to gather valuable key information. With the adoption and application of the ZCR method, resorts have not only contributed in the natural resource conservation but also increase their business profitability. The utilization of solar energy, rainwater harvesting, waste recycling and management and use of LED lights have all lead in decreasing carbon footprints of the resorts for improved environmental condition and healthier population. The methods, practices, applications, and uses of green technology in the concept of 3R's in the province of Palawan is discussed and presented.	https://www.researchgate.net/publication/358045463_Zero_Carbon_Resorts_best_practices_a_case_of_Palawan_Philippines
Raul Jr. Pelitones Palcis	1	Innovating Sustainability: The Transformative Use of Plastic Waste and Wheel Tires for Construction in the Philippines	In recent years, plastic waste and wheel tires have become an alarming environmental issue in the Philippines, with inadequate disposal leading to environmental degradation and public health hazards. This thesis proposes a solution that innovatively utilizes these waste materials for sustainable construction practices. The study aims to assess the feasibility, benefits, and drawbacks of utilizing plastic waste and wheel tires as alternative construction materials in the Philippines, and to provide recommendations for their implementation. This research uses a mixed-methods approach, including qualitative interviews, surveys, and laboratory testing, to evaluate the potential of these materials for construction. The findings suggest that using plastic waste and wheel tires in construction can significantly reduce environmental degradation and waste, lower construction costs, and improve the durability and insulation properties of buildings. However, the implementation of these materials poses technical, regulatory, and social challenges that require comprehensive solutions. This thesis concludes that the transformative use of plastic waste and wheel tires in construction has the potential to revolutionize sustainable construction practices in the Philippines, contributing to the achievement of the Sustainable Development Goals and promoting environmental stewardship.	DOI:10.13140/RG.2.2.28683.36640

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Authors	**Num-ber of authors**	**Title**	**Abstract**	**Link**
Felipe E. Balaria Jennifer Fronda Elsie G. Baligod Shirley Santiago Carmela T. Sula Eleah Vida V. Pelayo	6	Junkshop Industry as Waste Recycling Business: A Green Response towards Economic Sustainability and Social Responsibility	This study was conducted to assess the junkshop industry in Cabanatuan City, Philippines. It aimed to determine the profile of junkshops, the materials they trade, and their compliance with legal requirements. Using descriptive qualitative research design with 20 randomly chosen participating junkshops as respondents, the researcher found out that junk shop operations are lucrative and can help support economic development as well as solve certain environmental issues. However, many of them were operating without registering with the concerned authorities. Aggressive involvement of the LGUs, by organizing junkshop operators, and close monitoring of junkshop operations are few from among the recommendations of the study.	DOI:10.22161/ijeab.61.4
Raquel Balanay Anthony Halog	2	Tools for circular economy: Review and some potential applications for the Philippine textile industry	Instituting circular economy (CE) for sustainability is the aim of taking stock of various analytical/assessment tools. A review of these tools reveals a continuing endeavor to incorporate in the procedures the systems and life cycle thinking and the triple bottom-line framework of sustainable development (economic, social, and environmental). Over time, the CE tools have been modified with the incorporation of some unique attributes in the cases being studied. Life cycle assessment (LCA) remains the popular and the only standardized procedure to analyze CE issues in industries, specifically in the environmental aspect. However, consistency, measurement, and aggregation issues are the major setbacks of having an integrated LCA for economic, social, and environmental impacts. The alternative tools used across the world to study the economic, social, and environmental aspects of CE have increased in both number and sophistication. Optimization and systems models have been increasingly used on a case-based format. Although the downside is the less standardized approach with less chances of comparability in terms of results, these models have been designed appropriately to tackle challenges associated with intricate, multifaceted, and encompassing sustainability and CE issues to improve policy development. In the textile industry, LCA as a popular tool is only used for environmental sustainability assessment but not much in social and economic aspects. The Philippine textile industry still has to catch up in the application of those tools for sustainability assessment. A framework has been suggested for the country's roadmap/guide to attain circularity in textile industry operations.	https://doi.org/10.1016/B978-0-08-102630-4.00003-0

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Authors	**Number of authors**	**Title**	**Abstract**		**Link**
Arturo Mariano I. Figueroa Lynlei L. Pintor Grace P. Sapuay Arlen A. Ancheta Vella A. Atienza Wencelito P. Hintural Mattheus Imcon V. Abris Sadhan Kumar Ghosh	8	Circular Economy Strategies and Implementation in the Philippines	the East Asia Pacific region citing contributing factors like increasing urbanization, middle class growth, and percentage of younger population. The dynamic characteristics of the economy have been rooted to a stronger consumer demand that is supported by a vigorous labor market and healthy remittances. The resource efficiency of the Philippines compared to Asia Pacific Region is simulated by the UNESCAP in terms of domestic material consumption, energy intensity, and water efficiency. The Philippines could reduce 41.75percent domestic material consumption (DMC) intensity from 2000 to 2016, which is a significant indication of contribution towards Circular Economy. The simulation revealed that in 2016, the Philippines was more resource efficient in terms of usage of material resources compared to the Asia-Pacific regional average. The Republic Act (RA) 9003 promulgated in 2001 provided an ecological solid waste management program in the country consisting of processes such as segregation, collection, transport, storage, treatment, and disposal of solid wastes. This has featured a national target of establishing Material Recovery Facilities (MRF) in all the 42,000 barangay units. Waste management in the Philippines is controlled by both formal and informal recyclers being the key players dealing with E-waste, plastics waste, and other types of wastes in the country. A national initiative utilizing the principle of public and private partnership (PPP) has been adopted to create safe E-waste transport, storage, and disposal (TSD) for the benefit of the informal waste sectors in the country. The Philippines is already a party to the UN Framework Convention on Climate Change (UNFCCC), to the Hyogo Framework for Action, and strongly committed to the Sendai Framework. By 2030, the country has committed to reduce by 70percent all the carbon emissions coming from the energy, transport, waste, forestry, and industry sectors. The Green Energy Option Programs in the Philippines provided option to consumers to choose renewable energy as their source of power while the country fostered three guiding principles in all the areas of energy development, namely innovation, resilience, and sustainability. Water recycling and conservation activities in the country are propagated by enjoining the public through the conduct of aggressive Information, Education and Communication (IEC) campaigns. The government has developed programs and initiatives in enhancing conservation of water and efficient procedures in averting water shortages, namely rainwater harvesting facilities, establishing water recycling technologies in the country through the National Water Resources Board (NWRB). There are other initiatives to reduce, reuse, and recycle, and resource recovery in waste sectors, water sectors, industry sectors, and others that help Philippines to move towards implementation of Circular Economy while there are many challenges. This study reviews the situation and presents the status of the implementation of circular economy strategies in the Philippines considering the targets, implementation status, legislative support, achievements, and the future plans.		DOI:10.22161/ijeab.61.4

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Authors	**Number of authors**	**Title**	**Abstract**	**Link**
Raquel M. Balanay Rowena P. Varela Anthony B. Halog	3	Circular economy for the sustainability of the wood-based industry: the case of Caraga Region, Philippines	This work reviews the circular economy initiatives in the East and the Southeast Asian regions for sustainable forestry implications. Japan and China lead in these initiatives, having pursued extensively circular economy in the manufacturing, energy, and agriculture sectors. The CE in the forestry sector has just been initiated in China. Germany and Finland demonstrate circular economy insights for forestry that are highly relevant to the forestry sector of the Philippines' Timber Corridor, while the Philippines is transitioning toward circular economy. The Caraga Region is currently crafting a roadmap where research is at the core to develop a database for the science-based information necessary to advancing circular economy for a sustainable forestry sector. Integration of circular practices into the forestry sector and the innovative reuse of wood waste are the key actions for transitioning toward a forestry-based circular economy in Caraga Region, Philippines.	https://doi.org/10.1016/B978-0-12-821664-4.00016-9
Ivan Henderson V. Gue Raymond R. Tan Anthony S.F. Chiu Aristotle T. Ubando	4	Environmentally-extended input-output analysis of circular economy scenarios in the Philippines	Conventional economic systems are based on the unsustainable use of natural resources. Circular Economy is a framework for socio-technical regime change that prioritizes material loops to improve resource efficiency. The framework promotes business activities that capitalize on material recirculation pathways and extended product life cycles. Many countries have begun adopting Circular Economy principles through policies, targets, and action plans, but research in this area has focused largely on developed countries and major emerging economies. The lack of scientific analysis of Circular Economy implementation in developing countries is a critical research gap with significant implications on global material flows. Fast-growing countries such as the Philippines will benefit from the regime change towards Circular Economy to resolve sustainability issues from economic and demographic trends. Policy interventions need to be calibrated to enable a smooth transition to circularity. To address this gap, this study uses a 16-sector Environmentally-Extended Input-Output model to simulate four scenarios on a) increasing product demand, b) implementing circular business models, c) implementing government regulations, and d) promoting service sectors. GDP growth, material intensity, and regulatory constraints of each scenario are analyzed. Results show a potential of up to 10.05percent increase in GDP and 62.51percent decrease in material footprint relative to business-as-usual. Policy implications on the Philippines' transition to a Circular Economy are discussed.	https://doi.org/10.1016/j.jclepro.2022.134360

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Timothy James P. Edoria Jan Paul A. Pabilonia Jasper Aldwin M. Palapar Charles Dean E. Quiambao Ivan Henderson V. Gue Monorom Rith Alexis Mervin T. Sy	7	Modeling consumer preference on refillable shampoo bottles for circular economy in Metro Manila, Philippines	The transition to a Circular Economy (CE) depends on several factors, such as the implementation of circular business models. Although circular business models were developed, there are socio-cultural distinctions that need to be considered. One such distinction is the sachet culture of the Philippines. The country's consumers use single-use sachets for daily needs, including body care and hygiene. As the local sachet culture lead to significant waste emission to the ocean, designing circular business model for switching to a circular product (e.g., refillable shampoo bottle) is a key measure towards sustainable societies. The design of this business model, however, will need to consider consumer preference. In this sense, modeling consumer preference provides insights on how enterprises can design consumer-centric circular business models. The present study modeled consumer preference between single-use plastic shampoo sachet and refillable shampoo bottles through binary logistic regression, considering responses from 457 consumers of Metro Manila, Philippines. The independent variables used were the socioeconomic and demographic characteristics, product channel, and usage. The dependent variable was consumer preference between using sachet or refillable bottles shampoo. The model indicated a good fit with a McFadden $R2$ of 0.255. The model identified age, gender, education, environmental awareness, budget, daily use, and retailer as statistically significant independent variables. The variable 'environmental awareness' attained the highest significance for socioeconomic and demographic characteristics. Meanwhile, the variable 'retailer' attained the highest significance for product channel and usage. The two variables had the highest influence on consumer preference. This study recommends enterprises to focus on utilizing malls as the product channel and on ecolabelling of products. Future research works may use the model in integrating consumer preference on circular economy scenarios. Enterprises may also use the model in designing circular business models suitable for the target market.	https://doi.org/10.1016/j.clrc.2023.100118
Yong Geng Joseph Sarkis Raimund Bleischwitz	3	How to globalize the circular economy	Industry must rethink its approach to resources. Manufacturing is wasteful. It takes a tonne of metal, silicon and plastic to produce a laptop computer weighing a few kilograms. Waste is an afterthought. Each year, 8 million tonnes of plastic are dumped into the oceans. Greenhouse-gas emissions are out of control. Producing cement releases as much carbon dioxide into the atmosphere each year as Europe's 300 million cars: 1.5 billion tonnes1. Water is squandered — we calculate that it takes 1,250 litres of water to grow 1 kilogram of rice in China.	https://www.nature.com/articles/d41586-019-00017-z

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Authors	Num-ber of authors	Title	Abstract	Link
Ivan Henderson V. Guea Aristotle T. Ubandob Michael Angelo B. Promentillac Raymond R. Tanc	4	Determining the causality between drivers of circular economy using the DEMATEL framework	A trend arises among industrial and government sectors to transition from the conventional economic system to the new Circular Economy. Its benefit of material security, resource efficiency, and economic growth has attracted government institutions and business sectors to adopt the new trend. However, its challenge falls on the real complexities of economic systems. Adoption of the Circular Economy requires careful consideration of possible challenges. Previous works have aimed to identify the drivers of Circular Economy through surveys based on the frequency of data. The results provided useful information for the decision making of the transition. However, it is also limiting as it does not address a plausible chain-like effect of the drivers which can aid stakeholders determine which course of action is necessary for an efficient transition. Hence, this study is focused in determining these causal drivers by using the DEMATEL approach. DEMATEL is a methodology that identifies the cause and effect relationship between drivers, of which, it can then determine the top causal driver. The study uses a case study in the Philippines to illustrate the capability of the methodology of determining the causality between drivers of Circular Economy. The results of the case study were able to identify 'economic attractiveness', with a net cause/effect value of 1.22, and 'consumer demand', with a net cause/effect value of 0.87, as the main causal driver while 'company culture', with a net cause/effect value of -1.22, as the main effect. The result implies that the improvement in the circular business models and increase in customer awareness are the top priority for the transition. The application of this work is intended to provide researchers an alternative approach in identifying the critical causal drivers of Circular Economy	https://doi.org/10.3303/CET1976021
Ivan Henderson V. Guea Aristotle T. Ubandob Michael Angelo B. Promentillac Raymond R. Tanc	4	Determining the causality between drivers of circular economy using the DEMATEL framework	The 2030 Agenda for Sustainable Development provides a shared blueprint for peace and prosperity for people and the planet. To achieve the objective, the cohesive efforts among the government, private sectors, research intuition are paramount to translate the scientific output to address Sustainable Development Goals (SDGs). The Special Volume (SV) accepts and reviews a wide range of green initiatives with the goal to address the SDGs. This SV includes the fundamental research on alternative fuel, smart and green material, to reduce the waste and environmental impact; process system engineering tools to engineer the sustainable consumption and production for the communities; sustainable waste management system; circular economy and enabling strategies e.g. via the government policy and smart partnerships. This SV is based on the invited articles from the conference series of the 6th International Conference on Low Carbon Asia (ICLCA'20). ICLCA'20 themed "Urban Sustainability Towards Human Well-Being" served a high impact platform bringing together researchers and multi-stakeholders from academia, government and industry to share their expertise, knowledge and experiences to catalyse the transformation of Low carbon society in Asia and beyond. ICLCA 2020 addresses the various challenges outlined under the SDGs. Among the key Topics includes urban planning and smart cities, sustainable energy, waste and water management, sustainable agriculture and urban food production, nexus and circular economy, clean technologies and other topics relevant to sustainable development.	https://doi.org/10.3303/CET1976021

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Jovito Jose P. Katigbak	1	A Review of Circular Economy-related Laws and Policies in the Philippines	I. Chara cterizing the Circular Economy II. A Review of Circular Economy-related Philippine Laws and Policies III. Considerations towards a National Framework	https://pidswebs.pids.gov.ph/CDN/document/Presentation_May17_Katigbak.pdf
Sheralyn De Ungria Lara Therese Fernandez Sophia Ellise Sabado Jeano Paulo Santos Allysa Rose Sararaña Chona Camille VinceCruz-Abeledo	6	A Review of Circular Economy-related Laws and Policies in the Philippines Circular economy in fisheries: How is fish market waste managed in the Philippines?	Improper management of fish waste has led to the Comprehensive National Fisheries Industry Development Plan to declare that Philippine fisheries are unsustainable. A considerable portion of fish waste is produced in wet markets, where bulk of fish products are sold. A comparison of existing practices in different localities can indicate the best points of intervention and identify existing traditional practices that can be promoted. This study interviewed fish vendors and fishers, and collected information at the market level, to determine existing fish waste management systems. From the responses gathered, the average daily production of fish waste in Philippine wet markets was 70.3 ± 65.4 kg, with no significant differences across locations (p = 0.2501). Of the fish waste produced, 32.3 ± 43.1 kg per wet market were disposed of, 18.9 ± 23.3 kg were sold, and 19.1 ± 21.9 kg were given away to stakeholders who re-use the fish waste. A significantly greater proportion of fish waste in rural areas were re-used compared to Metro Manila (p = 0.0311). Incentivizing innovations that maximize the use of derived fish waste at the municipal level, and promoting existing traditional practices, can prove effective in contributing to the Philippine circular economy while providing alternative sources of income for the stakeholders of the fisheries industry.	DOI:10.21203/rs.3.rs-1413739/v1

List of CE Research				
Authors	**Number of authors**	**Title**	**Abstract**	**Link**
Patrizia Gazzola Enrica Pavione Roberta Pezzetti Daniele Grechi	4	Trends in the fashion industry. The perception of sustainability and circular economy: A gender/generation quantitative approach	The significant changes which have occurred in the competitive scenario in which fashion companies operate, combined with deep transformation in the lifestyles of final consumers, translate into the need to redefine the business models. Starting from a general overview of the emerging trends today affecting the fashion industry, the paper will devote particular attention to the analysis of the most important phenomena that are influencing this market and the drivers for long-lasting competitiveness: sustainability and attention to the so-called circular economy. According to the literature, from the consumer behavior's point of view, the younger generations are paying growing attention to these issues. In light of these considerations, this paper aimed to analyze how sustainability and circular economy principles are influencing the perception of the fashion world among the new generations of consumers. After mapping the emerging trends in the fashion industry and analyzing the role of sustainability from both the demand and supply side, this paper presents the results of a survey conducted through an anonymous questionnaire made in collaboration with Insubria University. The results of the survey describe the students' behaviour as regards fashion's emerging trends, with particular attention to sustainability issues and the application of circular economy principles. The survey results were analyzed from both a descriptive and quantitative point of view with the aim to check the different perceptions as regards sustainable fashion and circular economy in fashion, focusing mainly on the so-called Generation Z. The results of the analysis proved to be consistent with the theoretical framework and confirm the relevance of sustainability issues in the fashion industry today in driving the demand of Generation Z, by considering a gender perspective. Moreover, the circular economy is descriptively analyzed with the aim to understand the relevance of the different facets for the entire sample of respondents.	DOI:10.3390/su12072809
Gregorio Rafael P. Bueta	1	Circular Economy Policy Initiatives and Experiences in the Philippines: Lessons for Asia and the Pacific and Beyond	The Philippines is facing a waste crisis—perhaps of an unimaginable scale. The issue of solid waste management (SWM) has been one of the main environmental problems of the country for decades. Its archipelagic geographic structure, a rising population, lack of incentives for reform, and weak implementation and enforcement of regulations result in almost 35percent of plastics leaking into the open environment (WWF 2020). The problem has once again been thrust into the spotlight due to the increase in waste generation, particularly of plastics and medical waste, due to the ongoing coronavirus disease 2019 (COVID-19) pandemic. One solution that is slowly being included in the waste management narrative of the country is the concept of a circular economy. This chapter analyzes the current Philippine legal and policy framework related to this. Circular economy policy efforts in the Philippines over the last decade are analyzed, with a focus on measures on regulations of plastics and extended producer responsibility (EPR) schemes. The chapter concludes with lessons from the Philippine experience and gives recommendations on how circular economy policies can be made a reality for developing countries like the Philippines.	https://www.switch-asia.eu/site/assets/files/3423/adbi-transitioning-linear-circular-economy-developing-asia-web.pdf#page=87

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Patrizia Gazzola Enrica Pavione Roberta Pezzetti Daniele Grechi	4	Trends in the fashion industry. The perception of sustainability and circular economy: A gender/ generation quantitative approach	The significant changes which have occurred in the competitive scenario in which fashion companies operate, combined with deep transformation in the lifestyles of final consumers, translate into the need to redefine the business models. Starting from a general overview of the emerging trends today affecting the fashion industry, the paper will devote particular attention to the analysis of the most important phenomena that are influencing this market and the drivers for long-lasting competitiveness: sustainability and attention to the so-called circular economy. According to the literature, from the consumer behavior's point of view, the younger generations are paying growing attention to these issues. In light of these considerations, this paper aimed to analyze how sustainability and circular economy principles are influencing the perception of the fashion world among the new generations of consumers. After mapping the emerging trends in the fashion industry and analyzing the role of sustainability from both the demand and supply side, this paper presents the results of a survey conducted through an anonymous questionnaire made in collaboration with Insubria University. The results of the survey describe the students' behaviour as regards fashion's emerging trends, with particular attention to sustainability issues and the application of circular economy principles. The survey results were analyzed from both a descriptive and quantitative point of view with the aim to check the different perceptions as regards sustainable fashion and circular economy in fashion, focusing mainly on the so-called Generation Z. The results of the analysis proved to be consistent with the theoretical framework and confirm the relevance of sustainability issues in the fashion industry today in driving the demand of Generation Z, by considering a gender perspective. Moreover, the circular economy is descriptively analyzed with the aim to understand the relevance of the different facets for the entire sample of respondents.	DOI:10.3390/ su12072809
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Authors	**Number of authors**	**Title**	**Abstract**	**Link**
Linda Arthur Derek Hondo Reetta Kohonen	3	Prospects for Transitioning from a Linear to Circular Economy in Developing Asia	Unsustainable consumption, driven by the increasing extraction of raw materials, manufacturing, and production, is contributing to environmental degradation and the acceleration of climate change. In developing Asia, consumption trends will continue to rise as populations and economies grow. Shifting from the current "take–make–dispose" linear consumption pattern to a more circular economy provides an opportunity for governments to rewrite the narrative by decoupling economic output from increased resource use and environmental degradation. A circular economy aims to drive economic growth in a sustainable manner by maximizing resource efficiency while minimizing environmental impacts and greenhouse gas emissions. Prospects for Transitioning from a Linear to Circular Economy in Developing Asia overviews circular economy principles and provides policy recommendations to promote the transition to circularity. Part I describes the evolution of circular economy in the region and highlights key related initiatives and prospects for future growth. Part II looks at the regulatory and legal frameworks for plastics, such as extended producer responsibility, and assesses their adequacy to stem unsustainable production and minimize the disposal of plastic waste. Part III offers examples of circular economy investment and innovation and calls for effective policies to incentivize and strengthen circular business models.	https://www.adb.org/publications/prospects-for-transitioning-from-a-linear-to-circular-economy-in-developing-asia
Linda Arthur Derek Hondo Reetta Kohonen	3	Prospects for Transitioning from a Linear to Circular Economy in Developing Asia	Unsustainable consumption, driven by the increasing extraction of raw materials, manufacturing, and production, is contributing to environmental degradation and the acceleration of climate change. In developing Asia, consumption trends will continue to rise as populations and economies grow. Shifting from the current "take–make–dispose" linear consumption pattern to a more circular economy provides an opportunity for governments to rewrite the narrative by decoupling economic output from increased resource use and environmental degradation. A circular economy aims to drive economic growth in a sustainable manner by maximizing resource efficiency while minimizing environmental impacts and greenhouse gas emissions. Prospects for Transitioning from a Linear to Circular Economy in Developing Asia overviews circular economy principles and provides policy recommendations to promote the transition to circularity. Part I describes the evolution of circular economy in the region and highlights key related initiatives and prospects for future growth. Part II looks at the regulatory and legal frameworks for plastics, such as extended producer responsibility, and assesses their adequacy to stem unsustainable production and minimize the disposal of plastic waste. Part III offers examples of circular economy investment and innovation and calls for effective policies to incentivize and strengthen circular business models.	https://www.researchgate.net/publication/358459032_Systems_Approach_toward_a_Greener_Eco-efficient_Mineral_Extraction_and_Sustainable_Land_Use_Management_in_the_Philippines

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Authors	Number of authors	Title	Abstract	Link
Michael Angelo B. Promentilla Arnel B. Beltran Aileen H. Orbecido Ivyleen Bernardo-Arugay Vannie Joy Resabal Mylah Villacorte-Tabelin Irish Mae Dalona Einstine Opiso Richard Alloro Dennis Alonzo	10	Systems approach toward a greener eco-efficient mineral extraction and sustainable land use management in the Philippines	As the world transition towards a low-carbon future through renewable energy, mining of minerals and metals to attain this goal is substantial. The Philippines will play an important role in such global economy as it is the world's fifth most mineral-rich country. However, their exploitation has not been maximized to benefit society. Benefits from the mineral resources sector remain less than 2percent of the country's GDP since 2006, and the mining and mineral processing, including abandoned or legacy mines, are perceived negatively by the public. In low-and middle-income countries with weak implementation of mining and environmental legislation, the mining industry still operates in a linear system which is considered unsustainable. The mining, mineral extraction and processing, and metal extraction are designed to maximize profits with little plan on how to effectively manage mine wastes, protect the environment, transform post-mining land for beneficial use and empower impacted communities. This paper, thus, proposes a systems approach toward greener eco-efficient mineral extraction and sustainable land use management (SAGES). This approach will facilitate a paradigm shift, which is necessary to manage the country's mineral endowments sustainably without compromising future land use of mining areas while at the same time supporting the needs and aspirations of the impacted host communities. It envisions extending the usability of mining areas beyond the life of the mine and integrating circular economy principles in addressing holistically mine waste management problems. The multi-R framework, originally developed in waste ...	https://www.researchgate.net/publication/358459032_Systems_Approach_toward_a_Greener_Eco-efficient_Mineral_Extraction_and_Sustainable_Land_Use_Management_in_the_Philippines

Authors	Number of authors	Title	Abstract	Link
Clarence P. Ginga Jason Maximino C. Ongpeng Ma Klarissa M. Daly	3	Circular economy on construction and demolition waste: A literature review on material recovery and production	Construction and demolition waste (CDW) accounts for at least 30percent of the total solid waste produced around the world. At around 924 million tons in the European Union in 2016 and 2.36 billion tons in China in 2018, the amount is expected to increase over the next few years. Dumping these wastes in sanitary landfills has always been the traditional approach to waste management but this will not be feasible in the years to come. To significantly reduce or eliminate the amount of CDW being dumped, circular economy is a possible solution to the increasing amounts of CDW. Circular economy is an economic system based on business models which replaces the end-of-life concept with reducing, reusing, recycling, and recovering materials. This paper discusses circular economy (CE) frameworks—specifically material recovery and production highlighting the reuse and recycling of CDW and reprocessing into new construction applications. Likewise, a literature review into recent studies of reuse and recycling of CDW and its feasibility is also discussed to possibly prove the effectivity of CE in reducing CDW. Findings such as effectivity of recycling CDW into new construction applications and its limitations in effective usage are discussed and research gaps such as reuse of construction materials are also undertaken. CE and recycling were also found to be emerging topics. Observed trends in published articles as well as the use of latent Dirichlet allocation in creating topic models have shown a rising awareness and increasing research in CE which focuses on recycling and reusing CDW.	https://doi.org/10.3390/ma13132970
Lynlei L. Pintor Josel B. Godezano Mattheus Imcon V. Abris	3	A Review of Waste Management Technologies Towards a Circular Economy in the Philippines	Circular economy (CE) refers to the production and consumption of goods through closed loop material flows that internalize environmental externalities linked to virgin resource extraction and the generation of waste. CE has not materialized in the Philippines since the implementation of the Ecological Solid Waste Management Act in 2000. Several research studies have already been conducted focusing on the various aspects related to solid waste management. However, there is paucity of the available information related to waste management technologies that can stir the circular economy in the country. This study assessed the science, technology, and innovation on waste management in the Philippines within a ten-year period from 2009 to 2019. Content analysis was done on the research conducted and technologies generated to assess the role of science, technology, and innovation on waste management. Results revealed that several studies mainly focused on waste characterization, reuse, recycle, reduce or 3Rs, policy development and implementation, brand audits, and public and health effects of plastic wastes. Most of the studies conducted were quantitative in nature. On generated technologies, most of the reports focused on refuse-derived-fuel, vermin-composting, gravity-driven Materials Recovery Facility (MRF), bulb eater machine, and plastic bricks. Despite the annual increase in waste generation, waste management still receives poor attention from the government. Thus, achieving a circular economy will take time in the country.	DOI:10.36292/psdrmj.v2i1.52

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Authors	Number of authors	Title	Abstract	Link
Veronica A. Presentacion Ma Victoria P. San Gabriel Merry Grace M. Nuñez Geraldine A. Rimocal Harold M. Ramos Felipe E. Balaria	6	The Cost and Quality of Bottled Water in Refilling Stations and Tap Water in Cabanatuan City: A Comparative Study	This study compared the quality of tap water given by the Cabanatuan City Water District – Prime Water Cabanatuan to replenished filtered water and bottled water obtained from water refilling stations. Water samples, in particular, had been tested in the lab for microbiological, physical, and chemical quality. Parameters include heterotrophic plate count, total coliform, thermotolerant coliform/Escherichia coli, total dissolved solids, pH, and turbidity. It was found that water supplied by Cabanatuan City Water District – Prime Water Cabanatuan City is cheaper, safe, and passed the Philippine National Standards for Drinking Water of 2017 compared to bottled water samples from refilling stations. However, despite the availability of potable water provided by the city water district, it is difficult to convince the public to adopt the behavior of drinking tap water instead of bottled or refilled purified water.	DOI:10.22161/ijaems.77.4

C. List of CE Initiatives

List of CE Initiatives					
Program /Program/ Training	**Imple- mented by:**	**Location (City/Mu- nicipality, Province)**	**Affiliation**	**Project/Program/Training Description**	**Website**
Trash to Cashback	City LGU	Quezon City, Metro Manila	Barangays in Quezon City	The Trash to Cashback Program, which was launched by the Quezon City Government on March 2021, is part of the city's circular economy initiative that provides a mechanism for citizens to actively participate in the waste diversion program of the city. Implemented by the Climate Change and Environmental Sustainability Department in partnership with Basic Environmental Systems and Technologies, Inc. (BEST), the project allows participants to exchange and convert their recyclable wastes and single use plastics into Environmental Points, which may be used to purchase groceries, goods and services from the bXTRA App and as payment for utility bills such as electricity, water, and internet service through the Bayad App.	Trash to Cashback Program
Balik-Basket and Bayong Program	City LGU	City of Balanga, Bataan	Balanga Agrarian Reform Beneficiaries Multi-Purpose Cooperative	The BALIK-BASKET AND BAYONG PROGRAM is one of the very successful SWM projects of the City Government for it opens a livelihood opportunity to non-working mothers.	Balik-Basket and Bayong Program
Gamit Pang- eskwela mula sa Basura	City LGU	City of Balanga, Bataan	School-based Material Recovery Facility	The project GAMIT PANG-ESKWELA MULA SA BASURA is one way of inculcating to the minds of the youth the importance of segregating wastes and the truth behind the maxim, "may pera sa basura" (there is money in trash).	Gamit Pang- eskwela mula sa Basura
Junk Shop ng Bayan	City LGU	City of Balanga, Bataan	Barangay Material Recovery Facility	JUNK SHOP NG BAYAN is a city-operated Junk Shop that catered the recyclable materials of the 25 barangays from their Barangay Material Recovery Facility.	Junk Shop ng Bayan
Barangay Makeover thru KAANIB	City LGU	City of Balanga, Bataan	Kasama...ANI sa Barangay	BARANGAY MAKE-OVER THRU KAANIB (KAsama...ANI sa Barangay) is a daily activity of the CENRO personnel wherein vacant lots that is being utilized as mini dumpsite in the barangay is transformed into a more productive area for vegetable gardening.	Barangay Makeover thru KAANIB

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Program/Program/Training	Imple-mented by:	Location (City/Mu-nicipality, Province)	Affiliation	Project/Program/Training Description	Website
Modernong Kwaderno	Municipality LGU	Plaridel, Bulacan	Schools in Plaridel, Bulacan	Modernong Kwaderno is an innovative IEC strategy to catch the attention of the youth regarding effective solid waste management.	Modernong Kwaderno
Carmona Livelihood Center	Municipality LGU	Carmona, Cavite	Samahan ng Nagkakaisang Kababaihan ng Carmona	The CLC is actually found in the CEC which serves as its showroom area for the "eco-Livelihood Programs".	Carmona Livelihood Center
Basura Palit Gamit ATBP	Municipality LGU	Carmona, Cavite	Community	The said program works like the "passbook" system in banks wherein people get compensated with basic commodities, school supplies, and public market tax among others in return for bringing in their recyclables to the MRFs.	Basura Palit Gamit ATBP
Basuranihan	City LGU	City of Santa Rosa, Laguna	Community	BASURANIHAN is an acronym that is derived from the combination of the Filipino words, Basura (Solid Waste) + Bayanihan (Cooperation).	Basuranihan
Basura to Ayuda	City LGU	Pasig City	Brgy. San Antonio, Pasig City	The "Basura to Ayuda" program of BSA also eased some burden on the part of garbage collectors as many residents now segregate their wastes. Before, it took so much effort and time for garbage collectors to segregate the waste of residents.	Basura to Ayuda
Youth Group Recycling Project	City LGU	Cotabato City	Community	The recycling project will provide stay-at-home children and youth a chance to participate in a cause while earning a small amount of money that they can use to buy their school projects.	Youth Group Recycling Project
Recycling Program	Municipality LGU	Tarlac	Tarlac State University	The TSU promotes and established the recycling program in the university by using of non-environmentally acceptable products (NEAPs), following the 3-R approach (Reduce, Reuse, Recycling), proper segregation of waste, disposal of Hazardous Waste by DENR Accredited and adopting vermicomposting (the process by which worms are used to convert organic materials (usually waste) into a humus-like material known as vermicompost.	Recycling Program
Plastic Recycling Program	City LGU	Las Pinas City	Environtech	Plastic recycling program gives livelihood; helps solve lack of chairs and plastic woes. This move has helped provide livelihood while providing solutions to the country's problem on solid waste management and the lack of chairs in public schools.	Plastic Recycling Program

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Program /Program/ Training	**Imple-mented by:**	**Location (City/Mu-nicipality, Province)**	**Affiliation**	**Project/Program/Training Description**	**Website**
Bigas sa Basura Program	City LGU	Muntinlupa City	Brgy. Sucat	The "Bigas sa Basura" program was launched "to encourage Muntinlupeños to recover recyclable materials from waste by incentivizing the practice with rice, the staple food of Filipinos." Every two kilograms of plastic waste were replaced with a kilogram of rice. Residual waste such as plastic bottles and food sachets could be exchanged for rice, the city government added.	Bigas sa Basura Program
Recyclable Mo, Palit Grocery Ko	City LGU	Makati City	MMDA	'Recyclable Mo, Palit Grocery Ko,' allows residents to collect waste with equivalent points duly recorded in their Ecosavers Passbook and trade it into certain grocery items such as canned goods, instant noodles, and rice which can be redeemed during the MMRF Market Day.	Recyclable Mo, Palit Grocery Ko
Waste Minimization Program	Municipality LGU	Benguet	Benguet State University	The aim of the BSU waste management program is to minimize if not totally have a 'zero waste' policy. Minimization in the context of the BSU waste management plan includes the processes of segregation, recycling, re-use, reduction.	Waste Minimization Program
Recycling of PET bottles	City LGU	Batanes	Coca-Cola Philippines	Coca-Cola aims to establish a circular economy for its packaging by collecting clear bottles made from PET (polyethylene terephthalate)—even those produced by other manufacturers—and create a value chain that will make it for these recyclable materials to be collected and recycled. PETValue will also generate more jobs for Filipinos, overall contributing to economic recovery alongside ecological welfare.	Recycling of PET bottles
#BawasBasura by Sari-Cycling	City LGU	Pasig City	Community; Save Philippine Seas; Coca-Cola Philippines	Sari-cycling focuses on institutionalizing waste collection in low-income communities along the Pasig River, which was named as one of the world's most polluted waterways in June 2021.	#BawasBasura by Sari-Cycling
Communal Trash to Cash Bins by Republik Junk	Municipality LGU	Gusa, Cagayan de Oro	Barangay; Save Philippine Seas; Coca-Cola Philippines	Republik Junk, with their tagline "the modern mangangalakal," combines the model of incentivized recycling with outright cash payout and a broad network of recyclable waste-recovery drop off units in the 10 most populous barangays in Cagayan de Oro City, called their Communal Trash to Cash Bins.	Communal Trash to Cash Bins by Republik Junk

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Program /Program/ Training	**Imple- mented by:**	**Location (City/Mu- nicipality, Province)**	**Affiliation**	**Project/Program/Training Description**	**Website**
UGYON: Basura Mo, Manggad Ko	Southland College	Kabankalan City, Negros Occidental	Southland College - Community Outreach Program; Save Philippine Seas; Coca-Cola Philippines	UGYON: Basura Mo, Manggad Ko is a school-based initiative in Kabankalan City, Negros Occidental that aims to increase plastic recycling and upcycling rates through household and architectural products crafted by women in underserved communities.	UGYON: Basura Mo, Manggad Ko
Ecoloop's Cement-for- Trash program	City LGU	Pampanga	Ecoloop; Republic Cement	Through Ecoloop's Cement-for-Trash program, these LGUs received cement, which they can use for environment or social development projects, in exchange for qualified residual plastic wastes. These include waste that cannot be recycled or reused, which is usually plastic packaging such as sachets, plastic cutlery, grocery bags, food packaging, and straws, among others.	Ecoloop's Cement-for- Trash program
Seminar/ Training on Waste Recycling and Crafts Development	School	Dasmarinas, Cavite	De La Salle University - Dasmarinas	A number of seminars and training courses aiming to educate the whole academic community with regard to environmental concerns have been and are still being sponsored by the center.	Seminar/ Training on Waste Recycling and Crafts Development
'Eco-Bahay' Project	City LGU	Brgy. Pili, Calinog, Iloilo	Eco-Youth Philippines	The groundbreaking of the "Eco-Bahay" project for the IP community in Barangay Pili, Calinog, Iloilo. The eco house was built out of plastic bottles stuffed with trash. The Eco-Bahay Project was launched in 2018 in partnership with Eco-Youth Philippines using trash stuffed in plastic bottles as construction materials.	'Eco-Bahay' Project
Trash-to-Cash Program	Municipality LGU	Iloilo City	Public Partner Partnership (PPP) Center of the Philippines	Iloilo City has stepped up its solid waste management campaign through the conduct of the "Trash-to-Cash" project. Residents also traded their recyclable materials for cash by turning them over to junkshops all over the city.	Trash-to-Cash Program

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Program /Program/ Training	Imple-mented by:	Location (City/ Municipality, Province)	Affiliation	Project/Program/Training Description	Website
Helping Hands Products and Services (A Santa Maria Della Strada Livelihood Ministry Project)	Parish	Quezon City	Sta. Maria della Strada Parish	Re-conceptualized in 2015 by the Livelihood Ministry, Santa Maria Della Strada (SMDS) launched its Helping Hands Products project in response to the COVID-19 crisis with the support and kindness of Rev. Fr. Arthur Opiniano. It aims to provide the much-needed sustainable income of the mothers and residents in need of Brgys. Pansol, Kaingin 1 and 2. Its first products are beaded, recycled newspaper and retazo (overrun/excess) fashion accessories. At present, Helping Hands offers utilitarian fashion and every-room-in-the-home accessories, pandemic inspired, fashionably functional masks, and a host of custom-made products that are limited only by the imagination of this dynamic group.	Helping Hands Products and Services
My Basurero	Organization	Pasig City	Basic Environmental Systems and Technologies, Inc	My Basurero is a project by Basic Environmental Systems and Technologies, Inc. that exchanges donated plastic, paper and metal, with cash back points. A kilogram of waste gets "environmental points" that can be used to pay for products from the platform's mobile redemption store or any of partner outlets which include shops selling milk tea, burgers, and other food items. The recyclable waste will be used to create new items such as storage boxes, pails, pots, and laundry baskets. Donors or what the program calls "eco-warriors" can bring their items to the MBE-C Brixton Technology Center in Barangay Kapitolyo, Pasig City and the MBE-C in Quezon City Hall.	My Basurero

D. List of CE Products

List of CE Products									
Name of Business/ Project	**Type of Business**	**Name of Owner**	**Sex of Owner**	**Location (City/Municipality, Province)**	**Product 1**	**Product 1 Description**	**Product 2**	**Product 2 Description**	**Website**
Migliora	Clothing	-	-	City of Manila, Metro Manila	Eco Polo - Regular	"A timeless piece making an impact on our environment. The Eco Polo is an understated but confident choice for any day and activity. Made exclusively from 100percent RPET Fabric, it's soft, easy to care for, and a breeze to style for days on end. RPET Fabric is done by recycling old plastic bottles into high quality and durable, sustainable fabric. Ensuring the smooth feel of cotton for comfort, while solving our plastic problem."	Eco Polo - Cropped	Sleek. Stylish. Sustainable. Meet the durable and breathable Eco Polo which features a cropped fit, suited for a more dynamic styling. Its luxe cotton feel will provide you comfort from your work meetings to your much-needed vacations. It's easy to care for and a breeze to style for days on end. RPET Fabric is done by recycling old plastic bottles into high quality and durable, sustainable fabric. It has a smooth feel of cotton for comfort, while solving our plastic problem."	Migliora PH

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Name of Business/ Project	**Type of Busi-ness**	**Name of Owner**	**Sex of Owner**	**Location (City/Mu-nicipality, Province)**	**Product 1**	**Product 1 Description**	**Product 2**	**Product 2 Description**	**Website**
11th Earth Farm Home Decor	Home Décor	Jesette Fortuno	Female	Camarines Sur	Hand-loomed Beach Towels	All the way from CamSur, 11th Earth Home Decor brings you their eco-friendly collection using upcycled materials ranging from hand-loomed beach towels, handwoven bamboo bags, and home décor crafted by indigent communities in the provinces.	Hand-woven Bamboo Bags	All the way from CamSur, 11th Earth Home Decor brings you their eco-friendly collection using upcycled materials ranging from hand-loomed beach towels, handwoven bamboo bags, and home décor crafted by indigent communities in the provinces.	11th Earth Home Decor
Project DIGDI	Housing	"	Female	Camarines Sur	Self-sustaining resilient housing	The project designed and constructed a self-sustaining, disaster-resilient house made of Recycled Coarse Aggregate Concrete (RCAC) with a clean water system, built-in rainwater catchment facility, aquaponics system, solar-powered radio communication system, domestic liquid waste-treatment system, Mobile Cloud technology, and communal cooking area with a water heater.			https://ccar2. wordpress. com/2021/06/29/ project-digdi-ccarph-adnu-ce-collaboration-for-institutionalization/

List of CE Products									
Name of Business/ Project	**Type of Business**	**Name of Owner**	**Sex of Own- er**	**Location (City/Mu- nicipality, Province)**	**Product 1**	**Product 1 Description**	**Product 2**	**Product 2 De- scription**	**Website**
Precious Plastic Philippines	- Contruction Materials - Furnitures - Household Goods	Khim Cathleen Saddi"		Antipolo City	Lumber	Lumber made from 100percent post-consumer recycled plastic	Furniture	Make exquisite furniture pieces for all your needs. Chairs, stools, shelves, and more. Everything is not only possible, but impossibly beautiful.	Precious Plastic
Bukidnon Plastic Recycling Center	Insufficient Data								
Citizen Watch Philippines	Insufficient Data								https://www. facebook.com/ CitizenWatchPhilippines/
The Plaf	- Contruction Materials - Furnitures - Household Goods		Male	Muntinlupa City, Metro Manila	Eco Lumber	"Our eco- lumbers are very durable, which make them an ideal construction material. Especially in the tropics, our lumber can be exposed without losing its properties which make them suitable for your outdoor projects!"	Furniture	Our products are made 100percent out of recycled plastic waste. They are recyclable, which means we can shred them and put them back into our recycling process to be turned into our products, if needed, again!	The Plaf

List of CE Products

Name of Business/ Project	Type of Business	Name of Owner	Sex of Owner	Location (City/Municipality, Province)	Product 1	Product 1 Description	Product 2	Product 2 Description	Website
Papemelroti	- Stationary - Household Goods	Francois Lesage	Female	Quezon City, Metro Manila	Rectangular Ring Scrapbook	Record personal memories and milestones by decorating this eco-friendly Papemelroti scrapbook. Also, great to use as a journal or sketchbook.	Dogs Kraft Notepads	Make a note or jot down reminders in this handy, eco-friendly Papemelroti notepad which features a whimsical illustration of dogs. Great to use yourself or to give as a gift to a dog lover.	Papemelroti
EnviroTech Waste Recycling	- Contruction Materials - Furnitures	Socorro Alviola Alejandro	Male	Davao City, Davao Del Sur	Bricks	Plastic wastes will be segregated, shredded, and melted, ready to be transformed into a useful material.	Furniture	Melted plastic wastes will be molded, pressed, and assembled into new products such as chairs, pots, and other beneficial items.	EnviroTech
Bag-O Plastic Products	- Bags - Wallets	Winchester Lemen	Female	Bago City, Negros Occidental	Bags	Our products are individually handmade from 100percent recycled plastic bags. They are crocheted and creatively made into coin purses, wallets and sling-, hand- and shoulder-bags. Other styles may be requested for custom order. Every Bag-O Plastic crochet artist receives the majority of the profit from each bag they sell.	Wallets	Our products are individually handmade from 100percent recycled plastic bags. They are crocheted and creatively made into coin purses, wallets and sling-, hand- and shoulder-bags. Other styles may be requested for custom order. Every Bag-O Plastic crochet artist receives the majority of the profit from each bag they sell.	Bag-O Plastic

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Nora's Gown and Costumes Rental	- Gowns -Dress -Costumes	Group of Women	Female	Cainta, Rizal	White Gown	Made out of plastic bags and plastic spoons	Costume	Made out of sack of rice and plastic straws	[Nora's Costume and Gowns](#)
Green Antz	-Contruction Materials	Nora Buenviaje	Male	Plaridel, Bulacan	EcoBricks	Lego configured building blocks for housing	Ecohub	Full service ecohubs to process trash	[Green Antz](#)
Remdavie	- Home Organizers - Bags	Rommel Benig	Female	Los Baños, Laguna	Bags	The exquisitely handwoven and environment-friendly bags, a product of Los Baños, are made from water hyacinth stalks, a natural nuisance along the Laguna Lake area.	Home Organizers	100percent Handmade, made out of multistage processed water hyacinth stalks, and varnished	[Remdavies](#)

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Tela	Clothing	Remia V. Adedoja	Female	City of Manila, Metro Manila	Dresses and Jumpsuits	Our zippers are certified by the Global recycled standard. They are made out of recycled plastic bottles. Our handcrafted buttons are made from production offcuts. Our locally sourced fabrics are handwoven by local communities. We send our production offcuts to them to hand-weave into new fabrics again. To keep up with the latest fabric innovations, we source our environmentally friendly fabrics from trusted suppliers globally as well. Some of these fabrics include: Tencel™, Linen, GOTS certified Organic Cotton.	Tops, Bottoms, and Jackets	Our zippers are certified by the Global recycled standard. They are made out of recycled plastic bottles. Our handcrafted buttons are made from production offcuts. Our locally sourced fabrics are handwoven by local communities. We send our production offcuts to them to hand-weave into new fabrics again. To keep up with the latest fabric innovations, we source our environmentally friendly fabrics from trusted suppliers globally as well. Some of these fabrics include: Tencel™, Linen, GOTS certified Organic Cotton.	Tela

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The Plastic Flamingo Plastic Recyclers	- Container -Indoor Furtniture -Outdoor Furniture	Alyssa Lagon	-	Putatan, Muntinlupa	Eco Boards	The Plaf's recycled products are ideal for low-load bearing applications such as outdoor furniture, decking and fencing. They are made 100percent from recycled plastic waste and are very durable, rot- and splinter proof and termite free. They are non-structural grade, and The Plastic Flamingo cannot be taken responsible for any accident caused by the use of products in structural applications without proper reinforcements. Please take note that the given dimensions can deviate slightly due to shrinkages and that the available colors are indications but might be different as we are working with plastic waste materials.	Pellets	The Plaf's recycled products are ideal for low-load bearing applications such as outdoor furniture, decking and fencing. They are made 100percent from recycled plastic waste and are very durable, rot- and splinter proof and termite free. They are non-structural grade, and The Plastic Flamingo cannot be taken responsible for any accident caused by the use of products in structural applications without proper reinforcements. Please take note that the given dimensions can deviate slightly due to shrinkages and that the available colors are indications but might be different as we are working with plastic waste materials.	The Plaf

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Name of Busi-ness/ Project	Type of Business	Name of Owner	Sex of Owner	Location (City/Mu-nicipality, Province)	Prod-uct 1	Product 1 Description	Prod-uct 2	Product 2 Description	Website
Helping Hands Products and Services	-Bags and carriers -Crochet Products -Mask	Plaf team	-	Katipunan Ave, Quezon City	Bags and carriers	Its first products are beaded, recycled newspaper and retazo (overrun/excess) fashion accessories. At present, Helping Hands offers utilitarian fashion and every-room-in-the-home accessories, pandemic inspired, fashionably functional masks and a host of custom-made products that are limited only by the imagination of this dynamic group.	Mask	Its first products are beaded, recycled newspaper and retazo (overrun/excess) fashion accessories. At present, Helping Hands offers utilitarian fashion and every-room-in-the-home accessories, pandemic inspired, fashionably functional masks and a host of custom-made products that are limited only by the imagination of this dynamic group.	Helping Hands Products and Services

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Eco Hotel	Hotel; Restaurants	Sta. Maria della Strada Parish	-	Katipunan Ave, Quezon City	Bags and carriers	t uses different methods to stay green, each property is unique from the other. For example, it upcycles, reuses, and redesigns old furniture and materials for disposal in the locality (ex. Bottles, scrap wood, excess factory wastes, shredded single use plastic). Meanwhile, household and industrial excess, with the help of local artists, in-house creative employees, and local charities are converted into re-useable items. The façade is made from home-made bricks. Beds and furniture are made from paletas and re-useable steel. Sustainable wood or secondhand lumber is seen in all its furniture and interiors. Artwork from recycled wood, artwork from old tires, literally-what was garbage to others, was turned into gold. Empty bottles were converted into light fixtures, and wall ornaments. Natural lighting was maximized, good air cross ventilation, solar powered on grid, rainwater catchment used for the herb garden maintenance. All existing trees were identified and preserved	Mask	It uses different methods to stay green, each property is unique from the other. For example, it upcycles, reuses, and redesigns old furniture and materials for disposal in the locality (ex. Bottles, scrap wood, excess factory wastes, shredded single use plastic). Meanwhile, household and industrial excess, with the help of local artists, in-house creative employees, and local charities are converted into re-useable items. The façade is made from home-made bricks. Beds and furniture are made from paletas and re-useable steel. Sustainable wood or secondhand lumber is seen in all its furniture and interiors. Artwork from recycled wood, artwork from old tires, literally-what was garbage to others, was turned into gold. Empty bottles were converted into light fixtures, and wall ornaments. Natural lighting was maximized, good air cross ventilation, solar powered on grid, rainwater catchment used for the herb garden maintenance. All existing trees were identified and preserved.	Helping Hands Products and Services

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Eco Hotel	Hotel; Restaurants	Sta. Maria della Strada Parish	Male	Dona Consolacion Building 122 Jupiter Street, Bel-Air 1200 Makati City Metro Manila	Home-made bricks; Paletas and Re-useable steel; Recycled wood, artwork from old tires; Empty bottles	It uses different methods to stay green, each property is unique from the other. For example, it upcycles, reuses, and redesigns old furniture and materials for disposal in the locality (ex. Bottles, scrap wood, excess factory wastes, shredded single use plastic). Meanwhile, household and industrial excess, with the help of local artists, in-house creative employees, and local charities are converted into re-useable items. The façade is made from home-made bricks. Beds and furniture are made from paletas and re-useable steel. Sustainable wood or secondhand lumber is seen in all its furniture and interiors. Artwork from recycled wood, artwork from old tires, literally-what was garbage to others, was turned into gold. Empty bottles were converted into light fixtures, and wall ornaments. Natural lighting was maximized, good air cross ventilation, solar powered on grid, rainwater catchment used for the herb garden maintenance. All existing trees were identified and preserved.	Façade; Beds and furniture; Artwork; Light fixtures, and wall ornaments	It uses different methods to stay green, each property is unique from the other. For example, it upcycles, reuses, and redesigns old furniture and materials for disposal in the locality (ex. Bottles, scrap wood, excess factory wastes, shredded single use plastic). Meanwhile, household and industrial excess, with the help of local artists, in-house creative employees, and local charities are converted into re-useable items. The façade is made from home-made bricks. Beds and furniture are made from paletas and re-useable steel. Sustainable wood or secondhand lumber is seen in all its furniture and interiors. Artwork from recycled wood, artwork from old tires, literally-what was garbage to others, was turned into gold. Empty bottles were converted into light fixtures, and wall ornaments. Natural lighting was maximized, good air cross ventilation, solar powered on grid, rainwater catchment used for the herb garden maintenance. All existing trees were identified and preserved.	Eco Hotel