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FACILITATING TRADE AND INVESTMENT IN SUSTAINABLE MATERIALS MANAGEMENT SOLUTIONS IN THE APEC REGION:

*Promoting an Enabling Regulatory
Environment*

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ACRONYMS

3Rs	Reduce, Reuse, Recycle
APEC	Asia-Pacific Economic Cooperation
ARCAM	APEC Regulatory Cooperation Advancement Mechanism
CCME	Canadian Council of Ministers of the Environment
CTI	Committee on Trade and Investment (APEC)
EGS	Environmental Goods and Services
EPR	Extended Producer Responsibility
MSW	Municipal Solid Waste
IPR	Intellectual Property Rights
NTB	Non-Tariff Barrier
OECD	Organisation for Economic Co-operation and Development
PPEGS	Public-Private Partnership on Environmental Goods and Services (APEC)
RE	Renewable Energy
SMM	Sustainable Materials Management
SOM	Senior Officials Meeting (APEC)
UN	United Nations
UNEP	United Nations Environment Programme
USAID	U.S. Agency for International Development
US-ATAARI	US-APEC Technical Assistance to Advance Regional Integration

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EXECUTIVE SUMMARY

Among its 21 member economies, about 2.8 billion people live in the Asia-Pacific Economic Cooperation (APEC) forum's region, which accounts for 38 percent of the global population. The APEC region represents about 57 percent of the world's GDP, and since the founding of APEC in 1989, APEC citizens have seen their per capita income rise by at least 45 percent. However, such significant gains in regional economic development are met with their own challenges.

Increases in trade, economic growth, and development oftentimes result in rapid urbanization, exacerbating existing waste management deficiencies in cities and creating peripheral effects in marine debris accumulation. The United Nations Development Program estimates that more than five million people die each year from diseases related to inadequate waste management systems. The global cost of managing this waste is also rising, estimated to grow from \$205 billion per year in 2010 to \$375 billion by 2025, with the sharpest cost increases in developing economies. By one estimate, the world is on pace to generate 11 million tons of waste each day by 2100 (Hoorweg, Bhada-Tata, and Kennedy 2013).

In response to these estimates and recognizing the gains that could be made to improve waste management in APEC, in 2016 economies launched an initiative under the APEC Regulatory Cooperation Advancement Mechanism (ARCAM) to facilitate trade and investment in Sustainable Materials Management (SMM) Solutions (i.e. source reduction, recycling, composting, waste-to-energy). Through this study, APEC aims to lay the groundwork to determine how the region can best address barriers to trade in SMM solutions and prioritize actions for further work by APEC economies.

The scope of this study is targeted: identify barriers to trade and investment embedded within economies' definitions of key SMM terms, and recommend solutions to those barriers. A survey circulated to economies via the Committee on Trade and Investment (CTI) to collect data on domestic economy-wide definitions for key SMM-related terms and their sources was met with an impressive 86 percent response rate, signaling considerable regional interest in this topic.

The survey data was catalogued and analyzed for trade- and investment-impacting characteristics. Numerous stakeholder interviews supplemented the survey data, articulating public and private sector experiences with barriers to trade and investment in SMM solutions in APEC. Through these interviews (which are referred to as "case studies" throughout the report), this research is able to ground the analysis in reality—demonstrating "real world" barriers facing the APEC SMM community.

Stakeholder consultation and the analysis of definitions identified four trade and investment barriers rooted in economies' official definitions of SMM terms. First, the research team was advised on multiple occasions that the existence of 21 diverging definitions of SMM terms across all APEC economies—plus divergences in provincial or state-level definitions—create impediments to investment. Conversely, the second barrier is a lack of definitions. In some economies analyzed, official definitions do not exist for key SMM terms, especially for nascent industries like waste-to-energy. The lack of official definitions can similarly contribute to a confusing regulatory environment, creating impediments to investment. As a result of this study, Annexes B and C of this report contain 18 economies' official definitions of six key SMM terms, if such a definition was provided in a survey response or otherwise exists in English in the public

domain. Such a cataloguing exercise, to the research team's knowledge, has never before been made accessible to public and private sectors within APEC.

Third, policy instruments like local equity and local content requirements - which can be triggered by characteristics in SMM definitions - can deter foreign investment when applied to SMM solutions, denying APEC economies access to optimal technologies with which to address waste management challenges. Fourth, the exclusion of waste from qualified renewable energy sources can render waste-to-energy providers ineligible for policy incentives like Feed-in Tariffs and Renewable Energy Standards, which can support the market for SMM solutions. The Key Observations section addresses these barriers, and provides specific recommendations on how to amend definitions to eliminate the trade-impacting characteristics of economies' definitions.

Though stakeholder consultations indicated that definitions of key SMM terms were not the primary source of barriers for companies engaged in trade and investment in SMM solutions in APEC, stakeholders did identify other, non-tariff barriers which hindered market growth, which could hold potential for future research. Among these other barriers were issues like the relative cost of landfilling versus other, more sustainable waste management technologies; access to quality feedstock for SMM operations; extended producer responsibility agreements, and take-back arrangements as policy tools which interfere in the free market for recyclable materials; supply chain monopolies hindering providers from market access; and inadequate intellectual property rights protections for SMM technologies.

By addressing these definition-related barriers to trade and investment in SMM solutions, and engaging in additional research in other barriers identified in this report, APEC can help facilitate trade and investment in these solutions, allowing SMM markets across the Asia-Pacific to grow and flourish; markets which will be well-equipped to address today's waste management deficiencies and prevent tomorrow's.

RECOMMENDATIONS TO APEC ECONOMIES

Based on substantive stakeholder consultation, responses received to the ARCAM survey, and the accompanying analysis, the following section puts forth a set of key observations to promote trade and investment in SMM solutions (technologies and services) for APEC member economies and articulates opportunities for APEC to continue to develop their waste management regulatory frameworks¹:

- 1) Establish official definitions for key SMM terms in domestic law where there are none. Engage all relevant ministries and departments & consider the use of public consultation mechanisms to formulate and develop SMM definitions to ensure private sector stakeholder buy-in.
 - Establishing official definitions signals to investors that the basis for a regulatory framework is developed, attracting investment in SMM solutions and technologies. Economies should consult and consider all relevant stakeholders in the development of official definitions. This recommendation directly corresponds to stakeholder feedback regarding definitional gaps and divergences in economies' regulatory frameworks as a barrier for trade and investment.
- 2) Exclude Waste (incl. MSW & Household Waste) from economy-level definitions of Natural Resources. Ensure that local equity and content requirements are discouraged in SMM trade and investment activities to the maximum extent practicable.
 - Ensuring that local equity requirements are excluded from SMM investment activities will remove some barriers to foreign direct investment. Economies could take one step further, to ensure that in addition, local content requirements are excluded from regulations pertaining to trade in SMM technologies. This move could open potential trade relationships and ensure a competitive economy for SMM technologies.
- 3) Include Biomass and MSW as sources of Renewable Energy.
 - Including biomass and MSW as sources of renewable energy could make SMM technology providers eligible for local policy incentives, such as feed-in-tariffs (FITs) and renewable energy standards (RESs), in economies where these incentives exist. Economies should consider including each of these renewable energy sources separately under their renewable energy laws/regulations to avoid confusion. Attracting foreign and domestic investment in renewable energy solutions could assist economies achieve green growth and develop viable alternative energy markets.

¹ These recommendations have been put forward for consideration by the study authors and should not be taken to indicate APEC-wide endorsement of these recommendations.

- 4) Include a catch-all phrase or a non-exclusive list of Renewable Energy sources within the official definition.
 - Developing alternative energy markets requires allowing new technologies to grow. Including a catch-all phrase or a non-exclusive list of renewable energy sources can allow new technology providers to access the same incentives (e.g. FiTs) as existing technology providers by ensuring regulatory bodies can adjust lists of qualifying sources of renewable energies without pursuing changes in the legislation of member economy governments.
- 5) Consider how state- or provincial-level definitions of key SMM terms in an economy, if any, may pose barriers to trade and investment.
 - The existence of many state- or provincial-level definitions, which may contrast with each-other, can contribute to a confusing regulatory environment for investors, who may wish to establish operations in more than one state or province across an economy. In particular, contrasting state- or provincial-level definitions and an overarching economy-level definition may prove to be an impediment to compliance with federal and state/provincial regulations.

BACKGROUND

In 2011, APEC Leaders committed to a series of concrete steps to enhance trade and investment in environmental goods and services (EGS). While chief among these was a commitment to reduce tariffs on environmental goods by the end of 2015, another was to “promote regulatory coherence and cooperation in areas affecting environmental goods” (APEC 2011). As a part of this commitment, APEC economies have reduced import duties to 5 percent or less on 54 environmental goods; the organization’s first and only multilateral tariff-cutting arrangement. The reductions are projected to promote trade worth about US\$300 billion within the region and US\$500 billion worldwide (Buxbaum 2016).

To ensure continuity on EGS issues, in May 2014 APEC launched the Public-Private Partnership on Environmental Goods and Services (PPEGS) to “promote dialogue among public and private sector stakeholders on ways to address trade and investment in EGS with a view to achieving green growth and sustainable development in the APEC region.” The first PPEGS Dialogue, held in August of that same year, allowed for a constructive exchange between private sector and government representatives on opportunities to improve trade and investment in the clean and renewable energy sector. Following this dialogue, APEC economies approved a terms of reference for the PPEGS, which recognized the group as an appropriate platform to discuss the reduction of non-tariff barriers (NTB) to trade in EGS. The Second PPEGS Dialogue, held in 2015, reunited the private and public sectors to showcase best practices and discuss how non-tariff barriers to trade in EGS had been successfully addressed in the APEC region.

The outputs and feedback from these dialogues formed the basis for the **ARCAM Initiative to Facilitate Trade and Investment in SMM Solutions**, launched in 2016 through the APEC Committee on Trade and Investment (CTI). In May 2016, under the scope of ARCAM, the United States’ US-ATAARI program circulated an APEC-wide survey to catalogue member economies’ regulatory or official definitions, or both, for key SMM-related terms (waste; recyclable material; natural resource; biomass; renewable energy; and waste-to-energy or energy-from-waste).

To review initial findings of the survey and continue to collect stakeholder input, the U.S. led a one-day *ARCAM Dialogue on Facilitating Trade and Investment in SMM Solutions* held in August 2016 in Lima, Peru. APEC officials from relevant ministries and private sector representatives were invited to discuss issues related to trade and investment in SMM solutions. After this initial public-private sector dialogue, the research team reached out to an additional group of stakeholders to solicit supplemental case studies on the subject. Additionally, the research team performed desk research to fill in definitions of key SMM terms that were not identified by members in their survey responses. Finally, in an acknowledgement that definitions alone do not necessarily encompass an economy’s entire regulatory framework for SMM, economies were asked to submit any additional context they believed germane for analysis. This report encompasses the last phase of the initiative, and will be brought for endorsement by economies at SOM II in May 2017. Using the data collected through the survey, supplemental desk research, and stakeholder consultations, this report analyzes the extent to which economy definitions pose barriers to trade and investment in SMM solutions, and highlights key observations that may assist economies as they continue to develop their waste management related regulatory frameworks.

ARCAM SURVEY & RESEARCH METHODOLOGY

The scope of the APEC survey—and this resulting study—was narrow, focusing only on the official definitions of the identified key SMM terms. Most of the data used for this analysis was provided through the survey responses, supplemental desk research, and private sector consultation.

In May 2016, US-ATAARI circulated an open-response type survey² to all 21 APEC economies via CTI. The survey sought information on APEC members' definitions of key SMM terms, which could inform an analysis of the divergences in those definitions and allow for the assessment of potential barriers to trade and investment in SMM-supportive technologies and solutions.

The primary component of the survey requested that APEC members provide (1) official, working, or regulatory definitions to key SMM terms and (2) the sources of those definitions. The key SMM terms included in the survey are as follows:

- Waste, also further defined as:
 - Municipal Solid Waste (MSW), or
 - Household waste,
- Recyclable materials,
- Natural resources,
- Biomass,
- Renewable energy, and
- Waste-to-energy or energy-from-waste.

In addition to the key definitions, the survey collected basic respondent information (name, title, organization or institution, economy, contact information, etc.) of public sector officials responsible for SMM-related regulatory oversight and the promotion of SMM solution deployment.

The survey also asked the respondent to identify public sector or government offices that (1) serve as leads on policy issues related to SMM or (2) promote trade and investment for SMM technologies. Further, the survey asked economies to provide any examples of difficulties in trade and investment related to SMM technologies, products, and services. It also specifically asked if member economies experienced any such difficulties or obstacles to trade and investment owing to differing concepts or understanding of SMM trade definitions. Lastly, the respondents were able to provide any additional comments at the end of the survey.

After the survey responses were submitted to the research team, the team engaged in desk research to supplement the economies' official submissions and fill in any data gaps resulting from the survey responses. In early 2017, economies were invited to submit any additional context on their SMM regulatory environments that may prove germane to the research.

In order to demonstrate “real world” examples of how economies' official definitions may pose barriers to trade and investment in SMM solutions and technologies, the research team reached out to APEC industry stakeholders to solicit case studies. These case studies identified characteristics (e.g. inclusion or exclusion of potentially recyclable material in the definition of waste) and triggers (e.g. local equity requirements) included in or associated with economies'

² A copy of the survey template, as well as responses received, are included as Appendices A and B, respectively.

definitions that have caused impacts on trade and investment in SMM solutions. These characteristics then served as the basis of analysis for each economy's official definition, included in this report.

The original survey is included in Annex A and the responses to the survey are included in Annex B. Qualitative data from stakeholder consultations, both case studies used in this research and topics raised by stakeholders, which could provide a basis for future research, is included in the body of this report.

Limitations to Data Completeness

An overarching limitation of this study is that definitions alone do not reflect an economy's entire regulatory framework. For example, economies without an official definition for waste-to-energy may indeed have a robust policy framework for incentivizing investment in waste-to-energy. However, due to the limited scope of this report, only an economy's definitions for the key terms were considered as germane to the analysis. Additionally, this study focused on economy-level definitions, while sub-economy wide definitions may also be useful in understanding the breadth of an economy's regulatory framework. Furthermore, an SMM term may be defined differently within multiple laws from a single economy depending on the scope or purpose of the laws. But, this study focused on the definitions provided by economies in the survey responses and does not include an exhaustive review of every law in which any of the SMM terms may be defined.

Secondly, there was a notable lack of publically available data in English for the economies' relevant legislation, regulation, or standard. Where relevant sources were not available in English, the research team was unable to verify or supplement survey responses.

Thirdly, quality of survey participation contributed to data gaps. Of the 21 APEC economies, three economies chose not to participate. Additionally, in response to the call for additional regulatory context issued early in 2017, only two economies submitted additional information pertaining to their existing or recently developed SMM regulations.

INTRODUCTION TO SMM

SMM is regarded as a whole-of-economy approach that recognizes the benefits of planning for reuse and efficient re-purposing of materials from the start of the design phase. SMM employs a diverse set of policy instruments, regulations, and incentives, and it requires a high degree of coordination among various domestic ministries and private and public stakeholders. Applying SMM principles to policy development can profoundly benefit the economy, human health, the environment and employment, as well as mitigate resource security concerns (OECD 2012b).

Managing waste that results from domestic economic and industrial activity is recognized by most APEC economies as a priority in their budgets, planning, and to a growing degree, their policy frameworks. With growth in low- and medium-income economies' GDPs and increasing rates of population growth and urbanization, average per capita production of solid waste is on the rise. As economies become affluent, it becomes increasingly urgent to address the efficient, effective management of resultant increases in waste.

In 2012, it was estimated that globally, cities generated 1.3 billion tons of solid waste per year, and this figure is projected to almost double by 2025 (Hoorweg and Bhada-Tata 2012). The World Bank estimates that the world's cities will generate 4 billion tons of MSW per year by 2100 (Hoorweg, Bhada-Tata, and Kennedy 2013). Costs to manage this surge in solid waste are also increasing, and are estimated to be about US\$275 billion per year in 2025. Hoorweg, Bhada-Tata and Kennedy also claim that trash collection and management services are currently the largest budget items of municipalities in lower income economies, and projected cost increases will be more severe as efforts are made to scale up MSW waste systems and infrastructure (2013).

The mismanagement of solid waste impacts the local environment as well as the global environment. Locally, uncollected waste can lead to flooding and to air and water pollution, and is a leading cause of respiratory illnesses, diarrhea, and dengue fever. Globally, solid waste contributes to methane emissions, a powerful pollutant, as well as growth in marine debris. A report by the World Bank found that the downstream economic and social costs of improperly managed solid waste are more expensive than the cost of implementing proper management plans in the first place (Hoorweg and Bhada-Tata 2012).

Waste management is a concern for all APEC economies, and given its recent successes in reducing tariff barriers for environmental goods, APEC is uniquely positioned to facilitate a trade environment in which SMM solutions flourish. Through the promotion of SMM solutions and technologies, APEC economies can jointly advance toward a future in which pollution is mitigated, and which sees the more efficient use and reuse of materials along their life cycles.

Global Trends in SMM Policy

The sustainable management of material and product streams has received increasing attention from global institutions, regional organizations, and economies during the past 30 years. From once having had a tentative space on meeting agendas, it is now recognized as a priority in international forums. Under various labels such as *resource efficiency* (UN Environment Programme); *SMM* (OECD); and the *Green Economy* (Rio+20 Conference), the SMM approach to managing material and waste streams continues to evolve as more research is produced and SMM is integrated into waste management policies.

SMM can enhance GDP growth while simultaneously mitigating environmental degradation and addressing the issue of resource security. Recent research and SMM policies implemented by various economies highlight key trends in SMM. Before looking at the current regulatory environment in APEC, it is instructive to note these key policy principles.

A Life-Cycle Approach

A core principle of the SMM approach emphasizes early life-cycle design and planning (i.e., up-stream policies) for managing material flows. With better design and planning, the amount of material used in providing goods and services can be reduced without reducing value. For example, lightweight engineering of steel beams and other building materials has the potential to reduce the total amount of material needed in building construction by half, without impacting strength or safety (Allwood 2012). Reducing inputs at the beginning of material life cycles and utilizing recovered materials whenever possible can reduce costs significantly, improve competitiveness, and mitigate the need to deal with environmental impacts resulting from the extraction and use of those materials. Designing products from the beginning with recycling and material recovery in mind can also lead to large economic and environmental benefits.

Japan has provided leadership in this area through its promotion of its 3R strategy for building a “sound-material-cycle society” through a focus on *Reduce, Reuse and Recycle*.³ The focus of the strategy is on up-stream, beginning of life-cycle design and planning for efficient use of resources and materials. This strategy incorporates a comprehensive suite of policies aimed at the whole life-cycle of materials. To this end, the government has brokered numerous extended producer responsibility (EPR) agreements in which producers take on some of the cost for downstream, end-of-life recovery, reuse, and recycling of products (Yamakawa 2013).

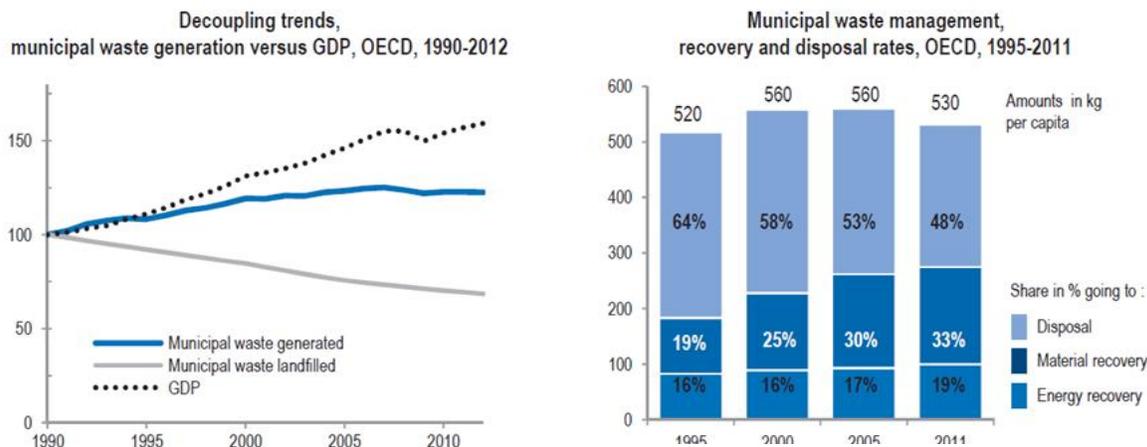
Materials Extraction: Decoupling Economic Growth and Natural Resource Use

While conventional wisdom maintains that strong GDP growth requires an increased use of materials for production (and as a consequence, increased solid waste generation), the medium-term effects of sound SMM policies in OECD members have shown a decoupling of GDP growth from the rate of solid waste generation in the past decade. In other words, there has been a change in the historical relationship between municipal waste generation and GDP growth.

³ The 3R Initiative aims to promote the “3Rs” (reduce, reuse and recycle) globally to build a sound-material-cycle society through the effective use of resources and materials. It was finalized at the Group of 8 Sea Island Summit in June 2004 as a new initiative. See <https://www.env.go.jp/ recycle/3r/en/outline.html>.

Figure 1

Trends in municipal waste, OECD

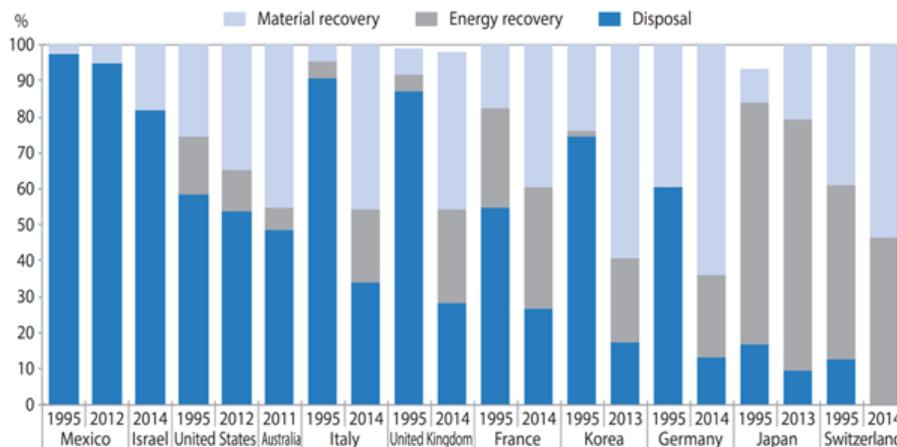


Source: Peter Borkey, OECD Environment

In Figure 1, the trajectory of GDP growth increases, while MSW remains relatively constant. Further analysis shows that as OECD members deployed policy instruments that promote energy recovery (e.g., waste-to-energy technologies) and material recovery (e.g., upstream recycling, product design, and public information and incentives), significant economic and competitiveness gains have accrued. Total waste generated per capita is falling, and the share of solid waste ending up in landfills shrank from 64 percent in 1995 to 48 percent in 2011.

Figure 2 highlights the successes of economies who have taken advantage of SMM policy approaches, and the potential transformations of energy and material recovery.

Figure 2: Impact of SMM Approach in Selected OECD Members, Selected Years



Source: Peter Borkey, OECD Environment Directorate.

DEFINITIONS OF KEY SMM TERMS IN THE APEC REGION

KEY GAPS AND DIVERGENCES IN APEC DEFINITIONS

Inconsistent definitions of SMM-related terms across economies create a confusing regulatory landscape for SMM solution providers, which can hinder regional trade and investment in SMM solutions. This section focuses on the gaps and definitional divergences among APEC economies for several of the SMM terms included in the survey.

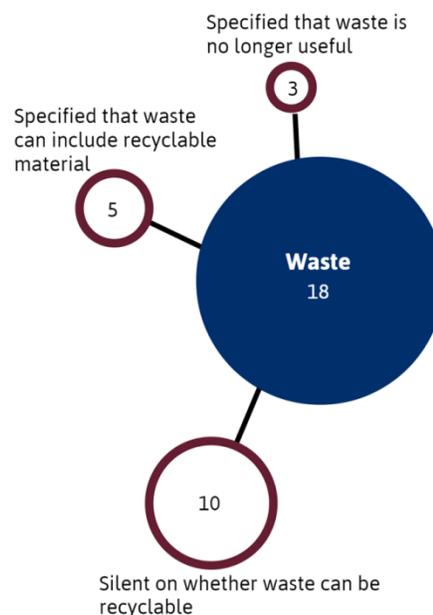
The survey results, as supplemented by US-ATAARI desk research, indicate that definitions for SMM-related terms differ across APEC economies in ways that could impact trade and investment in SMM solutions. To varying degrees based on the term being analyzed, the definitions diverge in terms of being incorporated into a law -as opposed to being an official definition that is not necessarily binding and potentially more easily revised - as well as the breadth or scope of the activities described in the definition. The following section describes the data collected for each SMM term included in the survey.

The data collection can be classified in two ways: data included in economies' survey responses; and data identified through supplemental desk research. This section identifies divergences in definitions, focusing on specific language or characteristics that are included or excluded from definitions that could impact trade and investment in SMM solutions. Visuals of each analysis accompany the narrative in this section. The relative sizes of each circle in the system correspond to the number of economies that have established definitions for each SMM term. The connected circles represent characteristics of the term's definition, and the relative frequency with which an economy's definition exhibits that characteristic. For ease of reference, each circle contains the number of how many economies have a definition, or how many economies' definitions exhibit the analyzed characteristic. A complete visual of all terms and characteristics can be found at the end of the analysis.

See Appendix B for a complete accounting of the definitions reviewed for this study.

Waste

A definition of waste was provided by all 18 survey respondents, and supplemental desk research identified 2 additional definitions in certain economies' regulatory frameworks not previously identified in the economies' survey results. A binding definition⁴ of waste was provided or otherwise identified through desk research for 17 economies. Key divergences in the definition of waste include:



⁴ For the purposes of this report, "binding definition" means a definition that is incorporated in legislation, regulation, or executive order.

- Use of language indicating that waste includes materials that can be recycled.

Of the 18 economies that provided a definition of waste, the definitions from 5 economies (Australia; Canada; Malaysia; Singapore; and the United States) include language that indicate that waste could include discarded material that could be recycled. The definitions from Australia, Canada, and the United States include the term recycle and the definitions from Malaysia and Singapore include the term scrap material.

For example, the definition provided for the State of New South Wales in Australia specifies that waste includes the following:

“(a) any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment, or

(b) any discarded, rejected, unwanted, surplus or abandoned substance, or

(c) any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance, or

(d) any processed, recycled, re-used or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations, or

(e) any substance prescribed by the regulations to be waste.

A substance is not precluded from being waste for the purposes of this Act merely because it is or may be processed, recycled, re-used or recovered” (emphasis added).

In contrast, the Philippines’ definition of waste does not indicate that waste includes materials that could be recycled, stating “Waste - means any material either solid, liquid, semisolid, contained gas or other forms resulting from industrial, commercial, mining or agricultural operations, or from community and household activities that is devoid of usage and discarded.”

- Explicit specification that waste is no longer useful.

Of the 18 economies that provided a definition of waste, the definitions from 3 economies (Republic of Korea; the Philippines; and Thailand) explicitly specified that waste is a material that is no longer useful.

For example, The Republic of Korea’s definition of waste states that “The term “wastes” means such materials as garbage, burnt refuse, sludge, waste oil, waste acid, waste alkali, and carcasses of animals, which have become no longer useful for human life or business activities” (emphasis added). In contrast, Viet Nam’s definition states that “Waste means any matter in a solid, liquid or gaseous state which is discharged from manufacturing, business, services or living activities or from other activities,” and does not include language clarifying that the material is necessarily no longer useful.

Recyclable Materials

A definition of recyclable materials was provided by 11 survey respondents, and supplemental desk research identified one additional definition. Of the 12 economies for which a definition was reviewed, a binding definition of recyclable materials was provided or otherwise identified through desk research for 10 economies. The key divergences in the definition of recyclable material include:

- Explicit specification that recyclable materials are a form of waste.

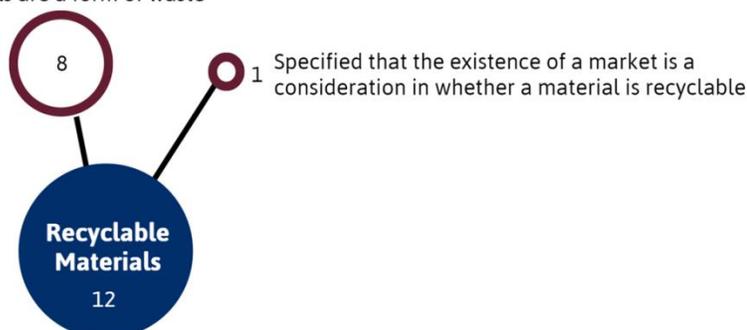
Of the 12 economies for which a definition of recyclable materials was reviewed, the definitions from 8 economies (China; Indonesia; Malaysia; Mexico; the Philippines; Singapore; and the United States) identify recyclable materials as a waste or describe the relationship between recyclable materials and the waste stream.

For example, the definition provided by China describes recyclable materials as “Waste suitable for recycling and resource utilization, e.g. waste paper, waste glass, waste plastic, waste metal, waste fabric and waste bottles and cans” (emphasis added). Or, the Philippines’s definition states “Any waste material retrieved from the waste stream and free from contamination that can still be converted into sustainable beneficial use or for other purposes, including but not limited to, newspaper, ferrous scrap metal, used oil, corrugated cardboard, aluminum, glass, office paper, tin cans and other materials as may be determined by the [National Solid Waste Management Waste] Commission” (emphasis added). In contrast, Japan’s definition does not describe recyclable materials as waste or directly link them to the waste stream, stating that “Recyclable Resources shall mean such used products, etc. or by-products that are useful and are available or can be made available as raw materials.”

- Explicit specification that the existence of a market is a consideration in whether a material is recyclable.

One definition was provided in which the existence of a market for a recycled material has to exist for the material to be considered recyclable. Specifically, the definition provided by Chinese Taipei describes recyclable materials as “Substances that have lost their original usefulness are economically and technologically feasible to recycle, and may be recycled or reused as announced or approved by this Act” (emphasis added).

Explicitly specified that recyclable materials are a form of waste



Natural Resources

A definition of natural resource was provided by 7 survey respondents, and supplemental desk research identified 2 additional definitions. Of the 9 economies for which a definition of natural resource was reviewed, a binding definition of natural resource was provided or otherwise identified through desk research for 8 economies. No divergence in the definitions of natural resources was identified that could impact trade and investment in SMM solutions. However, stakeholder consultation did indicate that other policies related to how an economy regulates its natural resources can impact trade and investment in SMM solutions.

For example, the Philippines interprets the term natural resource to include MSW as described in the following portion of the Constitution of the Republic of the Philippines: “SECTION 2. All lands of the public domain, waters, minerals, coal, petroleum, and other mineral oils, all forces of potential energy, fisheries, forests or timber, wildlife, flora and fauna, and other natural resources are owned by the State. With the exception of agricultural lands, all other natural resources shall not be alienated. The exploration, development, and utilization of natural resources shall be under the full control and supervision of the State. The State may directly undertake such activities, or it may enter into co-production, joint venture, or production-sharing agreements with Filipino citizens, or corporations or associations at least sixty per centum of whose capital is owned by such citizens. Such agreements may be for a period not exceeding twenty-five years, renewable for not more than twenty-five years, and under such terms and conditions as may be provided by law. In cases of water rights for irrigation, water supply, fisheries, or industrial uses other than the development of water power, beneficial use may be the measure and limit of the grant.”⁵

Biomass

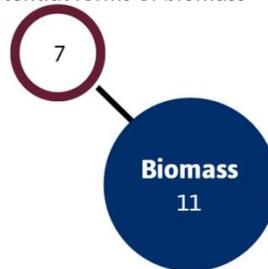
A definition of biomass was provided by 10 survey respondents, and supplemental desk research identified 3 additional definitions. Of the 11 economies for which a definition of biomass was reviewed, a binding definition of biomass was provided or otherwise identified through desk research for 7 economies. The key divergence in the definition of biomass identified includes:

- Explicit specification as to whether biomass can include certain types of waste.⁶

Of the 11 economies for which a definition of biomass was reviewed, the definition from 7 economies (Canada; Malaysia; Mexico; the Philippines; Chinese Taipei; Thailand; and the United States) explicitly stated that certain types of waste can be included in biomass.

For example, Malaysia’s definition states “Biomass is “(a) A resource in solid form; and (b) Comprises of non-fossilized and biodegradable organic material, including products

Explicitly included certain types of waste as potential forms of biomass



⁵ Stakeholder input confirmed that the Philippines government has interpreted municipal solid waste to be a natural resource. See the section on “Stakeholder Case Studies” for additional detail.

⁶ No definition was provided or otherwise identified through desk research that explicitly specified that biomass can include unsegregated solid waste (i.e., both the organic and inorganic waste materials).

and by-products and residues from agricultural, industrial or municipal wastes originating from Malaysia” (emphasis added). In contrast, the definition provided by China does not specify that any form of waste can be considered to be biomass, stating that “Biomass refers to organic materials produced directly or indirectly through photosynthesis by using solar energy, which mainly comes from forestry and agriculture industry.”

Renewable Energy

A definition of renewable energy was provided by 15 survey respondents, and supplemental desk research a definition for an additional economy. Of the 16 economies for which a definition of renewable energy was reviewed, a binding definition of renewable energy was provided or otherwise identified through desk research for 13 economies. Key divergences in the definition of renewable energy include:

- Identification of biomass or bioenergy as a source of renewable energy.

Of the 16 economies for which a definition of renewable energy was reviewed, the definition from 14 economies (Australia; Brunei Darussalam; China; Indonesia; Japan; Republic of Korea; Malaysia; Mexico; the Philippines; Singapore; Chinese Taipei; Thailand; the United States; and Viet Nam) explicitly identifies biomass or bioenergy as a renewable energy source.

For example, the definition provided by Chinese Taipei includes the following as sources of renewable energy: “Solar energy, biomass energy, geothermal energy, ocean energy, wind power, non-pumped-storage hydropower, the energy generated directly, or derived from domestic general waste and general industrial waste” (emphasis added). In contrast, the definition provided by Canada states “Renewable energy is energy obtained from natural resources that can be naturally replenished or renewed within a human lifespan, that is, the resource is a sustainable source of energy.”

- Inclusion of waste as a source of renewable energy separate from biomass or bioenergy.

Of the 16 economies for which a definition of renewable energy was reviewed, the definition from 4 economies (Australia; Republic of Korea; Chinese Taipei; and the United States) included waste as a source of renewable energy separate from biomass or bioenergy.

For example, Republic of Korea’s definition states:

The term “renewable energy” means energy converted from existing fossil fuels, or renewable energy, including sunlight, water, geothermal, precipitation, bio-organisms, etc., which falls under the following items:

- (a) Solar energy;
- (b) Bio energy converted from biological resources which fall within the criteria and scope prescribed by Presidential Decree;
- (c) Wind power;
- (d) Water power;
- (e) Fuel cells;
- (f) Energy from liquefied or gasified coal, and from gasified heavy residual oil which falls within the criteria and scope prescribed by Presidential Decree;
- (g) Marine energy;
- (h) Energy from waste which falls within the criteria and scope prescribed by Presidential Decree;

- (i) Geothermal energy;
- (j) Hydrogen energy;
- (h) Energy prescribed by Presidential Decree, other than petroleum, coal, nuclear power, or natural gas (emphasis added).

In contrast, Malaysia's definition includes waste as a source of renewable energy, but only to the extent that waste falls into the category of biomass. Specifically, Malaysia's definition specifies that the following are sources of renewable energy: "biogas, biomass, small hydropower, and solar photovoltaic."

- Use of language describing the sources of renewable energy using broad categories of waste that could include inorganic materials.

Of the 16 economies for which a definition of renewable energy was reviewed, the definitions from 3 economies (Chinese Taipei; Korea; and United States) describe sources of renewable energy using broad categories of waste that could include inorganic materials ("general waste and general industrial waste," "Energy from waste which falls within the criteria and scope prescribed by Presidential Decree," and "municipal solid waste," and respectively). The remaining 13 definitions either do not explicitly state whether waste in any form is considered to be a source of renewable energy or explicitly state that categories of organic waste or biomass are sources of renewable energy and do not mention any categories of waste broad enough to include inorganic materials. However, most of the definitions reviewed include some kind of catch-all phrase or other language indicating a method for supplementing the list of sources of renewable energy included in the law.

- Inclusion of a list of sources of renewable energy.

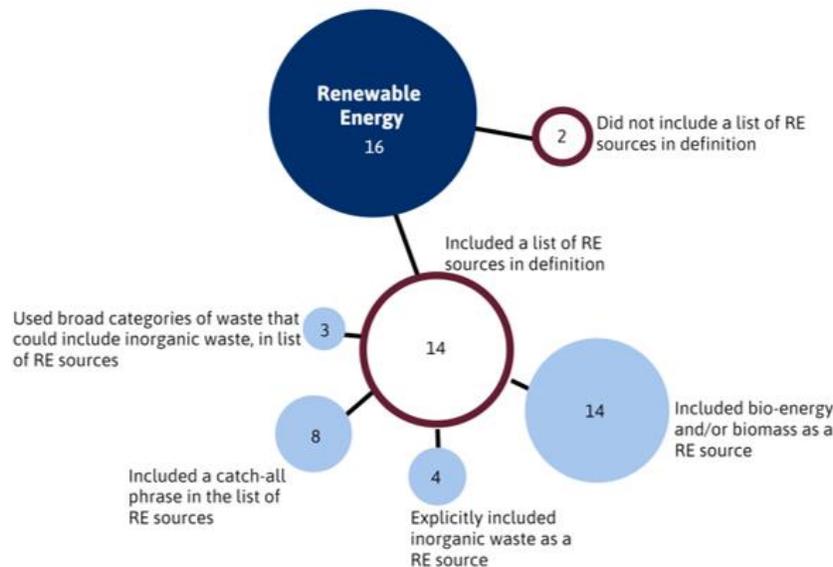
Of the 16 economies for which a definition of renewable energy was reviewed, the definitions from 14 economies (Australia; Brunei Darussalam; China; Indonesia; Japan; Korea; Malaysia; Mexico; the Philippines; Singapore; Chinese Taipei; Thailand; the United States; and Viet Nam) include a list of sources of renewable energy.

For example, Indonesia's definition states "Renewable Energy is source of energy produced from energy sources, which will not naturally be used up and sustainable if managed properly, amongst others, geothermal, biofuel, river flow, solar heat, wind, biomass, biogas, sea waves, and sea-depth temperature." In contrast, the Philippines's definition states "Renewable energy sources refer to energy sources that do not have an upper limit on the total quantity to be used. Such resources are renewable on a regular basis."

- Inclusion of a catch-all phrase within a list of the types of energy sources that would qualify as a renewable energy source, or other language indicating a method for supplementing the list of sources of renewable energy included in the definition.

Of the 16 economies for which a definition of renewable energy was reviewed, the definitions from 8 economies (Australia; Brunei Darussalam; Indonesia; Japan; Korea; Mexico; the Philippines; and Viet Nam) included a catch-all phrase within a list of the types of energy sources that would qualify as renewable energy sources or other language indicating a method for supplementing the list of sources of renewable energy included in the definition.

For example, Japan’s definition states “The term “Sources of Renewable Energy” means the following energy sources: 1. Sunlight, 2. Wind power, 3. Hydraulic power, 4. Geothermal power, 5. Biomass... 6. in addition to what is listed in the preceding items, energy sources other than crude oil, petroleum gas, combustible natural gas, coal, and products manufactured therefrom, which are provided for by Cabinet Order as being recognized as perpetually usable as energy sources for electricity” (emphasis added). In contrast, Chinese Taipei’s definition identifies an exhaustive list of eligible sources of renewable energy, listing “Solar energy, biomass energy, geothermal energy, ocean energy, wind power, non-pumped-storage hydropower, the energy generated directly, or derived from domestic general waste and general industrial waste.”

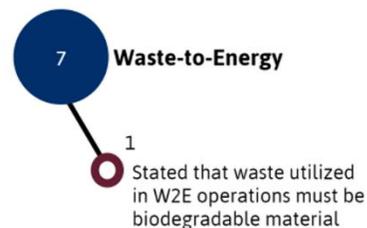


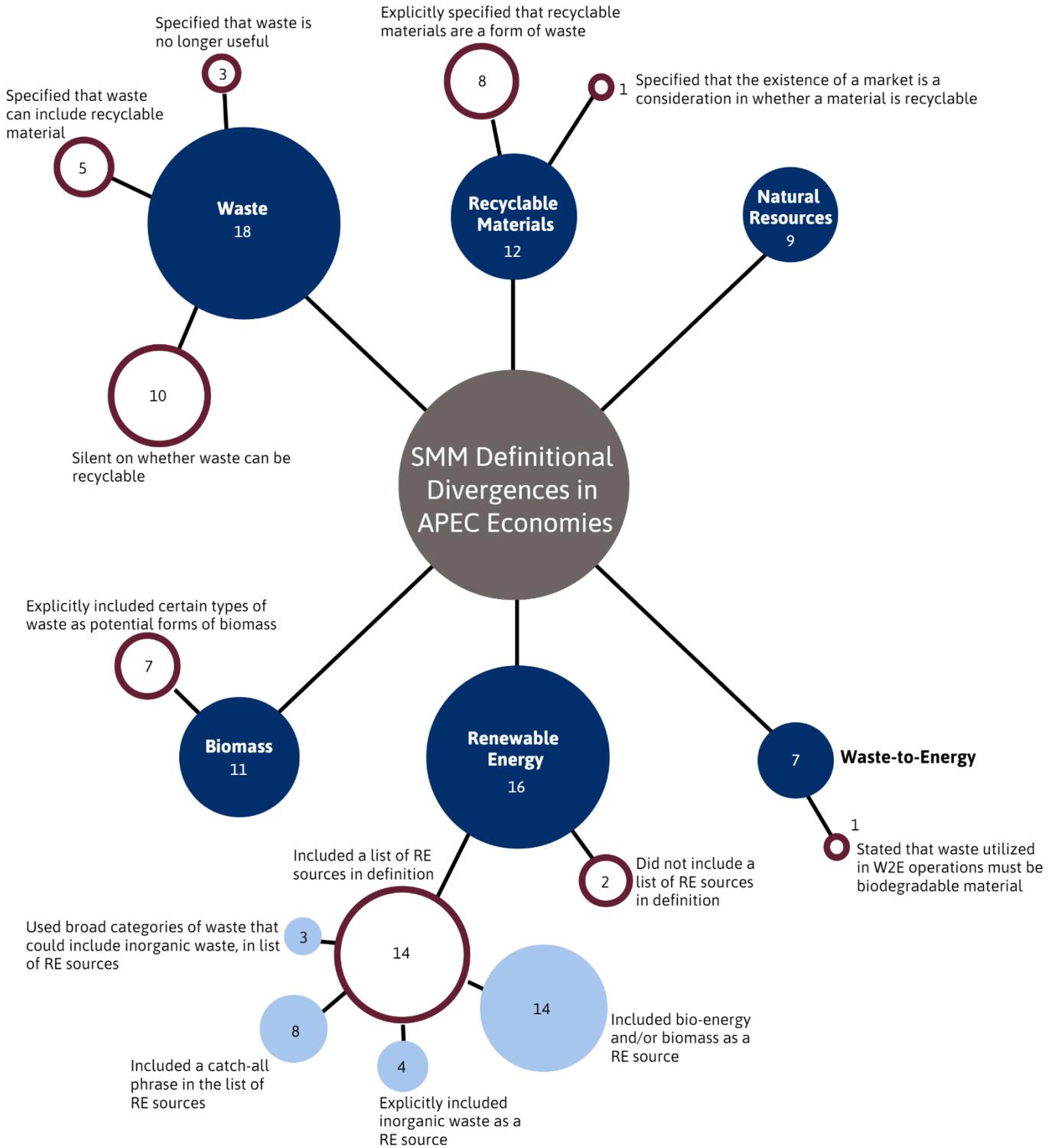
Waste-to-Energy/Energy-from-Waste

A definition of waste-to energy or energy-from waste was provided by 7 survey respondents, and no additional definitions were identified through supplemental desk research. Of the 7 economies for which a definition of biomass was reviewed, a binding definition of waste-to-energy or energy-from-waste was provided for 5 economies. Key divergences in the definition of waste-to-energy or energy-from-waste include:

- Explicit specification that the waste utilized in the energy recovery activity must be biodegradable materials.

Of the 7 economies for which a definition of waste-to-energy was reviewed, only the Philippines’ definition of waste-to-energy specifies that biodegradable materials must be the input into the energy recovery operation. Specifically, the Philippines’ definition states that “Waste-to-Energy Technologies shall refer to systems which convert biodegradable materials, such as but not limited to, animal manure or agricultural waste, into useful energy through processes such as anaerobic digestion, fermentation and gasification, among others, subject to the provisions and intent of Republic Act No. 8749 (Clean Air Act of 1999) and Republic Act No. 9003 (Ecological Solid Waste Management Act of 2000)” (emphasis added). In contrast, Viet Nam’s definition states that “Recovery of energy from waste is a process of recovery of energy from waste transformation.”





Map Notes



Definitions

The dark blue circles represent each SMM term. The number contained inside the circle and the circle's relative size represents the number of economies that have an official definition of a given term.



Characteristics/Sub-characteristics

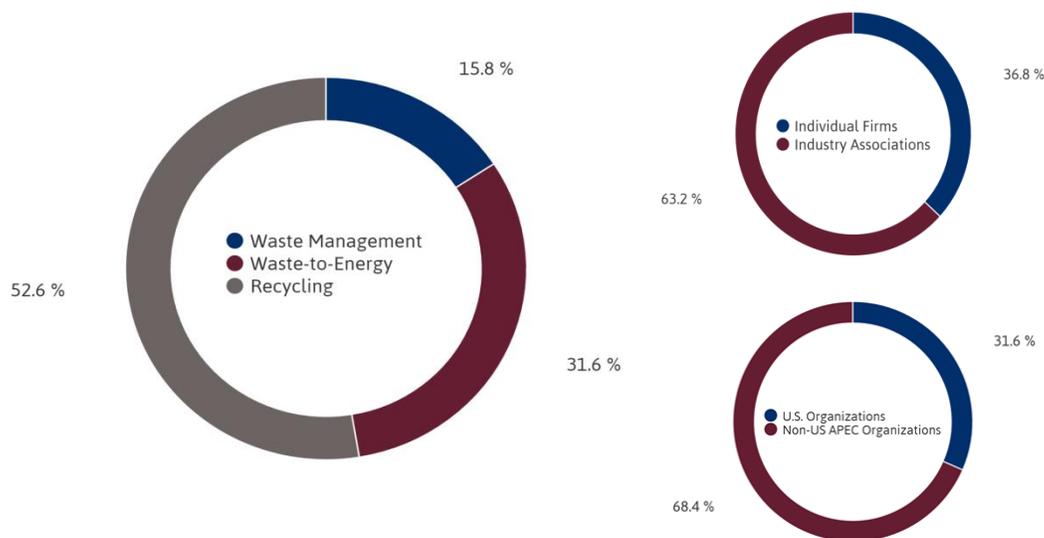
The red circles represent characteristics of SMM definitions analyzed. The light blue circles represent sub-characteristics. The number inside the circle and the circle's relative size represents the number of economies whose definitions exert that characteristic.

STAKEHOLDER CASE STUDIES

In order to better understand potential barriers to trade and investment in SMM solutions, the survey included questions on economy's experiences and the research team consulted with APEC industry stakeholders. This section describes the results of these efforts.

The survey asked economies to respond directly to open response questions on each economy's experience with trade and investment barriers related to SMM solutions. Question 4 of the survey asked each economy's respondent(s) to provide detail on any difficulties in trade or investment related to SMM technologies, products, and services. A more focused Question 5 asked for examples of those trade and investment barriers which were related to *definitions* of the identified key SMM terms. Just over sixty percent of responding economies stated that their economy had experienced a barrier to trade and investment in SMM solutions; however the source of those barriers was rarely linked to diverging definitions or a non-existent definition (gap) in regulatory frameworks. When the causes for barriers were linked to economies' official definitions for key SMM terms, the barriers often focused on the import of waste, a topic which is outside the scope of this report.

In addition to soliciting each economy's experience in the survey, the research team asked the same of the private sector through stakeholder consultations. The research team reached out to 19 U.S. and foreign stakeholders from the private sector. Of those stakeholders, approximately 63 percent were from industry associations, which were able to reach out to a broad membership base to collect case studies. The remaining 37 percent were individual firms. Of the 19 stakeholders consulted, 52 percent were from the recycling industry, 32 percent were from the waste-to-energy industry, and 16 percent from the waste management/commodity industry.



Of the private sector firms and industry associations consulted, the majority did not identify definitions as a primary source of trade and investment barriers. However, several stakeholders from the waste-to-energy industry did identify trade and investment barriers related to varying definitions of *renewable energy*, and *waste-to-energy*. As arguably the most nascent market of those analyzed, the waste-to-energy space in most economies was noticeably under-defined: fifty percent of the responding economies did not have an official definition of waste-to-energy. Additionally, stakeholders from the waste-to-energy industry noted diverging definitions of renewable energy that can impact investment decisions.

The following case studies were extracted from this stakeholder outreach, and directly relate to economies' official definitions of key SMM terms. Although the majority of stakeholders both public and private did not identify definitions of key SMM terms as a primary source of barriers, private sector stakeholders did identify other barriers as an impediment to intra-regional growth. Common causes cited by responding economies for other, non-definitional barriers included incompatible economy-level standards certifications and safety approvals between economies' certification bodies (or a lack thereof); exceptionally high tariff rates for certain SMM goods; inadequate intellectual property rights protections for SMM technologies; and lack of access to finance for SMM investments, lack of market, and relatively high cost of SMM solutions when compared to "traditional" waste management solutions (i.e. landfills). These non-definitional barriers are further discussed in the next section.

Local Equity Requirements for Waste-to-Energy Investments

Several waste-to-energy stakeholders commented on their experience investing in one APEC economy where investments in waste-to-energy projects were subject to local equity requirements. The stakeholders view the Constitution's nationality requirement as limiting participation to waste-to-energy projects.

In this economy, foreign investors received mixed messages from the member economy's government bodies on whether or not MSW is a natural resource as defined by this economy's Constitution, and therefore whether or not waste-to-energy investments are subject to local equity requirements. One of the bodies responsible for SMM in this economy recently published a set of guidelines for establishing and operating waste-to-energy facilities utilizing MSW. However, the guideline document published was silent on the issue of whether MSW is a "natural resource". Uncertainty surrounding MSW's inclusion or exclusion from this economy's list of natural resources was cited by several stakeholders as an impediment to investment. Though in the case of one stakeholder consulted specifically on this issue, the investment was allowed to proceed, according to the same stakeholder the uncertainty for future projects still remains.

Gaps & Divergences in Economies' Definitions as a Barrier

In several cases across the spectrum of industries represented, stakeholders cited the pure quantity of diverging definitions for key SMM terms as a barrier to trade and investment. It was noted that for a new investor in APEC, the existence of 21 diverging economy-level definitions can contribute to a confusing regulatory environment. Further, at least three economies have diverging sub-economy wide definitions of one or more key SMM terms, requiring potential investors to navigate multiple binding definitions within even one economy.

Conversely, gaps in definitions among economies create similar confusion potential. Through an analysis of survey responses and supplemental desk research, it was concluded that one economy did not have official definitions for over sixty percent of the SMM terms that were the focus of this study. As previously mentioned, fifty percent of respondent economies did not have an official definition for waste-to-energy. It was noted by several stakeholders that the absence of official definitions for key terms in their industries contributed to the decision whether or not to invest in an economy; and that investment in foreign growth opportunities was more probable in economies with mature solid waste management and renewable energy policies.

SMM continues to be a burgeoning practice in economies across APEC, and according to the survey of official definitions of SMM terms and subsequent desk research, opportunities exist for

further development of definitions. Indeed, in January 2017 Chinese Taipei revised their definition of waste to further define how waste is created and to lay the regulatory framework for the sustainable management of qualified industrial waste.

Definitions Limiting Markets for Recyclable Materials

In a revision of Chinese Taipei's official definition of waste, the legislative change seems to hold potential for expanding the market for recyclable materials. In the previous version of the law, waste produced by industry workers (waste that otherwise would be considered MSW, e.g. waste produced in factory lunch or break rooms, in day-to-day office operations, et cetera) was interpreted as industrial waste, removing it from the MSW supply chain. Instead, waste that could have been classified as MSW and harvested for recyclable material was combined with other industrial waste that required special processing. By further classifying waste produced by industry into general waste, industrial waste, and hazardous industrial waste, the legislation may create additional feedstock for the MSW supply chain. If implemented effectively, Chinese Taipei's revised definition could create new recycling-related investment opportunities in the economy.

Exclusion of Waste from Renewable Energy Sources

In a non-APEC example of a barrier to trade and investment in SMM, one waste-to-energy stakeholder noted that an economy's failure to include inorganic materials in the list of renewable energy sources prevents the energy provider from qualifying for local policy incentives. The stakeholder commented that including waste as a source of renewable energy separate from biomass or bioenergy can accomplish the goal of including inorganic materials as a source of renewable energy.

From the analysis of the definitions of renewable energy among the 18 respondent economies, it was noted that only four economies (Australia, Korea, Chinese Taipei, and the United States) included waste as a source of renewable energy separate from biomass or bioenergy.

The inclusion of language specifying that inorganic wastes can qualify as a source of renewable energy could ensure SMM technology providers are eligible for local policy incentives, like Feed-in Tariffs, which can assist waste-to-energy providers in recovering high investment costs and make the risks of foreign (and domestic) investment in this space more palatable; creating a more favorable investment landscape.

As APEC regulatory environments for renewable energy further develop, and as definitions are created and changed, this case study provides a model for avoiding future potential barriers to the development of new waste-to-energy technologies where waste comprises any percentage of feedstock.

AREAS OF POSSIBLE FUTURE RESEARCH

Stakeholders frequently brought to the research team's attention other non-definitional barriers to trade and investment that could provide a basis for future research. The research team has consolidated these barriers and organized them into areas for potential future research and action.

1) Cost of landfilling versus cost of other SMM technologies

- Industry stakeholders highlighted the cost of landfilling as a barrier in a number of cases. Market growth in SMM solutions is often reliant on policy incentives that offer opportunities for SMM solutions providers to recover operational costs. One stakeholder mentioned the European Union's landfill diversion requirements and penalty fees for solid waste disposed of in landfills as examples of policies that divert suppliers from traditional landfills, allowing SMM solutions providers to introduce alternative services. In some contexts, the recycling industry and waste-to-energy industry may utilize inorganic recyclable materials in their operations. Ensuring that those resources are utilized in the most sustainable way could be an area of future regulatory cooperation within APEC economies. Future research could be conducted which focuses on how various policy instruments to encourage SMM solutions could be adapted in various APEC economies.

2) Creating intentional monopolies for the recycling supply chain

- A recycling industry stakeholder noted that one APEC economy created an intentional monopoly in their recycling supply chain, subcontracting out all recycling to one domestic organization. Monopolization of the market by definition does not permit competition, potentially stifling innovation in SMM solutions and technologies.

3) Intellectual Property Rights

- SMM Solutions providers raised concerns with IPR not being protected across economies, especially for imported technologies.

Appendix A SMM SURVEY



APEC SURVEY: APEC Regulatory Cooperation Advancement Mechanism (ARCAM) Initiative to Facilitate Trade and Investment in Sustainable Materials Management Solutions (SMM)

General Instructions

Thank you in advance for taking the time to complete this survey. The survey has been developed in coordination with the Office of the U.S. Trade Representative (USTR) as supported by the US-APEC Technical Assistance to Advance Regional Integration (US-ATAARI) activity. The survey has been circulated to the Committee on Trade and Investment (CTI) under the ARCAM Initiative and aims to create an APEC-wide dialogue on how members can better align policies to improve trade and investment in SMM technologies and services.

Sustainable materials management (SMM) is a systemic approach to using and reusing materials more productively over their entire lifecycles, from the point of resource extraction through material recycling or final disposal, to reduce environmental impacts, conserve resources, and reduce costs. SMM solutions may include, but are not limited to: source reduction and reuse, recycling, composting and waste-to-energy.

Based on responses from APEC economies as well as supplemental desk research, the resulting study will:

- *Highlight major divergences in definitions among economies;*
- *Assess the types of barriers to trade in SMM-supportive technologies, services and investment that varying definitions create for SMM solutions providers; and,*
- *Recommend a set of APEC guidelines that will enable member economies to ensure domestic definitions of SMM-related terms evolve in a way that promotes trade and investment in SMM solutions.*

The outcomes of the study will be presented during a workshop on the margins of the Third APEC Senior Officials Meeting in August 2016. Your timely and complete responses are critical to the ability to finalize the draft report. After completing the survey, please save and e-mail the file to myarrington@nathaninc.com, akatsiak@nathaninc.com, and abajwa@nathaninc.com by **Friday June 10, 2016**.

Respondent Information

Name:	
Title:	
Organization/Institution:	
Economy:	
E-mail address:	
Date survey submitted:	

I. Please provide an official/working/regulatory definition of the following key SMM terms, and provide its source (e.g., legislation, responsible public sector office and/or document or website link):

TERM	DEFINITION	RESOURCE
Waste		
- Municipal Solid Waste (MSW)		
- Household Waste		
Recyclable Materials		
Natural resource		
Biomass		
Renewable energy		
Waste-to-Energy / Energy-from-Waste		

2. What public sector/government office serves as the lead on policy issues related to SMM solutions and technologies?

--

3. Are there any other public sector offices that contribute to the promotion of trade and investment for SMM technologies? Please list.

--

4. Has your economy experienced any difficulties in trade or investment related to SMM technologies, products or services? Please provide background / examples.

<input type="checkbox"/> YES	<input type="checkbox"/> NO
------------------------------	-----------------------------

Additional Detail:

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5. Has your economy experienced difficulties / obstacles to trade or investment in SMM technologies, products, or services due to different concepts/understandings of SMM trade definitions? If yes, please provide background /examples.

◇ YES	◇ NO
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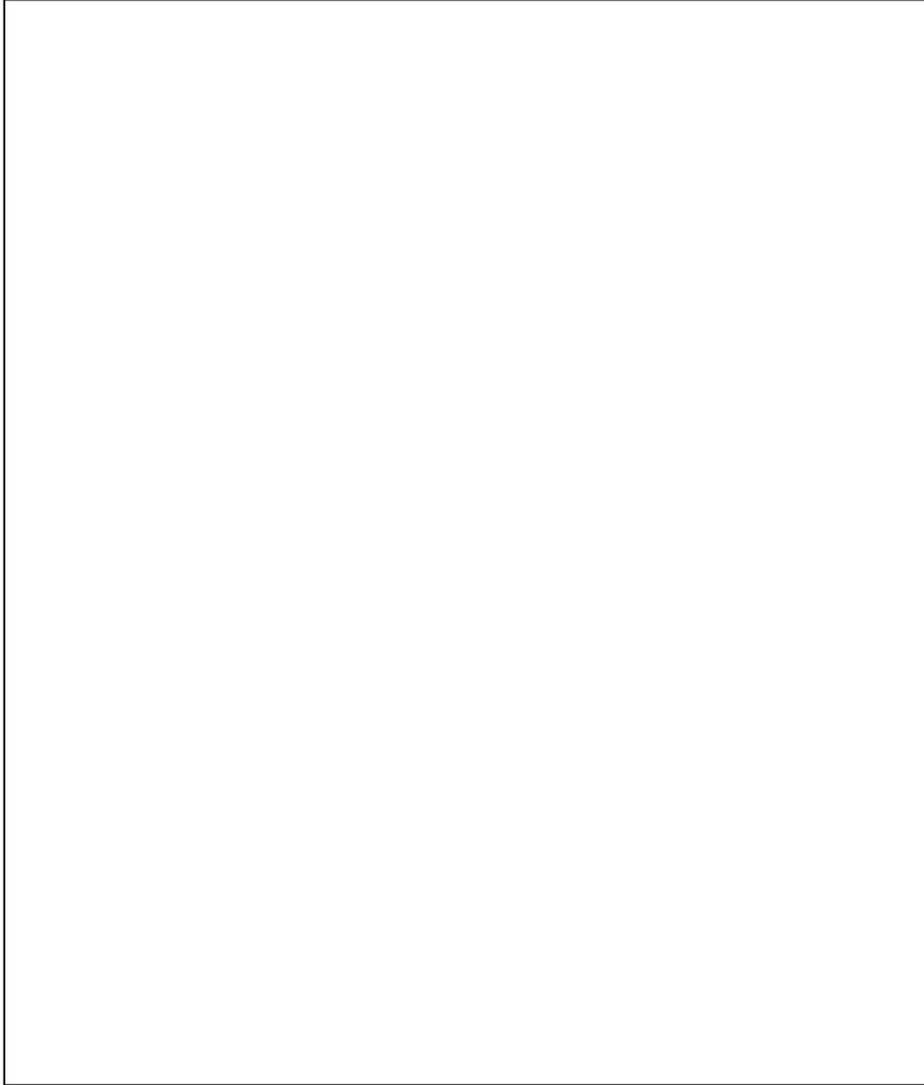
Additional Detail:

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6. Please provide the name(s), title(s)/organization(s), and current email address(es) for officials who work most closely on topics related to SMM – including adoption of new technologies, management of current programs, and trade and investment policymakers – so that we may follow up with any questions as we prepare the results of this survey for the APEC meetings. Please provide the relevant senior ministry officials as well as working level experts.

Name:	
Title / Organization:	
E-mail Address:	
Name:	
Title / Organization:	
E-mail Address:	
Name:	
Title / Organization:	
E-mail Address:	

7. Additional comments / details:



**Appendix B ANNOTATED
SURVEY RESULTS BY
RESPONDENT**

Table B-I: Definitions of Waste by Respondent

Respondent	Definition(s) Analyzed	Source
Australia	<p>Waste means any:</p> <ul style="list-style-type: none"> (a) discarded, rejected, unwanted, surplus or abandoned matter; or (b) otherwise discarded, rejected, unwanted, surplus or abandoned matter intended for: <ul style="list-style-type: none"> (i) recycling, reprocessing, recovery, reuse, or purification by a separate operation from that which produced the matter; or (ii) sale, whether of any value or not.⁷ <p>The definition of waste varies between state jurisdictions:</p> <p>in the State of New South Wales (NSW): "waste" includes:</p> <ul style="list-style-type: none"> (a) any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment, or (b) any discarded, rejected, unwanted, surplus or abandoned substance, or (c) any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance, or (d) any processed, recycled, re-used or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations, or (e) any substance prescribed by the regulations to be waste. <p>A substance is not precluded from being waste for the purposes of this Act merely because it is or may be processed, recycled, re-used or recovered.</p> <p>in the State of Victoria (VIC): "waste" includes—</p> <ul style="list-style-type: none"> (a) any matter whether solid, liquid, gaseous or radio-active which is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment; (b) any greenhouse gas substance emitted or discharged into the environment; (b) any discarded, rejected, unwanted, surplus or abandoned matter; (c) any otherwise discarded, rejected, abandoned, unwanted or surplus matter intended for— <ul style="list-style-type: none"> (i) recycling, reprocessing, recovery or purification by a separate operation from that which produced the matter; or (ii) sale; and (d) any matter prescribed to be waste <p>in the State of Queensland (QLD): waste includes anything, other than a resource approved under the Waste Reduction Act, chapter 8, that is—</p>	<p>National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998</p> <p>NSW: Protection of the Environment Operations Act 1997.</p> <p>VIC: Environment Protection Act 1970.</p> <p>QLD: Environmental Protection Act 1994.</p>

⁷ Definition uncovered by supplemental desk research conducted by US-ATAARI.

Respondent	Definition(s) Analyzed	Source
	<p>(a) left over, or an unwanted by-product, from an industrial, commercial, domestic or other activity; or</p> <p>(b) surplus to the industrial, commercial, domestic or other activity generating the waste.</p> <p>* Example of paragraph (a)—</p> <p>* Abandoned or discarded material from an activity is left over, or an unwanted by-product, from the activity.</p> <p>(2) Waste can be a gas, liquid, solid or energy, or a combination of any of them.</p> <p>(3) A thing can be waste whether or not it is of value.</p> <p>(4) For subsection (1), if the approval of a resource under the Waste Reduction Act, chapter 8, is a specific approval, the resource stops being waste only in relation to the holder of the approval.</p> <p>(5) Despite subsection (1), a resource approved under the Waste Reduction Act, chapter 8, becomes waste—</p> <p>(a) when it is disposed of at a waste disposal site; or</p> <p>(b) if it is deposited at a place in a way that would, apart from its approval under that chapter, constitute a contravention of the general littering provision or the illegal dumping of waste provision under that Act—when the depositing starts.</p> <p>in the State of Western Australia (WA): waste includes matter —</p> <p>(a) whether liquid, solid, gaseous or radioactive and whether useful or useless, which is discharged into the environment; or</p> <p>(b) prescribed to be waste;</p> <p>in the State of South Australia (SA): "waste" means—</p> <p>(a) any discarded, rejected, abandoned, unwanted or surplus matter, whether or not intended for sale or for recycling, reprocessing, recovery or purification by a separate operation from that which produced the matter; or</p> <p>(b) anything declared by regulation (after consultation under section 5A) or by an environment protection policy to be waste, whether of value or not;</p> <p>in the State of Tasmania (TAS): waste means any –</p> <p>(a) discarded, rejected, unwanted, surplus or abandoned matter, whether of any value or not; or</p> <p>(b) discarded, rejected, unwanted, surplus or abandoned matter, whether of any value or not, intended –</p> <p>(i) for recycling, reprocessing, recovery, reuse or purification by a separate operation from that which produced the matter; or</p> <p>(ii) for sale;</p> <p>in the Australian Capital Territory (ACT): "waste" means any solid, liquid or gas, or any combination of them, that is a surplus product or unwanted by-product of an activity, whether the product or by-product is of value or not.</p> <p>in the Northern Territory (NT): "waste" means:</p> <p>(a) a solid, a liquid or a gas; or</p> <p>(b) a mixture of such substances,</p>	<p>WA: Environmental Protection Act 1986.</p> <p>SA: Environment Protection Act 1993.</p> <p>TAS: Environmental Management and Pollution Control Act 1994.</p> <p>ACT: Environment Protection Act 1997.</p> <p>NT: Waste Management and Pollution Control Act.</p>

Respondent	Definition(s) Analyzed	Source
	that is or are left over, surplus or an unwanted by-product from any activity (whether or not the substance is of value) and includes a prescribed substance or class of substances.	Australian Bureau of Statistics: Waste Account, Australia, Experimental Estimates.
Brunei Darussalam	Materials which no longer can be used for the purposes they were intended for originally "waste" means a substance or object that is - (a) proposed to be disposed of; (b) disposed of; or (c) required by any written law to be disposed of. ⁸	Not specified Hazardous Waste (Control of Export, Import and Transit) Order, 2013
Canada	Waste generally refers to any material, non-hazardous or hazardous, that has no further use, and which is managed at recycling, processing, or disposal sites.	Environment and Climate Change Canada website, 2016.
Chile	Substance or object which the generator discards or intends or is required to discard according to the law	Law 20.920: Regarding Waste Management, Extended Responsibility of the Producer and Recycling Encouragement; 2016.
China	"Solid waste" means articles and substances in solid, semi-solid state or gaseity in containers that are produced in the production, living and other activities and have lost their original use values or are discarded or abandoned though haven't yet lost use values, and articles and substances that are included into the management of solid wastes upon the strength of administrative regulations.	Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste, 2005.
Hong Kong, China	For the purpose of the Waste Disposal Ordinance which is to "provide for the control and regulation of the production, storage, collection and disposal including the treatment, reprocessing and recycling of waste" – Waste means any substance or article which is abandoned and includes animal waste, chemical waste, clinical waste, construction waste, household waste, livestock waste, street waste and trade waste.	S.(2) Waste Disposal Ordinance (Cap. 354), 2015.
Indonesia	Waste is the remnant of human daily activities and/or natural processed in the solid form.	The Act Regarding Waste Management, Act of the Republic of Indonesia Number 18 of 2008.
Japan	Waste refers to refuse, bulky refuse, ashes, sludge, excreta, waste oil, waste acid and alkali, carcasses and other filthy and unnecessary matter, which are in solid or liquid state. (excluding radioactive waste and waste polluted by radioactivity).	Waste Management and Public Cleansing Law, Chapter 1, Article 2, 2001.
Korea	The term "wastes" means such materials as garbage, burnt refuse, sludge, waste oil, waste acid, waste alkali, and carcasses of animals, which have become no longer useful for human life or business activities;	Wastes Control Act, Act No.13038, Article 2, 2015.
Malaysia	Waste is defined as any matter prescribed to be scheduled waste or any matter whether in a solid, semi-solid or liquid form, or in the form of a gas or vapor, which is emitted, discharged or deposited in	

⁸ Definition uncovered during supplemental desk research conducted by US-ATAARI.

Respondent	Definition(s) Analyzed	Source
	<p>the environment in such volume, composition or manner as to cause pollution.⁹</p> <p>(Solid waste includes –</p> <ul style="list-style-type: none"> (a) Any scrap material or other unwanted surplus substance or rejected products arising from the application of any process; (b) Any substance required to be disposed of as being broken, worn out, contaminated or otherwise spoiled; or (c) Any other material that according to this act or any other written law is required by the authority to be disposed of, but does not include scheduled wastes as prescribed under the Environmental Quality Act 1974 [Act 655] or radioactive waste as defined in the Atomic Energy Licensing Act 1984 [Act 304].) 	<p>Solid Waste and Public Cleansing Management Act 2007.</p>
Mexico	<p>XXXI. Waste: Any material generated in the processes of extraction, dressing, transformation, production, consumption, use, control or treatment that, due to its quality, can not be used it again in the process where it was produced .</p> <p>XXIX. Waste: Material or product whose owner or holder discarded, found in solid or semisolid state, or a liquid or gas in containers or tanks, and which can be capable of being valued or required subject to treatment or disposal in accordance with the provisions of this Act and other systems derived therefrom.⁹</p>	<p>General Law on Ecological Balance and Environmental Protection, Article 3 fraction XXXII, 1988.</p> <p>General Law for Prevention and Integral Waste Management (LGPGIR), Article 5, fraction XXIX, 2003.</p>
Peru	<p>These are products or sub products that the generator is responsible for their disposal or is demanded to dispose according [to] law.⁹</p>	<p>Law N° 27314, 2004.</p>
The Philippines	<p>Waste - means any material either solid, liquid, semisolid, contained gas or other forms resulting from industrial, commercial, mining or agricultural operations, or from community and household activities that is devoid of usage and discarded.</p> <p>Waste Materials shall refer to any material unused and rejected as worthless or unwanted.</p>	<p>Republic Act No. 9275, Philippine Clean Water Act of 2004.</p> <p>Guidelines Governing the Establishment and Operation of Waste-to-Energy Technologies for Municipal Solid Waste. National Solid Waste Management Commission. 2016.</p>
Singapore	<p>“[W]aste” includes —</p> <ul style="list-style-type: none"> (a) any substance which constitutes a scrap material or an effluent or other unwanted surplus substance arising from the application of any process; and (b) any substance or article which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled, and anything which is discarded or otherwise dealt with as if it were waste shall be presumed to be waste unless the contrary is proved; 	<p>Environmental Public Health Act, Chapter 95, 2002.</p>
Chinese Taipei	<p>The waste stated in the Act refers to the following solid or liquid substances or objects which can be moved away:</p> <ul style="list-style-type: none"> I. Those that are abandoned. II. Those that are with impaired effect or abandoned effect, or without effect or with unclear effect. 	<p>Waste Disposal Act, 2017.</p>

⁹ Supplemental desk research could not verify this definition due to unavailable English translation.

Respondent	Definition(s) Analyzed	Source
	<p>III. Those that are produced beyond the purpose in the process of construction, manufacturing, processing, repair, sales or utilization.</p> <p>IV. Those that are produced from process without feasible utilization technology or market economic value.</p> <p>V. Other items announced by the central competent authority.</p> <p>The preceding waste is divided into the following two categories:</p> <p>I. General waste: It refers to the waste which is not industrial waste.</p> <p>II. Industrial waste: Instead of the waste produced from the life of industrial personnel, it refers to the items produced from industrial activities and includes the following hazardous industrial waste and general industrial waste:</p> <p>A. Hazardous industrial waste: waste produced by industry that is toxic or dangerous with the concentration or volume sufficient to influence human health or pollute the environment</p> <p>General industrial waste: waste produced by industry that is not hazardous industrial waste.</p>	
Thailand	<p>I. Ministry of Industry: waste is unusable materials or all types of wastes generated from industrial activity including wastes from raw material, wastes generated from production process, products that are deteriorated in quality, and effluent having hazardous constituents or hazardous characteristics.</p> <p>II. Ministry of Natural Resources and Environment: "Waste" means refuse, garbage, filth, dirt, wastewater, polluted air, polluting substances or any other hazardous substances which are discharged or originate from point sources of pollution, including residues, sediments, or the remainders of such matters, either in the state of solid, liquid or gas.</p>	<p>Notification of Ministry of Industry, Re: Industrial Waste Disposal, B.E. 2548, 2005.</p> <p>Enhancement and Conservation of National Environmental Quality Act, B.E. 2535, 1992.</p>
The United States	Please refer to survey response attachment "U.S. Waste-Related Definitions and Related Statutory Authorities".	
Viet Nam	Waste means any matter in a solid, liquid or gaseous state which is discharged from manufacturing, business, services or living activities or from other activities.	Law on Protection of the Environment, 2001.

Table B-2: Definitions of MSW by Respondent

Respondent	Definition(s) Analyzed	Source
Australia	Waste produced primarily by households and council facilities, including biodegradable material, recyclable materials such as bottles, paper and cardboard and aluminum cans, and a wide range of non-degradable material including paint, appliances, old furniture and household lighting.	Australian Bureau of Statistics; Waste Account, Australia, Experimental Estimates ; 2013.
Brunei Darussalam		No official definition provided
Canada	"Municipal solid waste refers to recyclables and compostable materials, as well as garbage from homes, businesses, institutions, and construction and demolition sites"	Environment and Climate Change Canada Website, Municipal Solid Waste , 2017.

Respondent	Definition(s) Analyzed	Source
Chile	Waste generated in households as a result of domestic activities. Wastes generated in commercial or productive activities that by their nature or composition are similar to those above, which are considered in the course of collection are also considered ¹⁰	Technical standard NCh3321:2013
China	"Urban residential refuse" refers to the solid waste produced in urban daily life, or which results from the activities that serve urban daily life. It also includes those solid wastes that are specified by laws and administrative regulations as urban residential refuse.	Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste , 2005.
Hong Kong, China	<p>Municipal solid waste includes three categories: domestic waste, commercial waste and industrial waste –</p> <p>Domestic waste refers to household waste, waste generated from daily activities in institutional premises (e.g. schools, government offices) and refuse collected from public cleansing services. Public cleansing waste includes dirt and litter collected by the Food and Environmental Hygiene Department, marine refuse collected by the Marine Department and waste from country parks collected by the Agriculture, Fisheries and Conservation Department.</p> <p>Commercial waste is waste arising from commercial activities taking place in shops, restaurants, hotels, offices, markets in private housing estates, etc. It is collected mainly by private waste collectors.</p> <p>Industrial waste is waste arising from industrial activities and does not include construction waste and chemical waste. It is usually collected by private waste collectors. However, some industries may deliver their industrial waste directly to landfills for disposal.</p> <p>Municipal solid waste contains a small portion of bulky items like furniture and domestic appliances which cannot be handled by conventional compactor type refuse collection vehicles. These items are regarded as bulky waste and are usually collected separately.</p>	Monitoring of Solid Waste in Hong Kong, China: Waste Statistics for 2014 .
Indonesia	Waste that appear[s] in the city	Indonesian National Standard Number 19-2454-2002 about The procedure for the operational techniques of urban waste management ¹¹
Japan	<p>Waste other than industrial waste</p> <p>(We defined MSW as General waste. We defined industrial waste as:</p> <ol style="list-style-type: none"> 1) Ashes, sludge, waste oil, waste acid, waste alkali, waste plastics and others specified by a Cabinet Order among all the wastes left as a result of business activity.) 2) Imported waste (excluding the kinds of waste defined in the preceding Item, those wastes attributable to navigation of a ship or aircraft (confined to the items specified by a Cabinet Order), which are defined as "navigational waste" in Paragraph I of Article 15-4-2, and waste personally carried into Japan by persons entering it (confined to the items specified by a Cabinet Order), 	Waste Management and Public Cleansing Law , Chapter 1, Article 2, 2001.

¹⁰ Supplemental desk research could not verify this definition due to unavailable English translation.

¹¹ Supplemental desk research could not independently verify this source.

Respondent	Definition(s) Analyzed	Source
	which are defined as "carried-in waste" also in Paragraph I of Article 15-4-2). ¹²	
Korea		
Malaysia	<i>Municipal solid waste</i> defined as any substances or scrap materials which the holder discards or intends to discard within the area of municipal; residential, commercial, institution, industry and city center. (Public solid waste means any solid waste generated by public places, which are under supervision or control of any local authority.)	http://www.kpkt.gov.my ¹³ Solid Waste and Public Cleansing Management Act 2007.
Mexico	Urban solid waste. The generated in-room houses, resulting from the disposal of materials used in their domestic activities of consuming products and their container, boxing or packaging; the residues from any other activity within establishments or on public roads that generate waste with household characteristics, and those resulting from the cleaning of roads and public places, provided they are not considered by this Law as waste otherwise	General Law for Prevention and Integral Waste Management (LGPGIR) , Article 5, fraction XXXIII, 2003.
Peru	These are the solid waste[s] generated in houses[] activities and similar sources like small stores, institutions, or schools.	Law N° 27314 , 2004.
The Philippines	Municipal waste refers to wastes produced from activities within local government units which include a combination of domestic, commercial, institutional and industrial wastes and street litters	R.A. No. 9003 – Ecological Waste Management Act of 2000.
Singapore	Waste from households, offices, hotels, malls, trade premises, schools, institutions, hawker centres, markets and municipal services such as street cleaning, and maintenance of recreation areas.	Singapore Standard (SS) 594:2014 – Terminology for waste management. Clause 3.79
Chinese Taipei	General waste: It refers to the waste which is not industrial waste.	Waste Disposal Act, 2017
Thailand		No official definition provided
The United States	Please refer to survey response attachment "U.S. Waste-Related Definitions and Related Statutory Authorities".	
Viet Nam		No official definition provided

Table B-3: Definitions of Household Waste by Respondent

Respondent	Definition(s) Analyzed	Source
Australia	<i>household waste</i> means waste collected from households, but does not include waste specified in the regulations. ... 4 Waste that is not household waste (1) For the definition of <i>household waste</i> in section 4 of the Act, waste mentioned in items B1010, B2020, B3010, B3020 and B3030 of Annex IX (List B) to the Basel Convention is not household waste.	Hazardous Waste (Regulation of Exports and Imports) Act 1989

¹² Full definition was added by supplemental desk research activities.

¹³ Definition could not be independently verified by supplemental desk research.

Respondent	Definition(s) Analyzed	Source
	<p>(2) For subregulation (1), item B3010 is taken to be modified by omitting “a specification:” and inserting “a standard (other than bale properties) not less strict than the standard applicable to the resin type, product type and category of the material, set out in <i>Scrap Specifications Circular 1998, Guidelines for Plastic Scrap: P-98</i>, published by the Institute of Scrap Recycling Industries, Inc in 1998.”.</p> <p>Note 1: The parts of the standard set out in <i>Scrap Specifications Circular 1998</i> that apply to materials in item B3010 deal with the following matters about scrap plastic:</p> <ul style="list-style-type: none"> - Contamination - hazardous materials - moisture - storage. <p>Note 2: Items B1010, B2020, B3010, B3020 and B3030 of Annex IX (List B) to the Basel Convention, as taken to be modified by subregulation (2), are set out in Schedule I.¹⁴</p>	
Brunei Darussalam	"household waste" means waste collected from households, but does not include such waste as may be specified in any regulations made under this Order. ¹⁵	Hazardous Waste (Control of Export, Import and Transit) Order, 2013
Canada	<p>Residential waste refers to waste from primary and seasonal dwellings, which include all single family, multi-family, high-rise and low-rise residences. It includes:</p> <p style="padding-left: 40px;">The waste picked up by the municipality, (either using its own staff, or through contracted companies), and</p> <p style="padding-left: 40px;">The waste from residential sources which is self-hauled to depots, transfer stations and landfills.”</p>	Statistics Canada, Waste Management Industry Survey: Business and Government Sectors , 2010.
Chile		No official definition provided
China	“Household Waste” refers to waste produced in life activities, is an important component of domestic waste.	Industrial standard of People's Republic of China of City sanitation terminology CJJ/T65-2004 ¹⁶
Hong Kong, China	For the purpose of the Waste Disposal Ordinance which is to “provide for the control and regulation of the production, storage, collection and disposal including the treatment, reprocessing and recycling of waste”, household waste means waste produced by a household, and of a kind that is ordinarily produced by a dwelling when occupied as such.	S.(2) Waste Disposal Ordinance (Cap. 354) , 2015.
Indonesia	Household waste comes from everyday activities in the home, not including feces and specific waste.	Act of the Republic of Indonesia Number 18 Year 2008, The Act Regarding Waste Management , 2008.
Japan		No official definition provided
Korea	The term <i>household wastes</i> means any wastes other than commercial wastes.	Wastes Control Act , Act No.13038, Article 2, 2015.
Malaysia	<i>Household waste</i> [is] defined as any substances or scrap materials that comes from household, commercial, institutional and other sources.	http://www.kpkt.gov.my/

¹⁴ Definition uncovered by supplemental desk research conducted by US-ATAARI.

¹⁵ Definition uncovered by supplemental desk research conducted by US-ATAARI.

¹⁶ Source could not be independently verified through supplemental desk research.

Respondent	Definition(s) Analyzed	Source
	(Household solid waste means any solid waste generated by a household, and of a kind that is ordinarily generated or produced by any premises when occupied as a dwelling house, and includes garden waste.)	Solid Waste and Public Cleansing Management Act 2007 .
Mexico		No official definition provided
Peru	These are the solid waste[s] generated exclusively in houses activities.	Law N° 27314 , 2004.
The Philippines		No official definition provided
Singapore	Waste arising from households.	Singapore Standard (SS) 594:2014 – Terminology for waste management. Clause 3.36
Chinese Taipei	General waste: It refers to the waste which is not industrial waste.	Waste Disposal Act, 2017.
Thailand		No official definition provided
The United States	Please refer to survey response attachment “U.S. Waste-Related Definitions and Related Statutory Authorities”.	
Viet Nam		No official definition provided

Table B-4: Definitions of Recyclable Materials by Respondent

Respondent	Definition(s) Analyzed	Source
Australia		No official definition provided
Brunei Darussalam		No official definition provided
Canada	Any material that has reached the end of its useful life in the form or purpose for which it was initially made and that can be recycled into a material that has value as a feedstock in another production process.	Statistics Canada: Waste Management Industry Survey: Business and Government Sectors , 2010.
Chile		No official definition provided
China	Waste suitable for recycling and resource utilization, e.g. waste paper, waste glass, waste plastic, waste metal, waste fabric and waste bottles and cans.	Industrial standard of People's Republic of China of City sanitation terminology CJJ/T65-2004 ¹⁷
Hong Kong, China		No official definition provided
Indonesia	Waste that may be recycled as referred to in paragraph (1), letter d, shall be waste that may be reutilized after having been processed such as, the remnant of cloth, plastic, paper, and glass. ¹⁸	Implementation of Infrastructure and Facilities in Handling Households Waste and Other type of Household Waste (Regulation of the Minister of Public Works Republic of Indonesia Number 03/PRT/M/2013, dated March 14, 2013)
Japan	"Recyclable Resources" shall mean such used products, etc. or by-products that are useful and are available or can be made available as raw materials.	Act on the Promotion of Effective Utilization of Resources , Article 2, 2006.

¹⁷ Source and definition could not be independently verified by supplemental desk research.

¹⁸ Definition uncovered by supplemental desk research conducted by US-ATAARI.

Respondent	Definition(s) Analyzed	Source
	"Reusable Parts" shall mean such used products, etc. that are useful and are available or can be made available as parts or other components of products.	
Korea	The term "recyclable resources" means products or by-products collected after being disposed of in a used or unused state, which are reusable or reusable after reconditioning (including recoverable energy and waste heat, but excluding radioactive substances and substances contaminated by radioactive substances).	Act on the Promotion of Saving and Recycling of Resources , Article 2; Act No.12319, 21. Jan, 2014.
Malaysia	Recyclable materials [are] raw or processed material that can be recovered from a waste stream for reuse. (Recyclable solid waste means controlled solid waste which is suitable for recycling as may be prescribed.)	http://www.kpkt.gov.my/ ¹⁹ Solid Waste and Public Cleansing Management Act 2007 .
Mexico	The definition "Recyclable Materials" is not specified in legislation. However, in Mexico's legal framework, there are these two definitions: Material: Substance, compound or mixture thereof, which is used as an input and is a component of consumer products, packaging and waste they generated; Recycling: waste transformation through various processes that allow return [on] its economic value, thus avoiding its disposal, provided that this restitution favor a saving energy and raw materials without damage to health, ecosystems or their elements. ²⁰	General Law for Prevention and Integral Waste Management (LGPGIR) , 2003.
Peru	Those wastes that once used, some components or substances can be used, with or without transformation process[es], for the same use, or another. ²¹	Law N° 27314 , 2004.
The Philippines	Any waste material retrieved from the waste stream and free from contamination that can still be converted into sustainable beneficial use or for other purposes, including but not limited to, newspaper, ferrous scrap metal, used oil, corrugated cardboard, aluminum, glass, office paper, tin cans and other materials as may be determined by the [National Solid Waste Management Waste] Commission.	R.A. No. 9003 – Ecological Waste Management Act of 2000.
Singapore	"recyclable" means such refuse, waste or other material or thing as may be prescribed by the Agency, with the approval of the Minister, to be capable of being recycled or reused Waste that could be recovered and processed into material suitable for the manufacture of a useful new product.	Environmental Public Health Act (Chapter 95) Singapore Standard (SS) 594:2014 – Terminology for waste management. Clause 3.100

¹⁹ Source could not be independently verified through supplemental desk research.

²⁰ Unavailability of publically accessible English translation did not allow for independent verification of definition.

Respondent	Definition(s) Analyzed	Source
Chinese Taipei	Substances that have lost their original usefulness are economically and technologically feasible to recycle, and may be recycled or reused as announced or approved by this Act.	Resource Recycling Act ²²
Thailand		No official definition provided
The United States	Please refer to survey response attachment “U.S. Waste-Related Definitions and Related Statutory Authorities”.	
Viet Nam		No official definition provided

Table B-5: Definitions of Natural Resources by Respondent

Respondent	Definition(s) Analyzed	Source
Australia	<i>natural resources management</i> means: (a) any activity relating to the management of the use, development or conservation of one or more of the following natural resources: (i) soil; (ii) water; (iii) vegetation; or (b) any activity relating to the management of the use, development or conservation of any other natural resources for the purposes of an activity mentioned in paragraph (a). ²³	Natural Resources Management (Financial Assistance) Act 1992
Brunei Darussalam		No official definition provided
Canada	Natural resources means mines, minerals and other non-renewable resources, energy, including energy developed from water, and forest resources.	Department of Natural Resources Act , s.2. c.41, Statutes of Canada, 1994.
Chile	The environmental components likely to be used by humans to satisfy their needs or spiritual, cultural, social and economic interests.	Law 19.300. General Bases of the Environment , 1994. environment
China		No official definition provided
Hong Kong, China		No official definition provided
Indonesia	Living resources shall be elements in nature consisting of living plant and animal resources which together with surrounding non-living elements constitutes an ecosystem.	Act of the Republic Indonesia Number 5 1990 Concerning Conservation of Living Resources and Their Ecosystems , Article 1, 1990.
Japan		No official definition provided
Korea		No official definition provided
Malaysia	Asset or material that constitutes the natural capital of a nation, require application of capital and human resources (mental and physical labor) to be exploited (extracted, processed, refined) for the realization of their economic value.	http://www.kpkt.gov.my/ ²⁴

²² Source is amended to this report in Appendix C, as supplemental regulatory context submitted by Chinese Taipei.

²³ Definition uncovered by supplemental desk research conducted by US-ATAARI.

²⁴ Source could not be identified through supplemental desk research.

Respondent	Definition(s) Analyzed	Source
Mexico	The natural element susceptible to being used for the benefit of man.	General Law on Ecological Balance and Environmental Protection , Article 3, Fraction XXIX, 1997.
Peru		No official definition provided
The Philippines	All lands of the public domain, waters, minerals, coal, petroleum, and other mineral oils, all forces of potential energy, fisheries, forests or timber, wildlife, flora and fauna, and other natural resources are owned by the State. With the exception of agricultural lands, all other natural resources shall not be alienated. ²⁵	Constitution of the Republic of the Philippines . Article 12, Section 2. 1987.
Singapore		No official definition provided
Chinese Taipei	Natural resources that influence human survival and development, including sunlight, air, water, soil, earth, minerals, forests, wildlife, etc. ²⁶	Basic Environment Act , 2002.
Thailand		No official definition provided
The United States	Natural resources, as defined in the Title 40 of the Code of Federal Regulations means land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States (including the resources of the fishery conservation zone established by the Magnuson-Stevens Fishery Conservation and Management Act [16 USCS §§ 1801 et seq.]), any State or local government, any foreign government, any Indian tribe, or, if such resources are subject to a trust restriction on alienation, any member of an Indian tribe.	
Viet Nam		No official definition provided

Table B-6: Definitions of Biomass by Respondent

Respondent	Definition(s) Analyzed	Source
Australia	<i>biomass</i> means organic matter other than fossilised biomass. Examples of fossilised biomass: Coal, lignite. ²⁷	Renewable Energy (Electricity) Regulations 2001
Brunei Darussalam		No official definition provided
Canada	<i>biomass</i> means a fuel that consists only of non-fossilized, biodegradable organic material that originates from plants or animals but does not come from a geological formation, and includes gases and liquids recovered from organic waste. (<i>biomasse</i>) ²⁸	Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations

²⁵ Definition uncovered by supplemental desk research conducted by US-ATAARI.

²⁶ The source provided appears to equate natural resources with the term “environment,” which precedes this definition.

²⁷ Definition uncovered by supplemental desk research conducted by US-ATAARI.

²⁸ Definition uncovered by supplemental desk research conducted by US-ATAARI.

Respondent	Definition(s) Analyzed	Source
	Biomass is plant material that can be turned into fuel (also known as biofuel when it is made from biological material) to supply heat and electricity.	Natural Resources Canada Website , 2016.
Chile		No official definition provided
China	Biomass refers to organic materials produced directly or indirectly through photosynthesis by using solar energy, which mainly comes from forestry and agriculture industry.	Biomass terminology GB/T30366-2013, 2013.
Hong Kong, China		No official definition provided
Indonesia		No official definition provided
Japan	<i>Biomass</i> is biological resources in mass quantities and is defined as organic resources derived from animals and plants (excluding fossil resources).	The Master Plan for the Promotion of Biomass Utilization (Adopted by the Cabinet Meeting on December 17, 2010) ²⁹
Korea		No official definition provided
Malaysia	Biomass is “(a) A resource in solid form; and (b) Comprises of non-fossilized and biodegradable organic material, including products and by-products and residues from agricultural, industrial or municipal wastes originating from Malaysia.” ³⁰ <i>Biomass</i> is defined as non-fossilised and originating from indigenous plants animals and micro-organisms including but not limited to products biodegradable organic material by-products residues and waste from agriculture industrial and municipal wastes.	RENEWABLE ENERGY (CRITERIA FOR RENEWABLE RESOURCES) REGULATIONS 2011, PU(A) 383/2011 http://www.seda.gov.my/ ³¹
Mexico	Bioenergy: fuels obtained from the biomass, which come from organic matter gained from agriculture, livestock activity, forestry, aquaculture, seaweed culture, fisheries waste, household, commercial and industrial activities, microorganisms, and enzymes. As well as its derivatives produced by technological sustainable processes that comply with specifications and quality standards established by the competent authority in terms of this law; as required on article 1 fraction I on this law. Vegetable biomass: products and residues of biological origin provided by agricultural crops, forestry, urban organic waste and/or from related industries.	NMX-AA-174-SCFI-2015. To establish specifications and requirements for the certification of environmental sustainability in the production of liquid biofuels from vegetable biomass. http://www.economia-nmx.gob.mx/normas/nmx/2010/nmx-aa-174-scfi-2015.pdf There are definitions of biofuel and biomass in norms http://dof.gob.mx/nota_detalle.php?codigo=5232012&fecha=02/02/2012 http://dof.gob.mx/nota_detalle.php?codigo=691939&fecha=15/08/2003 ³²
Peru		No official definition provided

²⁹ Source could not be independently verified by supplemental desk research.

³⁰ Definition uncovered by supplemental desk research conducted by US-ATAARI.

³¹ Source could not be independently verified by supplemental desk research.

³² Sources could not be independently verified by supplemental desk research.

Respondent	Definition(s) Analyzed	Source
The Philippines	Any organic matter, particularly cellulosic matter, which is available on a renewable or recurring basis, including trees, crops, and associated residues, plant fiber, poultry litter and other animal wastes, industrial wastes and biodegradable component[s] of solid waste.	R.A. No. 9367 - Biofuels Act of 2006.
Singapore	Material that is derived from living, or recently living biological organisms and plants that can be used directly or processed as a fuel source.	Singapore Standard (SS) 594:2014 – Terminology for waste management.
Chinese Taipei	The energy generated directly, or derived from agriculture or forestry plants, methane or domestic organic wastes.	Renewable Energy Development Act, 2009.
Thailand	Biomass is the production of industrial-agricultural waste such as rice husk, bagasse fiber and palm shell.	No official definition provided
The United States	P.L. 110-140 Energy Independence and Security Act of 2007 Title XII Section 1201, the term biomass—'(aa) means any organic material that is available on a renewable or recurring basis, including— '(AA) agricultural crops; '(BB) trees grown for energy production; '(CC) wood waste and wood residues; '(DD) plants (including aquatic plants and grasses); '(EE) residues; '(FF) fibers; '(GG) animal wastes and other waste materials; and '(HH) fats, oils, and greases (including recycled fats, oils, and greases); and '(bb) does not include—'(AA) paper that is commonly recycled; or '(BB) unsegregated solid waste.	P.L. 110-140 Energy Independence and Security Act of 2007, Title XII, Section 1201; 2007.
Viet Nam		No official definition provided

Table B-7: Definitions of Renewable Energy by Respondent

Respondent	Definition(s) Analyzed	Source
Australia	The following energy sources are eligible renewable energy sources: (a) hydro; (b) wave; (c) tide; (d) ocean; (e) wind; (f) solar; (g) geothermal-aquifer; (h) hot dry rock; (i) energy crops; (j) wood waste; (k) agricultural waste; (l) waste from processing of agricultural products; (m) food waste; (n) food processing waste; (o) bagasse; (p) black liquor; (q) biomass-based components of municipal solid waste; (r) landfill gas; (s) sewage gas and biomass-based components of sewage;	Renewable Energy (Electricity) Act 2000 , No. 174, 2000.

Respondent	Definition(s) Analyzed	Source
	<p>(t) any other energy source prescribed by the regulations.</p> <p>(2) Despite subsection (1), the following energy sources are not eligible renewable energy sources:</p> <p>(a) fossil fuels;</p> <p>(b) materials or waste products derived from fossil fuels.</p>	
Brunei Darussalam	<p>Sustainable Renewable Energy consists of:</p> <p>a) Small-scale hydro</p> <p>b) Wind</p> <p>c) Solar (photovoltaic and solar heat);</p> <p>d) Geothermal</p> <p>e) Bioenergy excluding traditional firewood and charcoal for households</p> <p>f) Upcoming Alternative energies that meet the sustainable criteria</p>	Adoption of the APEC definition of Renewable Energy
Canada	Renewable energy is energy obtained from natural resources that can be naturally replenished or renewed within a human lifespan, that is, the resource is a sustainable source of energy.	Natural Resources Canada Website , 2016.
Chile	It shall mean non-conventional renewable energies those defined in paragraph aa) of Article 225 of this law. It also means efficient cogeneration facilities to those defined as such in the letter c) of the same article.	Electric Services Law , Ley Núm 20.257, 2008.
China	Refers to non-fossil fuels including wind energy, solar energy, water energy, bioenergy, geothermal, ocean energy, etc.	Law of Renewable Energy of People's Republic of China , 2013.
Hong Kong, China		No official definition provided
Indonesia	<p>Renewable Energy is source of energy produced from energy sources, which will not naturally be used up and sustainable if managed properly, amongst others, geothermal, biofuel, river flow, solar heat, wind, biomass, biogas, sea waves, and sea-depth temperature.</p> <p>The energy coming from the renewable source of energy.</p>	<p>NATIONAL ENERGY POLICY (Presidential Regulation No. 5/2006 dated January 25, 2006)</p> <p>Law of the Republic of Indonesia Number 30, 2007</p>
Japan	<p>The term "Sources of Renewable Energy" means the following energy sources;</p> <p>1. Sunlight, 2. Wind power, 3. Hydraulic power, 4. Geothermal power, 5. Biomass... 6. in addition to what is listed in the preceding items, energy sources other than crude oil, petroleum gas, combustible natural gas, coal, and products manufactured therefrom, which are provided for by Cabinet Order as being recognized as perpetually usable as energy sources for electricity</p>	Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities , Article 2, 2011.
Korea	<p>The term "renewable energy" means energy converted from existing fossil fuels, or renewable energy, including sunlight, water, geothermal, precipitation, bio-organisms, etc., which falls under the following items:</p> <p>(a) Solar energy;</p> <p>(b) Bio energy converted from biological resources which fall within the criteria and scope prescribed by Presidential Decree;</p> <p>(c) Wind power;</p>	Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy , Article 2, 2011.

Respondent	Definition(s) Analyzed	Source
	(d) Water power; (e) Fuel cells; (f) Energy from liquefied or gasified coal, and from gasified heavy residual oil which falls within the criteria and scope prescribed by Presidential Decree; (g) Marine energy; (h) Energy from waste which falls within the criteria and scope prescribed by Presidential Decree; (i) Geothermal energy; (j) Hydrogen energy; (h) Energy prescribed by Presidential Decree, other than petroleum, coal, nuclear power, or natural gas.	
Malaysia	<p>"renewable resources" means the recurring and non-depleting indigenous resources or technology as set out in the first column of the Schedule; . . . "renewable energy" means electricity generated or produced from renewable resources. [Schedule identifies biogas, biomass, small hydropower, and solar photovoltaic as "renewable resources."]³³</p> <p>Renewable Energy is any form of primary energy from recurring and non-depleting indigenous resources. "Renewable resources" means the recurring and non-depleting indigenous resources or technology.</p>	Renewable Energy Act 2011, Act 725
Mexico	<p>Those renewable regulated by this Law, whose source lies in natural phenomena, processes or materials capable of being transformed into usable energy for humanity, which regenerate naturally, so are continuously or periodically available, and listed below:</p> <p>a) Wind; b) Solar radiation, in all its forms; c) The movement of water in natural or artificial channels; d) The ocean energy in its different forms, namely: tidal, the waves, ocean currents and salt concentration gradient; e) The heat from geothermal reservoirs; f) Bioenergy, determined by the Law on Promotion and Development of Bioenergy, and g) Any others, if any, determined by the Secretariat, whose source meets the first paragraph of this fraction;</p>	<p>Energy Transition Law, Article 3°, fraction XVI, 2015.</p> <p>Law for Renewable Energy and Utilization of Financing Energy Transition http://www.diputados.gob.mx/LeyesBiblio/pdf/LAERFTE.pdf</p>
Peru		No official definition provided
The Philippines	<p>"Renewable energy resources"³⁴ refer to energy resources that do not have an upper limit on the total quantity to be used. Such resources are renewable on a regular basis, and whose renewal rate is relatively rapid to consider availability over an indefinite period of</p>	<p>R.A. No. 9513, Renewable Energy Act of 2008.</p>

³³ Definition uncovered by supplemental desk research conducted by US-ATAARI.

³⁴ The Philippines' Renewable Energy Act of 2008 defined Renewable Energy Resources and not Renewable Energy.

Respondent	Definition(s) Analyzed	Source
	time. These include, among other, biomass, solar, wind, geothermal, ocean energy, and hydropower conforming with internationally accepted norms and standards on dams, and other emerging renewable energy technologies.”	
Singapore	Energy that is derived from natural processes that are replenished constantly. There are various forms of renewable energy, deriving directly or indirectly from the sun, or from heat generated deep within the earth. They include energy generated from solar, wind, biomass, geothermal, hydropower and ocean resources, solid biomass, biogas and liquid biofuels.	International Energy Agency's Energy Statistics Manual , pg. 115, 2005
Chinese Taipei	Solar energy, biomass energy, geothermal energy, ocean energy, wind power, non-pumped-storage hydropower, the energy generated directly, or derived from domestic general waste and general industrial waste.	Renewable Energy Development Act , 2009.
Thailand	Renewable energy includes energy obtained from wood, firewood, paddy husk, bagasse, biomass, hydropower, solar power, geothermal power, wind power, and waves and tides. ³⁵	NATIONAL ENERGY POLICY COUNCIL ACT, B.E. 2535 (1992)
The United States	RENEWABLE ENERGY: Energy derived from resources that are regenerative or for all practical purposes cannot be depleted. Types of renewable energy resources include moving water (hydro, tidal and wave power), thermal gradients in ocean water, biomass, geothermal energy, solar energy, and wind energy. Municipal solid waste (MSW) is also considered to be a renewable energy resource. RENEWABLE ELECTRIC ENERGY: energy produced by solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, geothermal heat pumps, microturbines, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project.	" Glossary of Energy-Related Terms " Energy.Gov Office of Energy Efficiency & Renewable Energy Executive Order 13693
Viet Nam	Renewable energy refers to energy that comes from resources such as water, wind, sunlight, geothermal heat, tides, waves, biological fuels and other resources that can generate renewable energy.	Law of Environment Protection , Clause I, Article 43,

Table B-8: Definitions of Waste-to-Energy/Energy-to-Waste by Respondent

Respondent	Definition(s) Analyzed	Source
Australia		No official definition provided
Brunei Darussalam		No official definition provided
Canada		No official definition provided
Chile		No official definition provided
China	The process of taking suitable measures to realize waste energy utilization.	Industrial standard of People's Republic of China of City sanitation terminology CJJ/T65-2004 ³⁶

³⁵ Definition uncovered by supplemental desk research by US-ATAARI.

³⁶ Source could not be verified by supplemental desk research.

Respondent	Definition(s) Analyzed	Source
Hong Kong, China		No official definition provided
Indonesia		No official definition provided
Japan		No official definition provided
Korea	<p>Article 2 (Definition)</p> <p>8. The term "energy recovery" means recovering energy from recyclable resources in accordance with the standards under subparagraph 7 of Article 2 of the Wastes Control Act (hereinafter referred to as "standards for energy recovery") or converting them into energy-recoverable substances;</p> <p>8-2. The term "waste-to-energy" means energy recovered from wastes, such as solid fuels and syngas from wastes, or converted materials from which energy can be recovered, which are prescribed by Ordinance of the Ministry of Environment</p>	Act on the Promotion of Saving and Recycling of Resource , 2014.
Malaysia		No official definition provided
Mexico	<p>The definition- Waste-to-Energy / Energy from waste- biomass it is not specified in our legislation, however, it can be used as the Bioenergy definition, although in this case, wastes from hydrocarbon derivatives are not considered.</p> <p>Utilization of waste: set of actions aimed to recover economic value of waste through reuse, remanufacturing, redesign, recycling and recovery of materials or energy abetted;</p>	<p>General Law for Prevention and Integral Waste Management (LGPGIR), 2003.</p> <p>Law for the Development and Promotion of Bioenergy, Art 2, fraction II, 2008.</p>
Peru		No official definition provided
The Philippines	<p>Waste-to-Energy Technologies shall refer to systems which convert biodegradable materials, such as but not limited to, animal manure or agricultural waste, into useful energy through processes such as anaerobic digestion, fermentation and gasification, among others, subject to the provisions and intent of Republic Act No. 8749 (Clean Air Act of 1999) and Republic Act No. 9003 (Ecological Solid Waste Management Act of 2000).</p> <p>Waste-to-Energy shall refer to the energy recovered from waste, usually the conversion of non-recyclable waste materials into useable heat, electricity, or fuel through a variety of processes. ... The [Waste-to-Energy] facility shall not accept non-segregated municipal solid wastes and hazardous wastes.</p>	<p>R.A. no. 9513, Renewable Energy Act of 2008.</p> <p>Guidelines Governing the Establishment and Operation of Waste-to-Energy Technologies for Municipal Solid Waste. National Solid Waste Management Commission. 2016.</p>
Singapore	The process of producing usable electricity, heat, or steam from a waste treatment technology such as incineration, pyrolysis, gasification or anaerobic digestion.	Singapore Standard (SS) 594:2014 – Terminology for waste management. Clause 3.145
Chinese Taipei	For the purpose of energy recycling, the waste with heating value are to be used as raw materials through particular production processing or technologies which turn them into fuels, or to be used directly as fuels for boiler auxiliaries.	Regulations Governing Administration of Reuse of Enterprise Waste
Thailand		No official definition provided
The United States		No official definition provided

Respondent	Definition(s) Analyzed	Source
Viet Nam	Recovery of energy from waste is a process of recovery of energy from waste transformation.	Decree no.38/2015/ND-CP , On Management of Waste and Discarded Materials, 2015.

Table B-9: Government Bodies Responsible for SMM in APEC Economies

Respondent	Primary Responsibilities for SMM	Secondary Responsibilities for SMM
Australia	Commonwealth Scientific and Industrial Research Organization and the Commonwealth Department of Industry, Innovation and Science	
Brunei Darussalam	Department of Environment, Parks and Recreation (under Ministry of Development); Energy and Industry Department of the Prime Minister Office; Department of Electrical Services	Brunei Development Economic Board; Department of Environment, Parks and Recreation.
Canada	Federal, provincial, territorial, and municipal governments; Department of the Environment (Environment and Climate Change Canada); CCME's Waste Management Task Group; Waste Reduction and Management Division (Environment and Climate Change Canada); Energy Sector, Electricity Resources Branch, Renewable and Electrical Energy Division (Natural Resources Canada)	CCME; The Trade Commissioner Service (Global Affairs Canada); Innovation and Energy Technology Sector (Natural Resources Canada); Canadian Forest Service (Natural Resources Canada); Commission on Clean Production (Natural Resources Canada)
Chile	Ministry of Environment; Ministry of Economy; Corporation on Production Promotion	
China	None	National Development and Reform Commission; Minister of Housing and Urban-Rural Construction; Ministry of Environmental Protection; Ministry of Agriculture; National Energy Administration; State Forestry Bureau
Hong Kong, China	Environment Bureau and Environmental Protection Department	
Indonesia	Ministry of Energy and Mineral Resources; Ministry of Environment and Forestry	
Japan	Ministry of the Environment	Ministry of Economy, Trade and Industry
Korea	Ministry of Environment	Environment Corporation; Resource Circulation Service; Environmental Industry and Technology Institute
Malaysia	Green Technology and Water (Ministry of Energy)	Ministry of Natural Resources and Environment; Sustainable Energy Development Authority Malaysia; Ministry of International Trade and Industry; Malaysian Investment Development Authority; Ministry of Finance (<i>Royal Malaysia Customs Department</i>); National Solid Waste Management Department

Respondent	Primary Responsibilities for SMM	Secondary Responsibilities for SMM
Mexico	Ministry of Environment and Natural Resources; Secretary of Economy; Secretary of Finance and Public Credit; Ministry of Communications and Transport; National Council of Science and Technology	
Peru	Housing, Building and Sanitary Ministry; Ministry of Environment; Mining and Energy Ministry	PROINVERSIÓN, within the Ministry of Economy and Finance
Philippines	National Solid Waste Management Commission	Inter-agency bodies
Singapore	National Environment Agency	Industry Development and Promotion Office; Economic Development Board; International Enterprise Singapore
Chinese Taipei	Department of Solid Waste Management (Environmental Protection Administration)	Bureau of Foreign Trade (Ministry of Economic Affairs); Environmental Protection Administration; Industrial Development Bureau (Ministry of Economic Affairs; Ministry of Science and Technology)
Thailand	Office of the Permanent Secretary (Ministry of Natural Resources and Environment); Office of the Natural Resources and Environmental Policy and Planning (Ministry of Natural Resources and Environment); Pollution Control Department (Ministry of Natural Resources and Environment); Department of Environmental Quality Promotion (DEQP) (Ministry of Natural Resources and Environment); Energy Policy and Planning Office (Ministry of Energy); National Energy Policy Committee	Department of Alternative Energy Development and Efficiency (Ministry of Energy); National Science and Technology Development Agency (Ministry of Science and Technology); National Science Technology and Innovation Policy Office (Ministry of Science and Technology); Department of International Economic Affairs (Ministry of Foreign Affairs); Department of Industry Promotion (Ministry of Industry)
United States	Department of Commerce; Environmental Protection Agency	Department of Energy
Viet Nam	Ministry of Natural Resources and Environment	

Table B-10: Examples of Trade & Investment Barriers by Respondent

Respondent	Question 4 - Has your economy experienced any difficulties in trade or investment related to SMM technologies, products or services? Please provide background / examples.	Question 5 - Has your economy experienced difficulties / obstacles to trade or investment in SMM technologies, products, or services due to different concepts/understandings of SMM trade definitions? If yes, please provide background /examples.
Australia		
Brunei Darussalam		
Canada	<p>Global Affairs Canada</p> <p>As any market has its specific opportunities and challenges, it is difficult to provide a general overview of difficulties faced by Canadian companies while doing</p>	<p>Global Affairs Canada (GAC)</p> <p>GAC does not hold any further information this other than was included in Question 4.</p>

Respondent	Question 4 - Has your economy experienced any difficulties in trade or investment related to SMM technologies, products or services? Please provide background / examples.	Question 5 - Has your economy experienced difficulties / obstacles to trade or investment in SMM technologies, products, or services due to different concepts/understandings of SMM trade definitions? If yes, please provide background /examples.
	<p>business abroad. Based on past interactions of the Canadian Trade Commissioners Service (TCS) with a number of Canadian companies in the SMM technologies sectors, it appears, however, some typical obstacles to trade can be identified. For example, in a number of cases, Canadian companies have required support from the TCS on investment opportunities, intellectual property protection, and due diligence on partnering opportunities. Depending on the market, some companies have indicated that there are unnecessary administrative burdens and additional costs as they need to adapt to different technology licensing requirements given the lack of international standards. Some have also expressed a lack of transparency related to accessing all the various laws and regulations affecting them as well as some regulatory frameworks for the solid waste management (including recycling) being too restrictive to facilitate the use of foreign SMM technologies. Some have also noted that certain markets have yet to be regulated despite a significant demand for SMM solutions.</p> <p>Natural Resources Canada & Environment and Climate Change Canada</p> <p>Wood</p> <p>Wood allows us to reduce, reuse, recycle, and recover waste - Sawmilling residues such as wood chips, bark and sawdust account for about half of the volume of wood that goes into a lumber mill for processing. Instead of being thrown out, this “waste” can be made into paper, engineered wood products, industrial chemicals, pharmaceuticals, clothing, personal care products and bioenergy. In Canada, bioenergy is primarily sourced from wood residues and sometimes dead or damaged timber.</p> <p>However some of the more innovative biochemical and biomaterials derived from forest biomass are meeting with adoption/deployment challenges on the demand-side and on the supply-side:</p> <p><u>Supply side challenges</u></p> <ul style="list-style-type: none"> - Access to Financing. Companies looking to adopt leading edge clean technologies often can't acquire favourable financing and then opt for “safer” process improvement capital projects. - Long lead times/Risk. Innovations and clean 	<p>Environment and Climate Change Canada</p> <p>This specific area has not been investigated by Environment and Climate Change Canada. Barriers to trade manifest themselves various ways. The following is one such example: some economies put in place legislation, regulations and/or policies to provide assurances that they are procuring fibre from sustainable sources, so as not to be creating an environmental impact in the economy that they are source from. However, from time to time, the mechanisms that are put in place, are not based on science, or do not fully appreciate Canadian sustainable forest management practices, and as a result, create a trade irritant for Canadian forest products. The issues are not so much trade definitions, but the requirement of certain attributes such not being sources from primary forests or intact forest landscapes, which are not scientifically or evidence based concepts. Additionally, using wood in buildings, can contribute to mitigating climate change (Wood stores carbon), however, the acceptance of building with wood versus building with alternative products (e.g., steel, concrete) in tall buildings, is only just being accepted/adopted in mainstream thinking.</p>

Respondent	Question 4 - Has your economy experienced any difficulties in trade or investment related to SMM technologies, products or services? Please provide background / examples.	Question 5 - Has your economy experienced difficulties / obstacles to trade or investment in SMM technologies, products, or services due to different concepts/understandings of SMM trade definitions? If yes, please provide background /examples.
	<p>technologies take a long time to move from initial conception to market-ready product, creating substantial business risk, especially if there is no guarantee of policy stability (e.g. will this policy promoting clean tech exist in 5 years?)</p> <ul style="list-style-type: none"> - Regulations. There are not enough mandatory regulations that encourage the adoption of clean technology. - Regulatory barriers. The forest sector has and is inventing many clean technologies that do not fall under existing standards and regulations, or else are restricted by outdated ones. - Cost. As noted above, many markets do not pay a premium for greener products. In these markets, the manufacturers which adopt clean technologies still need to match the price point of those who do not use clean technologies. <p><u>Demand side challenges</u></p> <ul style="list-style-type: none"> - Awareness. Many sectors and Canadians are unaware of the clean forest technologies available, or they have a misunderstanding of the sustainability of Canada's forests. <p>In the 2014 CCME State of Waste Management Report, the lack of secondary markets and weak and fluctuating markets were identified as an important challenge to foster "closed loop" recycling at the manufacturing level. Some industry sectors are taking the initiative at the economy-level to develop better markets and guidance on this problem. "Government's ability to influence secondary markets is limited. In addition, most markets for secondary materials in Canada are part of a larger North American and international commodities markets where Canadian influence on prices and material flows is limited." In 2009, a consultant report further identified that as a resource-based economy, there has been fewer imperative to develop processes and technologies to recycle or use end-of-life materials more efficiently in Canada. Since landfilling costs are lower in Canada than</p>	

Respondent	Question 4 - Has your economy experienced any difficulties in trade or investment related to SMM technologies, products or services? Please provide background / examples.	Question 5 - Has your economy experienced difficulties / obstacles to trade or investment in SMM technologies, products, or services due to different concepts/understandings of SMM trade definitions? If yes, please provide background /examples.
	the cost of recycling and composting, there has been a slower move to waste diversion.	
Chile		
China	<p>Trade and investment in SMM-supportive technologies and services should be aligned with economies' respective domestic laws. Strengthening work of inspection and quarantine in import and export is also needed, to protect from negative environmental impact during the course of trade.</p> <p>Not all SMM-related terms are suitable for launching international trade. Take municipal solid waste for example, we tend to process them locally to avoid pollution transfer problem. Also, recyclable material could be traded internationally in the premise of meeting renewable material standards. As such, we think work on defining whether or not one specific SMM-related term is suitable for trade should also be conducted.</p>	
Hong Kong, China		
Indonesia	In the case of Waste-to-Energy, majority of the projects are not bankable due to their low Internal Rate of Return and long Pay Back Period.	The issue of Sustainable Materials Management (SMM) has not been prioritized yet in our internal discussions. Currently we are focusing more on biomass, biogas, and waste-to-energy.
Japan	<p>In some cases, the uncertainty of the ways to approve and permit the services related to recycling have affected recycling companies whether they decide to invest on recycling services or not.</p> <p>In some cases, it is insufficient to apply the regulations related to environmental protection.</p> <p>This leads inequality between companies that observe regulations and those that breaking regulations. This inequality in the competitive environment also might affect recycling companies whether they decide to invest on recycling services or not.</p>	<p>When importing and exporting goods for the purpose of repairing/remanufacturing, those goods are sometimes considered to be secondhand goods or wastes. In such cases, the regulations of imports and exports for secondhand goods and wastes are applied for these goods, which have caused troubles in importing and exporting.</p> <p>Since there is difference in the definition of wastes or other materials in each economy, in some cases, even exported under appropriate procedures, those goods could be returned from destination economies. (Cf. The procedures of "Basel Convention")</p>
Korea		
Malaysia		
Mexico	The main issues in the trade or investment on almost any kind of technologies or product services is related to financial sufficiency and costs related to operation and maintenance.	The main problems related to the approval of definitions of concepts have been cross-border transit of hazardous waste as management of commodities.
Peru	<p>Experiences: burning and electricity generation from landfill biogas. Feasibility for biogas producing from sludge of waste water plants.</p> <p>Difficulties: Legal frame[work] low developed for PPP projects, [especially] when [it] includes new technology.</p>	

Respondent	Question 4 - Has your economy experienced any difficulties in trade or investment related to SMM technologies, products or services? Please provide background / examples.	Question 5 - Has your economy experienced difficulties / obstacles to trade or investment in SMM technologies, products, or services due to different concepts/understandings of SMM trade definitions? If yes, please provide background /examples.
The Philippines	With respect to trade and investments of SMM products and technologies, we have not experienced any difficulties. Moreover, SMM has already been mainstreamed in general policies for registration of projects through adoption of measures in selected sectors to support the National Framework Strategy on Climate Change, securing an Environmental Compliance Certificate pursuant to the Philippine Environmental Impact Statement System, utilization of up-to-date and market appropriate technologies, adherence to internationally-recognized standards, use of brand new equipment to ensure clean technology, and support to the Kyoto Protocol or Clean Development Mechanism.	Difficulties have been in the area of local equity requirement and waste classification under the DOR/NREB/ERC
Singapore		
Chinese Taipei	<ol style="list-style-type: none"> 1. Recycling technologies, products and services are essential parts of SMM. Due to the uncertainties involved in the policies, a shortage in the second hand materials was always encountered in the past. Same problem is expected to be arisen when SMM is developing in the future. 2. The form of domestic biomass energy products includes: liquid products, solid products and gaseous products. Limited by the manufacturing techniques, there is a lack of stability of the quality which affects the acceptance of the back-end application market. Beside independent research and development, the introduction of foreign technology also plays a vital role. However, a lack of information of overseas companies owning advanced technology impedes the technical cooperation between foreign and domestic industries. 	
Thailand	Yes, SMM production sites are usually not welcomed by the surrounding communities. Other than the site issue, there are also some relating issues such as cost, sustainability, policy, and acknowledgement.	Yes, due to the fact that different economies have different concepts/ understandings of trade definitions, import of waste can be refused
The United States	<ul style="list-style-type: none"> • In the environmental technologies sector, including solid and hazardous waste management, U.S. companies have encountered trade challenges. • For example, in Brazil, local electrical certifications and safety approvals typically fail to recognize international or U.S. equivalents, imposing additional and onerous costs on U.S. businesses for redundant testing and certification. • Additionally, despite certification from relevant and globally accepted international certification bodies, products that have transmitting and/or receiving devices must obtain approvals from ANATEL (Brazil's National Telecommunications Agency). 	Until recently, the Philippine Department of Energy classified municipal solid waste (MSW) as a "natural resource", which had the unintended effect of subjecting waste-to-energy projects to stringent local equity requirements (as any projects that utilize "natural resources" are subject to). Through a cooperative dialogue with industry, the Department of Energy determined that MSW did not meet the definition of "biomass" and was thus not a "natural resource". As a result, waste-to-energy projects can now be 100% foreign owned.

Respondent	Question 4 - Has your economy experienced any difficulties in trade or investment related to SMM technologies, products or services? Please provide background / examples.	Question 5 - Has your economy experienced difficulties / obstacles to trade or investment in SMM technologies, products, or services due to different concepts/understandings of SMM trade definitions? If yes, please provide background /examples.
	<ul style="list-style-type: none"> • U.S. companies also report that tariff rates as high as 48%, together with challenges associated with implementation of Ex Tarifario, make it very difficult for U.S. companies to compete in Brazil. • Other barriers to trade that the United States has encountered with respect to SMM technologies, services and products abroad include: lack of adequate and effective intellectual property rights protections; lack of regulatory transparency and sound legal infrastructure; state-controlled oil and energy sectors, which are often slower to invest in new technologies; cumbersome and unpredictable customs procedures; corruption; import licensing schemes; local content requirements; investment restrictions, including requirements to partner with domestic firms; and, in some economies, high applied tariff rates. 	
Viet Nam	<p>Difficulties in investment related to SMM technologies, products or services:</p> <ul style="list-style-type: none"> - Lack of budget; - Haven't got a systematic plan for investment from planning, implementation, assessment and solutions. - Do not have a long period of implementation, strong propagation to change awareness, behavior of people (Example in 3R program). - Lack of regulation to promote using of recycled products; - Lack of economy-level standards for recycled material's quality. 	

**Appendix C SUPPLEMENTAL
REGULATORY CONTEXT
SUBMITTED BY ECONOMIES**

U.S. Waste-Related Definitions and Related Statutory Authorities

The terms: waste, municipal solid waste, and recyclable materials have been defined below using US EPA terminology derived from: 1) working definitions and/or 2) relevant terms and definitions found in the Solid Waste Disposal Act and the subsequently-enacted Resource Conservation and Recovery Act (collectively, "RCRA") and regulations under Title 40, a part of the United States Code of Federal Regulations.

Statutory Definitions of Solid Waste and Hazardous Waste:

EPA's authority to regulate waste flows from the RCRA statutory definition of "solid waste." The RCRA statute defines "solid waste" as "any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 1342 of title 33, or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923) [42 U.S.C. 2011 et seq.]"

The RCRA statute also provides the authority for EPA to regulate "hazardous waste" which is a subset of solid waste. In the RCRA statute, "hazardous waste" is defined as

"a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may—

- (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or
- (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

Regulatory Definitions of Solid Waste and Hazardous Waste

In order to implement its statutory obligations under RCRA, EPA has developed regulatory definitions of solid waste and hazardous waste, which are typically applied in the context of the relevant regulatory program in which these terms apply (e.g., the hazardous waste management program, the municipal solid waste program, etc.). Below is a summary of some of these terms.

Hazardous Waste Program Definitions

Hazardous waste is regulated through a comprehensive federal 'cradle-to-grave' regulatory program under RCRA Subtitle C, where states then become authorized to implement their state hazardous waste program in lieu of the federal government.

Solid Waste:

EPA defines “solid waste” for purposes of implementing its hazardous waste regulatory program.

Under the RCRA hazardous waste regulations, a solid waste is any material that is discarded by being:

- **Abandoned:** The term abandoned means thrown away. A material is abandoned if it is disposed of, burned, incinerated, or sham recycled.
- **Inherently Waste-Like:** Some materials pose such a threat to human health and the environment that they are always considered solid wastes; these materials are considered to be inherently waste-like. Examples of inherently waste-like materials include certain dioxin-containing wastes.
- **A Discarded Military Munition:** Military munitions are all ammunition products and components produced for or used by the U.S. Department of Defense (DOD) or U.S. Armed Services for national defense and security. Unused or defective munitions are solid wastes when:
 - abandoned (i.e., disposed of, burned, incinerated) or treated prior to disposal;
 - rendered non-recyclable or non-useable through deterioration; or
 - declared a waste by an authorized military official.
 Used (i.e., fired or detonated) munitions may also be solid wastes if collected for storage, recycling, treatment, or disposal.
- **Recycled in Certain Ways:** A material is recycled if it is used or reused (e.g., as an ingredient in a process), reclaimed, or used in certain ways (used in or on the land in a manner constituting disposal, burned for energy recovery, or accumulated speculatively). Specific exclusions to the definition of solid waste are listed in the Code of Federal Regulations (CFR) at 40 CFR section 261.4(a). Many of these exclusions are related to recycling.

Hazardous Waste:

Under EPA’s regulations, a solid waste is a hazardous waste if it is specifically listed as a hazardous waste; or if that solid waste exhibits any characteristics of a hazardous waste. Listed wastes include wastes identified from common manufacturing and industrial processes (i.e., “F-listed” wastes), wastes from specific industries (i.e., “K-listed” wastes) and discarded commercial products (i.e., “U- and P-listed” wastes). Characteristic wastes are wastes that exhibit any one or more of the following properties: ignitability, corrosivity, reactivity or toxicity.

Listed Hazardous Wastes

A waste is determined to be a hazardous waste if it is specifically listed on one of four lists (the F, K, P and U lists) found in title 40 of the U.S. Code of Federal Regulations (CFR) in section 261.

The F and K Lists

The F-list, found at 40 CFR section 261.31, identifies wastes from common manufacturing and industrial processes as hazardous. Because the processes generating these wastes can occur in different sectors of industry, the F list wastes are known as wastes from non-specific sources. They can be divided into seven groups depending on the type of manufacturing or industrial operation that creates them:

- Spent solvent wastes,
- Electroplating and other metal finishing wastes,
- Dioxin-bearing wastes,
- Chlorinated aliphatic hydrocarbons production,
- Wood preserving wastes,
- Petroleum refinery wastewater treatment sludges, and
- Multisource leachate.

The K-list identifies hazardous wastes from specific sectors of industry and manufacturing and are considered source-specific wastes. To qualify as a K-listed hazardous waste, a waste must fit into one of the 13 categories on the list and the waste must match one of the detailed K list waste descriptions in [40 CFR section 261.32](#). The 13 industries that generate K list wastes are:

- Wood preservation,
- Organic chemicals manufacturing,
- Pesticides manufacturing,
- Petroleum refining,
- Veterinary pharmaceuticals manufacturing,
- Inorganic pigment manufacturing,
- Inorganic chemicals manufacturing,
- Explosives manufacturing,
- Iron and steel production,
- Primary aluminum production,
- Secondary lead processing,
- Ink formulation, and
- Coking (processing of coal to produce coke).

The P and U Lists

The P and U lists designate as hazardous waste pure and commercial grade formulations of certain unused chemicals that are being disposed. For a waste to be considered a P- or U-listed waste it must meet the following three criteria:

- The waste must contain one of the chemicals listed on the P or U list;
- The chemical in the waste must be unused; and
- The chemical in the waste must be in the form of a commercial chemical product.

EPA defines a commercial chemical product for P and U list purposes as a chemical that is either 100 percent pure, technical (e.g., commercial) grade or the sole active ingredient in a chemical formulation.

The P-list identifies acute hazardous wastes from discarded commercial chemical products. The P-list can be found at [40 CFR section 261.33](#). The U-list identifies hazardous wastes from discarded commercial chemical products. The U-list wastes can be found at [40 CFR section 261.33](#).

Characteristic Wastes

A hazardous waste characteristic is a property which, when present in a waste, indicates that the waste poses a sufficient threat to merit regulation as hazardous. EPA established four hazardous waste characteristics: ignitability, corrosivity, reactivity and toxicity.

Ignitability

Wastes that are hazardous due to the ignitability characteristic include liquids with flash points below 60 °C, non-liquids that cause fire through specific conditions, ignitable compressed gases and oxidizers. EPA assigned D001 as the waste code for ignitable hazardous wastes.

Corrosivity

Wastes that are hazardous due to the corrosivity characteristic include aqueous wastes with a pH of less than or equal to 2, a pH greater than or equal to 12.5 or due to the liquid's ability to corrode steel. EPA assigned D002 as the waste code for corrosive hazardous wastes.

Reactivity

Wastes that are hazardous due to the reactivity characteristic may be unstable under normal conditions, may react with water, may give off toxic gases and may be capable of detonation or explosion under normal conditions or when heated. EPA assigned D003 as the waste code for reactive hazardous wastes.

Toxicity

Wastes that are hazardous due to the toxicity characteristic are harmful when ingested or absorbed. Toxic wastes present a concern as they may be able to leach from waste and pollute groundwater. The toxicity of a waste is determined by the Toxicity Characteristic Leaching Procedure (TCLP) ([SW-846 Test Method 1311](#)). EPA assigned waste codes D004 through D043 that correspond to a contaminant and its associated TCLP concentration.

Mixed Radiological and Hazardous Waste

Mixed wastes are hazardous wastes which also contain radioactive material. Mixed waste is regulated under RCRA and the Atomic Energy Act. The hazardous component of the mixed waste is regulated by EPA under RCRA. The radiological component of the mixed waste is regulated by the Department of Energy (DOE) or the Nuclear Regulatory Commission (NRC). The NRC typically regulates waste from commercial and non-DOE facilities while the DOE regulates waste from DOE facilities.

EPA's Mixed Waste Rule provides increased flexibility to generators and facilities that manage low-level mixed waste (LLMW) and naturally occurring and/or accelerator-produced radioactive material (NARM) containing hazardous waste by exempting these wastes from RCRA storage and treatment requirements. The exemption is conditional upon the waste meeting specified conditions and that the waste is stored and treated in a tank or container.

Nonhazardous Waste Program Definitions

A significant amount of the solid waste generated in the United States falls outside of the purview of the federal hazardous waste program. This universe includes solid wastes that are specifically excluded from being a hazardous waste, such as waste generated by households, any crop waste and manure, mining overburden returned to the mine site, oil, gas and geothermal exploration and production waste, and solid waste from extraction, beneficiation and processing of ores and minerals. In addition, this universe of nonhazardous waste includes municipal solid waste and a variety of other types of industrial and commercial nonhazardous waste that is not specifically exempt from being hazardous waste, but due to its characteristics is typically not defined as being a hazardous waste under the federal regulations.

Under the RCRA statute, nonhazardous solid wastes are subject to the “subtitle D” provisions of RCRA. RCRA Subtitle D provides a framework for the management of solid waste that is not hazardous. EPA promulgated minimum criteria for determining which facilities “shall be classified as sanitary landfills and which shall be classified as open dumps.” These criteria, found in 40 CFR part 257, set minimum national standards for solid waste facilities and practices, and include certain regulatory definitions related to waste (from 40 CFR 257.2):

Domestic septage is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

Leachate means liquid that has passed through or emerged from solid waste and contains soluble, suspended or miscible materials removed from such wastes.

Sewage sludge means solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works.

Sludge means any solid, semisolid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility or any other such waste having similar characteristics and effect.

Also regulated under RCRA Subtitle D are municipal solid wastes (MSW), and EPA promulgated regulations for the design and operation of MSW landfills in 40 CFR part 258, which included some definitions related to waste, examples of which are below (from 40 CFR 258.2):

Commercial solid waste means all types of solid waste generated by stores, offices, restaurants, warehouses, and other nonmanufacturing activities, excluding residential and industrial wastes.

Household waste means any solid waste (including garbage, trash, and sanitary waste in septic tanks) derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).

Industrial solid waste means solid waste generated by manufacturing or industrial processes that is not a hazardous waste regulated under subtitle C of RCRA. Such waste may include, but is not limited to, waste resulting from the following manufacturing processes: Electric power generation; fertilizer/agricultural chemicals; food and related products/by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment. This term does not include mining waste or oil and gas waste.

Residential lead-based paint waste means waste containing lead-based paint, which is generated as a result of activities such as abatement, rehabilitation, renovation and remodeling in homes and other residences. The term residential lead-based paint waste includes, but is not limited to, lead-based paint debris, chips, dust, and sludges.

Municipal Solid Waste:

Municipal solid waste is a subset of solid waste and is defined as durable goods (e.g., appliances, tires, batteries), nondurable goods (e.g., newspapers, books, magazines), containers and packaging, food wastes, yard trimmings, and miscellaneous organic wastes from residential, commercial, and industrial non process sources.

It is more commonly known as trash or garbage and consists of everyday items such as product packaging, grass clippings, furniture, clothing, bottles and cans, food scraps, newspapers, appliances, consumer electronics, and batteries. These wastes come from homes, institutions such as schools and hospitals, and commercial sources such as restaurants and small businesses. EPA's definition of municipal solid waste (MSW) does not include municipal wastewater treatment sludges, industrial process wastes, automobile bodies, combustion ash, or construction and demolition debris.

Once generated, MSW must be collected and managed. Common management methods include recovery for recycling or composting, combustion (with the resulting energy used to generate electricity or steam in some cases), and landfill disposal. Many wastes that are disposed of in landfills represent a loss of materials that could be reused, recycled, or converted to energy to displace the use of virgin materials.

Recyclable Materials:

The EPA refers to recyclable materials as useful materials that can be recovered such as paper, glass, plastic, metals, construction and demolition (C&D) material and organics from the waste stream (e.g., municipal solid waste), along with the transformation of materials, to make new products and reduce the amount of virgin raw materials needed to meet consumer demands. It is important to point out that this term (Recyclable Materials) also has a particular, defined meaning within the hazardous waste regulations (see 40 CFR section 261.6, and Part 266).

Further definitions of frequently used terminology while discussing this process can be found in the RCRA statute and in the regulations at 40 CFR. Some of which include:

- *Recoverable resources* are defined as materials that still have useful physical, chemical, or biological properties after serving their original purpose and can, therefore, be reused or recycled for the same or other purposes (from 40 CFR section 246.101).
- *Recovery* means the process of obtaining materials or energy resources from solid waste (from 40 CFR section 246.101).
- *Recycling* means the process by which recovered materials are transformed into new products (from 40 CFR section 246.101).
- *Recycled material* means a material that is used in place of a primary, raw or virgin material in manufacturing a product (from 40 CFR section 246.101).
- *Recoverable* refers to the capability and likelihood of being recovered from solid waste for a commercial or industrial use (from 42 U.S.C. 6901, Section 1004).
- *Recovered materials* means waste materials and byproducts which have been recovered or diverted from solid waste, but such term does not include those materials and byproducts generated from, and commonly reused within, an original manufacturing process (from 42 U.S.C. 6901, Section 1004).



Article Content

Title Resource Recycling Act 

Amended Date 2009.01.21

Chapter 1 General Principles

Article 1 This Act is formulated to conserve natural resources, reduce waste, promote recycling and reuse of materials, mitigate environmental loading, and build a society in which resources are used in a sustainable manner. The regulations of other laws shall apply to those matters not regulated by this Act.

Article 2 The terms used in this Act are defined as follows.
 I. "Renewable resources" means substances that have lost their original usefulness, are economically and technologically feasible to recycle, and may be recycled or reused as announced or approved by this Act.
 II. "Recycling and reuse" means the act of reusing or recycling renewable resources.
 III. "Reuse" means the act of making direct, repeated use of renewable resources in their original form or using renewable resources after restoring some or all of their original functionality.
 IV. "Recycling" means the act of making renewable resources functional by altering the original form of substances, or combining them with other substances, so that they may serve as materials, fuel, fertilizers, animal feed, fillers, soil enhancers, or for other uses recognized by the central industry competent authority.
 V. "Enterprise" means companies, proprietorships, organizations, non-corporate bodies and other entities as designated by the central competent authority engaged in production, manufacturing, transportation, selling, education, research, training, engineering and construction or service activities.
 VI. "Recycled product" means a product made using at least a certain proportion of renewable resources as raw materials.

Article 3 The term "competent authority" in this Act means the Environmental Protection Administration, Executive Yuan, at the central government level, the municipal government in special municipalities and the county or city government in counties or cities.

Article 4 The competent authority shall designate a dedicated unit or personnel to formulate renewable resource recycling and reuse policies, and perform relevant auditing, public awareness, training, guidance, evaluation and research matters. When necessary, the competent authority may assign or commission a relevant agency or organization to perform such tasks.
 The industry competent authority may, as required, designate a dedicated unit or personnel to perform the tasks in the foregoing paragraph, and, when necessary, may commission a relevant agency or organization to perform such tasks.

Article 5 The central competent authority shall establish a Renewable Resource Recycling and Reuse Promotion Committee (herein referred to as "the Committee") that shall be responsible for the review of major policies and measures on the recycling and reuse of renewable resources as drafted by the competent authority and industry competent authority and the coordination and assessment of

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implementation and operational matters as related to items officially announced and designated in each article of the Source Management Chapter of this Act.

The Committee shall have one chairman; which shall be the Administrator of the Environmental Protection Administration. Committee members shall be appointed for a period of two years, and shall consist of relevant government agency representatives, scholars, experts and environmental protection group representatives. Scholars, experts and environmental protection group representatives may not constitute less than one-half of the total number of committee members. Committee members, their spouses, and their direct blood relatives shall avoid implementation and operational duties in the renewable resource recycling and reuse industries under review by the Committee during the appointment period of said member and for three years thereafter.

The Environmental Protection Administration shall determine the organizational rules, which shall be promulgated after approval by the Executive Yuan.

- Article 6 Priority consideration shall be given to the use of substances that reduce waste production to achieve resource sustainability insofar as is economically and technologically feasible. Priority consideration shall be given to the reuse, recycling, energy recovering, and appropriate disposal, in that order, of substances that have lost their original utility. However, a waste utilization method that yields optimal overall environmental benefit based on lifecycle considerations shall not be subject to this restriction.
- Article 7 The central competent authority and central industry competent authority shall, in accordance with their duties and powers, formulate and implement relevant policies, laws, and regulations governing the reduction of resource consumption, control of waste production and promotion of resource recycling and reuse.
- Article 8 The local competent authority and all local industry competent authorities shall, in addition to performing pursuant to regulations determined by the central competent authorities pursuant to the foregoing article, be responsible for reducing resource consumption, controlling waste production, and promoting resource recycling and reuse. Local competent authorities shall formulate consistent policies within their jurisdictions and implement said policies in accordance with governmental division of duties and powers.
- Article 9 Enterprises shall comply with the following principles when engaging in industrial activities to reduce resource consumption, control waste production, and promote resource recycling and reuse:
- I. Employ clean production technology.
 - II. Adopt necessary measures to reduce waste production when using raw materials.
 - III. Implement recycling and reuse of raw materials after they lose their original utility or provide said materials for recycling and reuse, and bear responsibility for the appropriate disposal of materials that cannot be recycled or reused.
 - IV. To prevent goods and containers from becoming waste, enterprises engaged in the manufacture and sale of goods or containers are responsible for increasing the useable life of such goods and containers and implementing the repair and maintenance thereof. Said enterprises shall also endeavor to perform product research, development, and design so as to facilitate recycling and reuse and shall indicate the types of materials used.

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Article 10 Citizens shall have the duty and be responsible for abiding by the principles of reducing resource consumption, controlling waste production, and promoting resource recycling and reuse, and, to the greatest extent possible, extend the usable life of goods, use recycled products, and sort recyclable resources to prevent goods from becoming waste and appropriately recycle and reuse goods and recycled resources.

Chapter 2 Source Management

Article 11 Enterprises as officially announced and designated by the central competent authority shall comply with the following designated items from the designated date onward:

I. Types of renewable resources recycled and recycling method

II. Labels listing materials used in products and proportion of renewable resources

III. Classification and recycling marks on products

IV. Other items as specified by the central competent authority in consultation with the central industry competent authority

The central competent authority in consultation with the central industry competent authority shall determine industry classifications, the designated dates, and other binding matters in the foregoing paragraph.

When importing products possessing similar or identical performance as those produced or manufactured by the designated industries in Paragraph 1, importers shall comply with the regulations of Paragraph 1 at the time of sale.

Article 12 The industry competent authority shall provide guidance to enterprises on the recycling and reuse of renewable resources. The central industry competent authority may, depending on the state of industrial development, officially announce and designate that certain products, construction and engineering, or enterprise types and scale shall comply with the following specified items during the research, development, design, manufacturing, production, sale, and construction stages:

I. Use of materials, specifications, or designs that facilitate decomposition, demolition, or recycling and reuse

II. Use of certain proportions or quantities of renewable resources

III. Use of refillable containers

IV. Other items specified by the central competent authority in consultation with the central industry competent authority

The central industry competent authority in consultation with the central competent authority shall determine the specified products, construction processes, types of industries, materials, specifications, certain proportions or quantities, and their implementation methods, etc. officially announced and designated in the foregoing paragraph.

Article 13 The central competent authority may officially announce and designate the restriction or prohibition of the use of goods, packaging, or containers as designated by the central competent authority on public or private premises.

The central competent authority in consultation with the central industry competent authority shall determine the specified materials, specifications, and method of restricting or prohibiting the use of goods, packaging, or containers in the foregoing paragraph.

Article 14 The production and sale of products shall avoid excessive packaging to reduce waste production and mitigate environmental loading. The central competent authority in consultation with the central industry

competent authority may officially announce and designate enterprises as being subject to restrictions on packaging volume ratio, number of packaging layers, and types or quantity of materials used in the packaging of specified products after a specified deadline.

When importing the specified products in Paragraph 1 or products possessing similar or identical performance, importers shall comply with the regulations of Paragraph 1 at the time of sale.

Chapter 3 Operational Management

- Article 15 The central competent authority shall announce renewable resource items that must be reused.
The central competent authority in consultation with the central industry competent authority and reuse industry competent authority shall determine collection, transport, and storage methods, facilities standards, reuse standards, records, and other binding matters with regard to the reuse of renewable resources.
The central industry competent authority shall announce renewable resource items that must be recycled.
The central industry competent authority in consultation with the central competent authority and recycling industry competent authority shall determine collection, transport, and storage methods, facilities standards, recycling standards, records, and other binding matters with regard to the recycling of renewable resources.
Enterprises may submit reuse or recycling plans for items not yet officially announced as renewable resources and apply to the central competent authority or central industry competent authority for approval as renewable resource items.
The central competent authority or central industry competent authority shall determine the format and content of the reuse or recycling plans in the foregoing paragraph.
- Article 16 Renewable resources and recycled products shall meet national standards. The central industry competent authority in consultation with the central competent authority shall announce standards for items for which there are no national standards.
Regulations in Chapter 4 Assistance and Incentive Measures of this Act are not applicable if renewable resources or recycled products fail to meet standards pursuant to the foregoing paragraph.
- Article 17 The central competent authority in consultation with the central industry competent authority may restrict or prohibit the import or export of renewable resources so as to effectively recycle and reuse domestic renewable resources.
The central competent authority in consultation with relevant agencies shall determine the restriction, prohibition, and related management of the import or export of renewable resources in the foregoing paragraph.
- Article 18 Enterprises officially announced and designated by the central competent authority shall report to the central competent authority their production, storage, collection, transport, reuse, recycling, import, export, transit, or transshipment of renewable resources via the Internet and in accordance with the format, items, content, and frequency required by the central competent authority. If authorized by the central competent authority, however, enterprises may report by some means other than the Internet.
- Article 19 Any renewable resources not recycled or reused in accordance with regulations shall be considered waste, and shall be recycled, cleared, and disposed of pursuant to the Waste Disposal Act.

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Any renewable resources that cannot be reused or recycled shall be cleared and disposed of pursuant to the Waste Disposal Act.

Article 20 For waste that is required to be recycled pursuant to the Waste Disposal Act and that is also a renewable resource as officially announced pursuant to this Act, recycling, storage, and the collection, safekeeping and utilization of recycling, clearance and disposal fees shall be subject to the regulations of the Waste Disposal Act.

Article 21 The competent authority and industry competent authority, or a commissioned professional organization, may dispatch personnel bearing identification documents to enter enterprise or renewable resource recycling and reuse operational, working, or business premises to perform inspection and request relevant information. Relevant businesses may not evade, obstruct, or refuse any inspections or requests in the foregoing paragraph. Before commissioning a professional organization to independently perform the inspection in Paragraph 1, the competent authority and industry competent authority shall announce the commissioned tasks and basis for such inspection and shall notify the premises to be inspected.

Chapter 4 Assistance and Incentive Measures

Article 22 To promote the recycling and reuse of resources, government agencies, public schools, public enterprises and organizations, and military authorities shall preferentially procure government-recognized environmentally preferable products, renewable resources produced within the national territory, or recycled products in which at least a certain proportion of renewable resources as raw materials are used.

The central competent authority in consultation with relevant agencies shall determine the environmentally preferable products, renewable resources, and certain proportion of renewable resources that recycled products must contain.

The central competent authority and all industry competent authorities shall themselves perform, or commission a professional organization or enterprise to perform educational and sales promotion activities for recycling technology, renewable resource, recycled product, and environmentally preferable products.

Article 23 The central competent authority shall regularly select and hold awards, or assign or commission a relevant agency or organization to regularly select and hold awards, for excellence in reuse and recycling technological developments and actual reuse and recycling achievements. The central competent authority in consultation with relevant agencies shall determine award money, grant, and commendation rules.

Enterprises engaged in recycling and reuse shall be granted tax incentives for the cost of investment in recycling and reuse research, facilities, tools, and equipment. The central tax competent authority in consultation with the central industry competent authority and central competent authority shall determine tax deduction items, their amount, and other binding matters.

Article 24 To promote the recycling and reuse of renewable resources, acquire advanced renewable resource recycling and reuse technology and talent, and encourage innovative technology research and development by the domestic environmental protection industry, the competent authority or industry competent authority may plan and establish dedicated areas for environmental protection science and technology

or renewable resource recycling and reuse depending on the land needs of renewable resource enterprises in each area.

If the land used for dedicated areas and environmental protection science technology or renewable resource recycling and reuse purposes in the foregoing paragraph entails changes to the urban plan, the competent authority may draw up a feasibility plan and, in conjunction with the competent urban planning authority, implement changes pursuant to the regulations of Article 27 of the Urban Planning Act; for non-urban land use changes, the competent authority shall implement the changes pursuant to the Regional Planning Act and non-urban land use control regulations.

After the completion of dedicated area and land change and rezoning in the foregoing paragraph in accordance with law, publicly-owned land may be appropriated for use by or leased to developers, and shall not be subject to the restrictions of Article 25 of the Land Act.

If the dedicated areas and land in Paragraph 2 are not used for environmental protection science and technology or renewable resource recycling and reuse purposes, the competent authority or industry competent authority may notify the land competent authority to terminate the lease contract, and may notify the urban planning competent authority or regional planning competent authority to restore the original zoning of the land, or change it to another appropriate zoning.

When an industrial park is developed, the competent authority may, in accordance with the local need for land for renewable resource recycling and reuse purposes, request the industrial park development unit to set aside land for said purposes.

Chapter 5 Penal Provisions

Article 25 Those having reporting obligations pursuant to Article 15 and Article 18 of this Act that knowingly report false information or keep false records of their operations shall be punished by a maximum of three years imprisonment, detention and/or a fine of a maximum of NT\$1.5 million.

Article 26 The competent authority or industry competent authority may issue a fine of NT\$30,000 to NT\$50,000 to those to whom any one of the following situations applies. Those notified to make corrections or improvements within a limited time period that have still failed to make corrections or complete improvements by the deadline shall be issued consecutive daily fines. Serious violators may be ordered to suspend work for one month to one year, or suspend business. When necessary, violators may be ordered to terminate business.

I. A manufacturing enterprise or importer that has violated any of the items requiring compliance in Article 11, Paragraph 1 or announced items in Paragraph 2.

II. Failure to comply with specifications or use restrictions or prohibitions concerning the goods, packaging, containers, and materials thereof specified by the central competent authority pursuant to Article 13.

III. A manufacturing enterprise or importer that has violated the regulations of Article 14 concerning product packaging.

IV. Violation of management regulations in Article 15, Paragraph 2 or Paragraph 4.

V. Violation of restrictions or prohibitions on the import or export of renewable resources specified pursuant to Article 17, Paragraph 1.

VI. Violation of reporting regulations in Article 18.

VII. Evasion, obstruction, or refusal of inspection by or requests

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made by the competent authority or industry competent authority pursuant to Article 21.

If an enterprise fails to comply with an order to suspend work or suspend business made in accordance with this Act, the local competent authority may make a report to the central competent authority, which shall request the industry competent authority to order the enterprise to terminate business.

Article 27 "Serious violators" in the foregoing paragraph means those to whom any one of the following situations applies:

I. Continuing violation of the same regulation of this Act after being ordered twice in one year to make improvements within a designated time period.

II. Failure to recycle and reuse renewable resources in accordance with regulations, and seriously polluting the environment.

III. Submission of untruthful application, reports, and records.

IV. Other situations as recognized by the competent authority.

Article 28 Those who fail to pay fines issued pursuant to this Act by the deadline shall be referred for compulsory enforcement in accordance with the law.

Article 29 The competent authority or industry competent authority shall carry out interdiction, evidence collection, and enforcement referral matters in accordance with to this Act.

Unless implemented by the industry competent authority, the special municipality, city or county competent authority shall implement penalties designated in this Act.

Chapter 6 Supplementary Provisions

Article 30 The central competent authority shall determine the enforcement rules of this Act.

Article 31 This Act shall take effect one year after promulgation.

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