



行政院環境保護署

Environmental Protection Administration
Executive Yuan, R.O.C. (Taiwan)



Key Strategies for Resource Recycling and Zero Waste (Draft)

Department of Waste Management and Office of Resource Circulation,
Recycling Fund Management Board

December 28 , 2022

Outline

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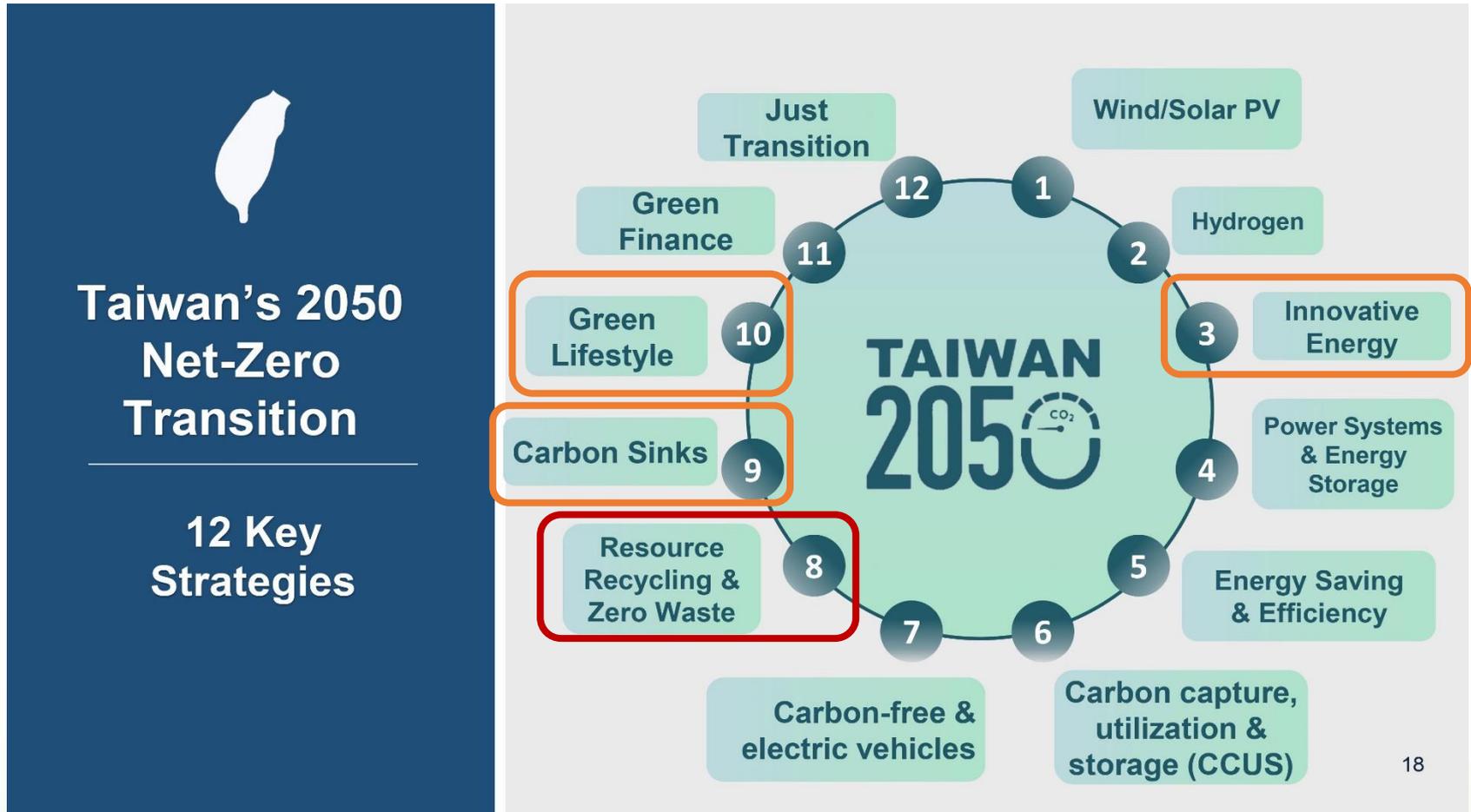
06 Epilogue





12 Key Strategies

Resource Recycling & Zero Waste – Strategy 8

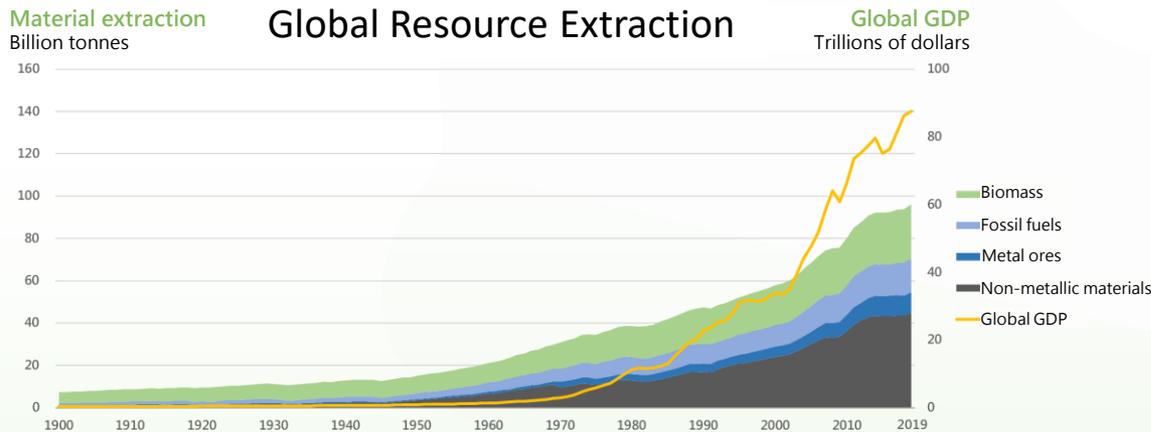


International Trends(1/2)

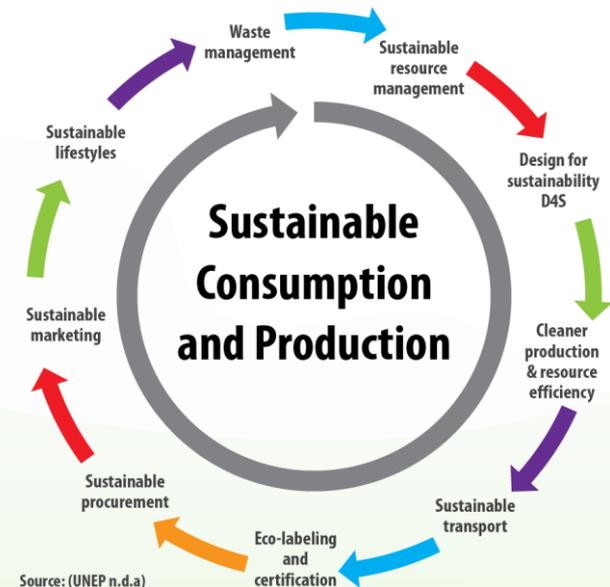
- Between 2015-2021, over 500 billion metric tons of resources are used globally. Out of them only 8.6% are included in recycling pathways(The Circularity Gap Report 2022).
- Global consumption of resources will persistently rise to 1.5 times the current levels by 2060.

SDG 12: Sustainable consumption and production patterns

- To achieve a green economy and promote sustainable consumption and production patterns, it is very important to recycle resources, master material usage, promote cradle-to-cradle design, adopt circular agriculture, and develop sustainable tourism while encouraging responsible consumption and production.



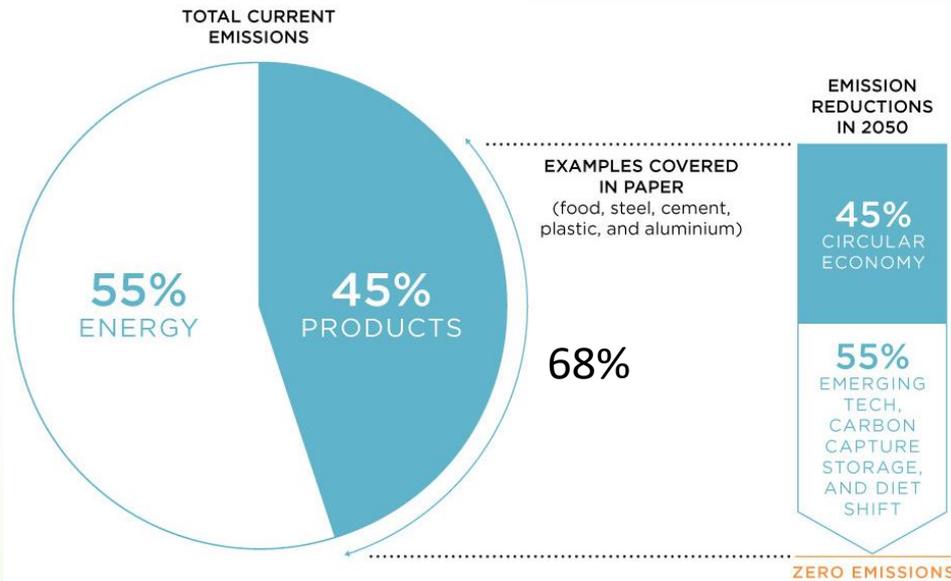
Source: 1. UNEP IRP Global Material Flows Database
 2. The World Bank Open Data
 3. Krausmann et al., 2018



International Trends(2/2)

Relation between Circular Economy and Carbon Reduction

- 55% of the total carbon emissions are attributed to energy usage, while the remaining 45% are associated with product manufacturing.
- 68% of carbon emissions are produced due to the products manufactured such as plastic, cement, steel, food and aluminum. New technologies can cut off 55% of carbon emissions and the remaining 45% can be achieved by circular economy.
- Source: EMF, Completing The Picture - How The Circular Economy Tackles Climate Change, 2019



Strategy adopted

- Reduce waste generation during production.
- Extending product life through leasing, sharing, and repairing
- Using recycled materials to make new products reduces the need for virgin materials.

Legal Sources and Organizations (1/2)

- **Current laws and regulations :** "Waste Disposal Law" , "Resource Recovery and Reuse Law" to promote waste management and promote material recycling and reuse
- **Organizational Transformation: From Waste Management to Resource Circulation**
 - The "Office of Recourse Circulation" has been established in July 2021 , and the "Resource Circulation Agency" will be established in near future.
 - On the basis of the properties of materials , improve the efficiency of resource through redesign, waste prevention, enhanced recycling and circulation

Resource Circulation Agency

sustainable consumption and production

Improve resource usage efficiency

Value-added treatment of waste

Comprehensive Planning

Sustainable Consumption Recycling

Reuse Promotion

Circulation Process

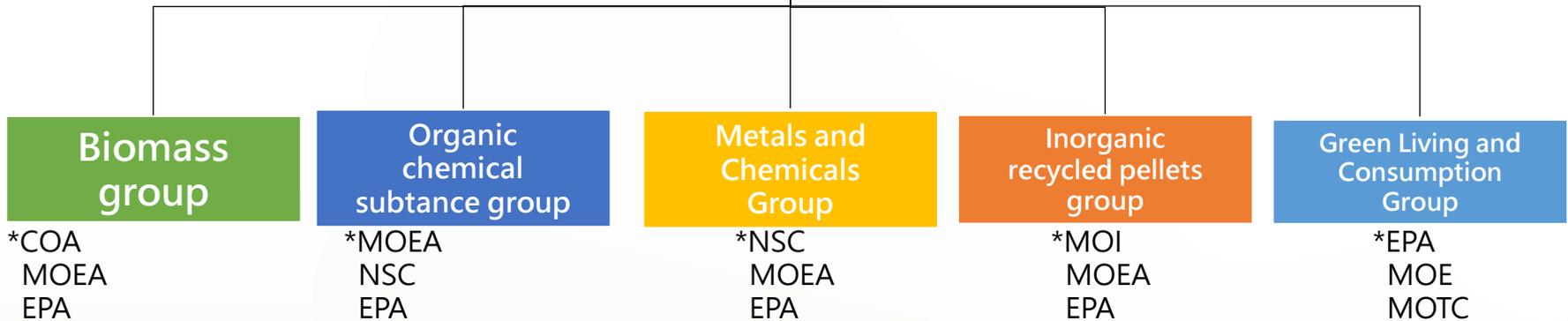
Legal Sources and Organizations (2/2)

■ Establish a plan and set up a committee:

Established the "Renewable Resource Recycling and Reuse Promotion Committee" and formulated the "Resource Circulation Action Plan" for inter-departmental promotion.

Renewable Resource Recycling and Reuse Promotion Committee

*Environmental Protection Agency
 Ministry of Education
 Ministry of Communications



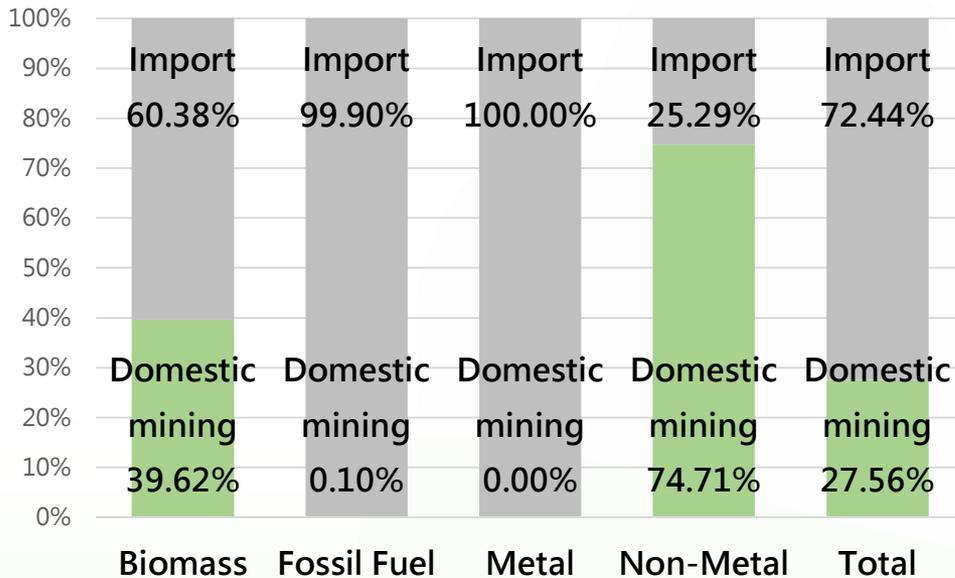
COA: Council of Agriculture
 EPA: Environmental Protection Agency
 NSC: National Science Council

MOEA: Ministry of Economic Affairs Environmental Protection Agency
 MOE: Ministry of Education
 MOI: Ministry of Interior
 MOTC: Ministry of Transportation and Communications

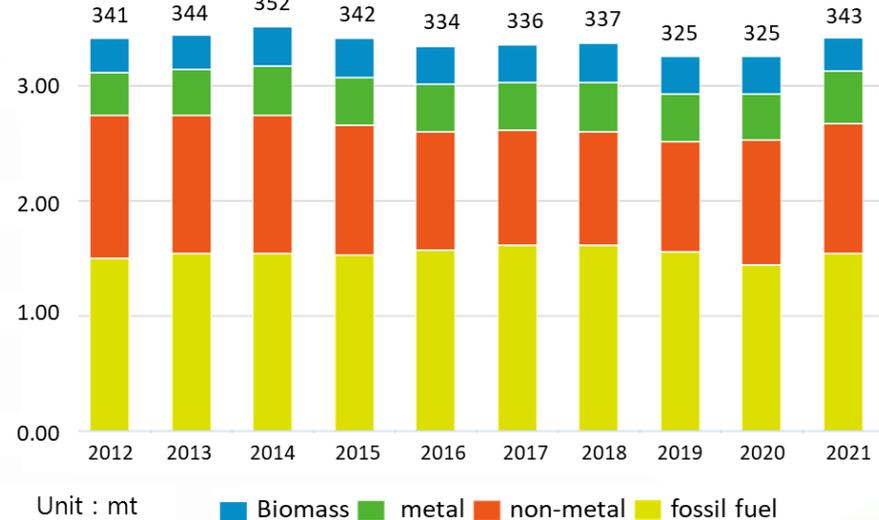
Status statement(1/2)



- In 2021, 343 million tonnes of materials were used in Taiwan, of which 72.44% were imported from other countries.
- The domestic material consumption is 270 million tonnes which is equivalent to 11.57 tonnes per capita per year.



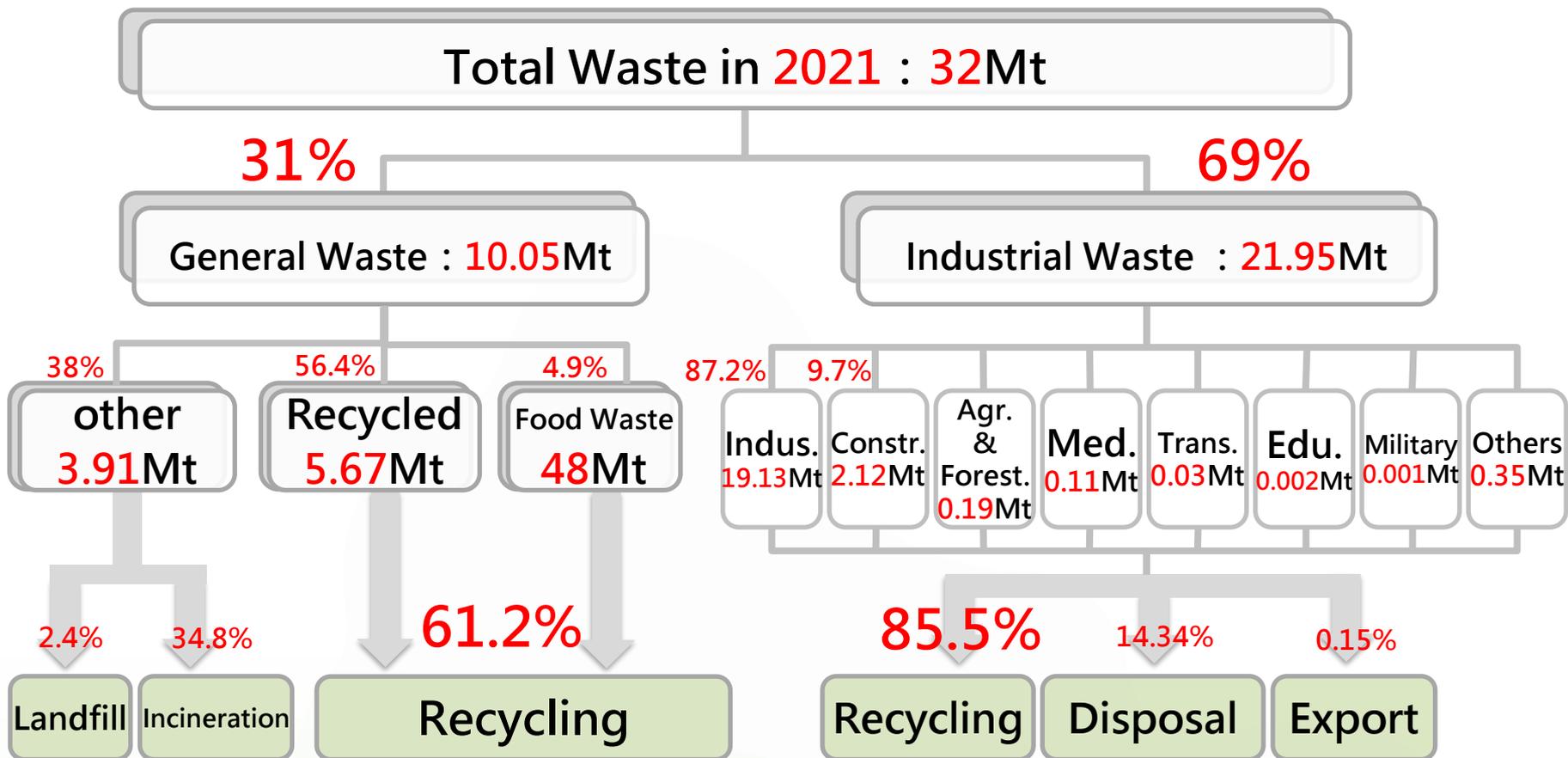
The ratio of import and export of raw materials in 2021



2012-2021 Direct Material Input



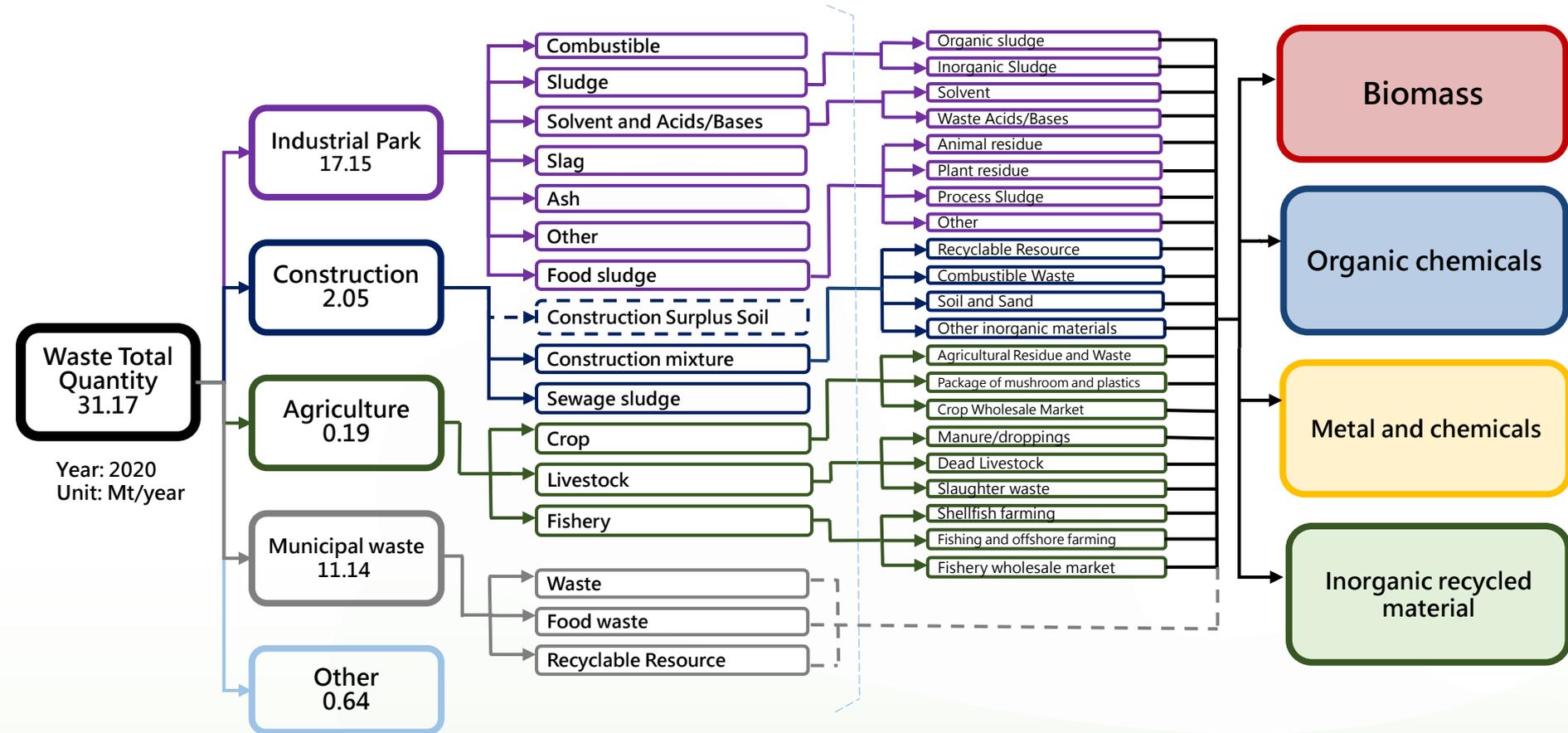
Status statement(2/2)



* Temporary storage is 1.5% (150,000 tons)

(Unit : Million tonnes, Mt)

Resource inventory from waste flows



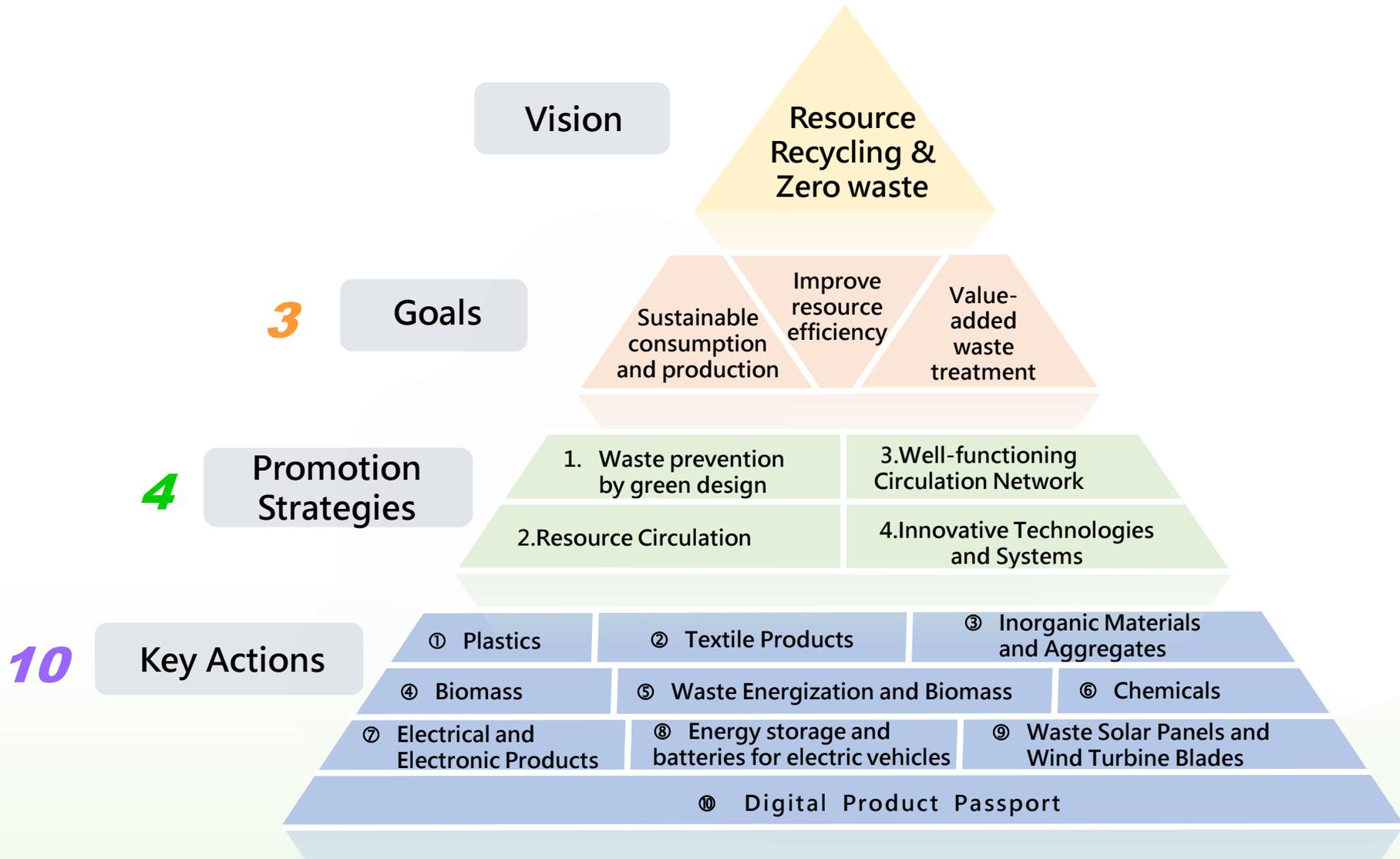


Problem Analysis

- 01** The production and consumption patterns need to be transformed from linear economy toward a sustainable approach.
- 02** Limited resources and environmental carrying capacity should be considered during production and need to reduce the use of raw materials and non-renewable resources.
- 03** Biomass and combustible wastes have the potential to produce renewable energy, which needs to be fully promoted after inventory.
- 04** Promoting circularity with innovate technologies and the system to create a favorable environmental development for resource circulation.



Policy Framework



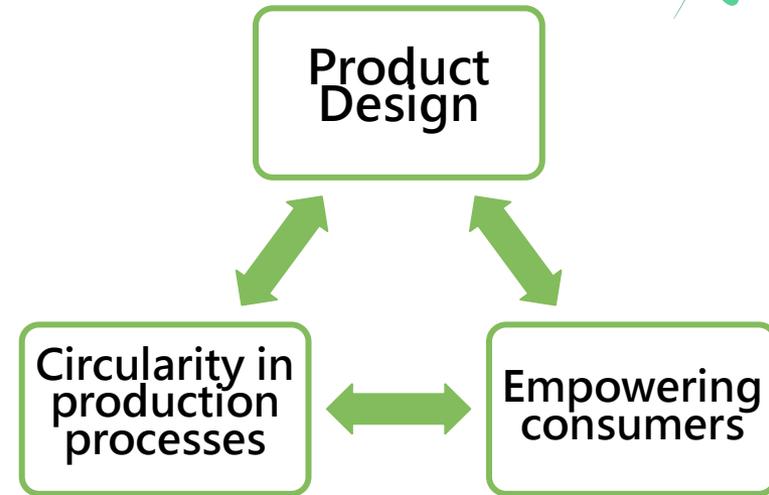
Promotion Strategies(1/2)



1

Waste Prevention by Green Design

- Empower consumers by providing information about products and encouraging sustainable consumption, which can lead to better product design and extended warranty services.
- Use single material, circular design and add recycled materials for product design to replace the use of raw materials.
- Product manufacturers are encouraged to retain ownership of their products, thus promoting extended producer responsibility and facilitating the establishment of a circular business model
- Reduce the amount of single-use products to prevent waste, eliminate single-use plastics and reduce fossil material use.



Source: European Union

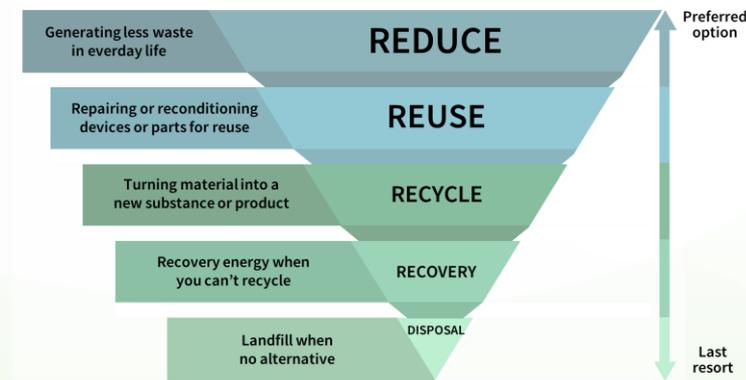
2

Resource Circulation

- Strengthen the separation of raw materials, recycled materials and waste and promote upcycling.
- Convert organic waste into energy and establish a regional co-processing model.
- Transform combustible waste and biomass into energy.
- Transform metallic waste into raw materials and promote reuse of chemical resources.
- Recovery inorganic waste materials and apply it to marine engineering and build material banks.

THE ZERO WASTE HIERARCHY

The Zero Waste hierarchy refers to the following options for managing waste:
RESPONSIBLE WASTE MANAGEMENT HIERARCHY



Source: UNEP

Promotion Strategies(2/2)

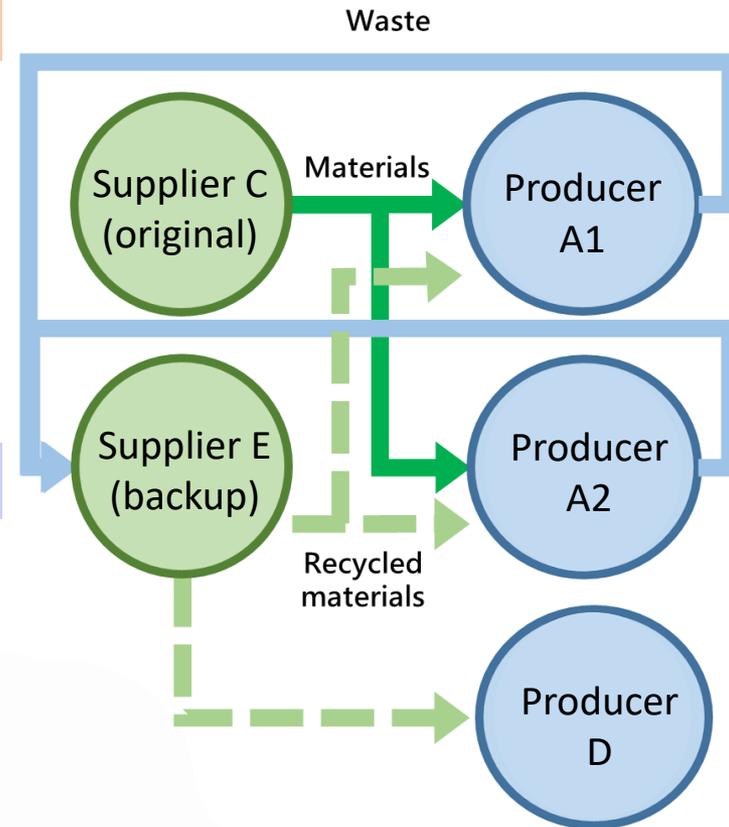


3 Well-functioning Circulation Network

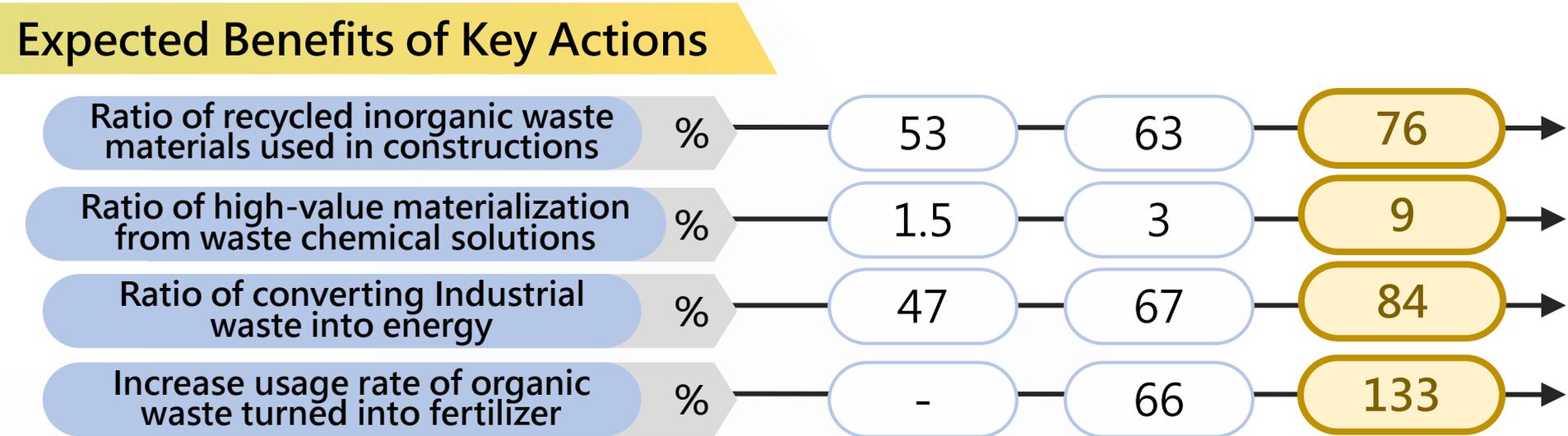
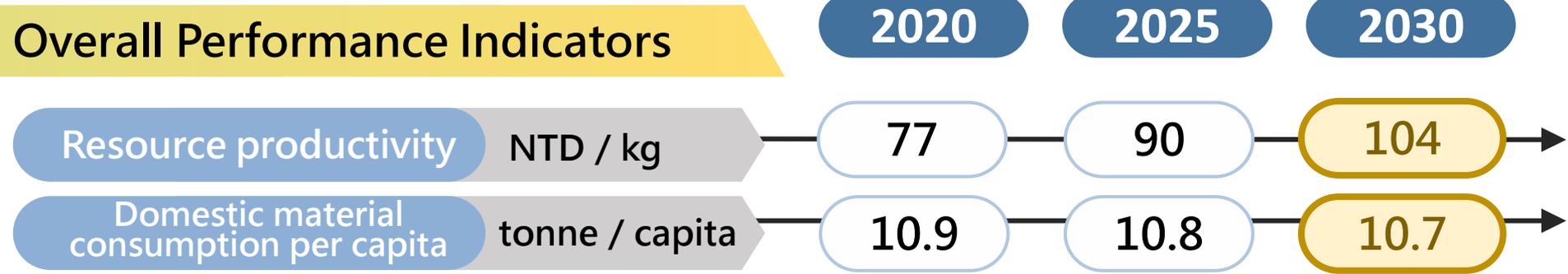
- Establish the link between upstream, midstream, downstream and horizontal sectors to form industrial chains for resource circulation.
- Develop region-based industrial circulation centers or eco-industrial parks to connect the regional industries.
- Strengthen the public communication to enforce the circulation mindset of the public.

4 Innovative Technologies and Systems

- Conducting research and developing innovative technologies to enhance the quality of renewable resources can enhance the exploration of high-value applications, leading to the creation of circular value.
- Promote digital product passports to reveal product environmental information.
- Establish a material tracking system, leverage digital technology and promote material verification mechanism with matchmaking implementation.
- Improve innovation of resource circulation law and regulation systems.
- Implement indicators to monitor the progress.



Goals and Benefits



Materialization

Recycled inorganic waste materials:
420,000 tonnes CO₂e;
Reuse Chemicals: 48,200 tonnes CO₂e.

Waste-to-fuel

Combustible waste resources and biomass turned into fuel: 280,760 tonnes CO₂e.

Fertilizer

Biomass turned into fertilizer:
286,600 tonnes CO₂e.

Key actions(1/3) - Materials

Action	Measure	Division of labor
Plastic	<ul style="list-style-type: none"> • Reduce plastic waste, improve recycling and propose alternative solutions by redesign. • Reduce demand for plastics, extend the life cycle of products, encourage reuse and innovate business models. • Prevent plastic waste leakage to the environment by effective collection and treatment. • Promote plastic recycling and stimulate the market for recycled materials. 	EPA MOEA COA NSC MOHW
Inorganic materials and pellets	<ul style="list-style-type: none"> • Reduce waste generation through product design, source reduction, and on-site sorting and recycling. • Establish a regional circulation system, promote sorting applications through control and incentive mechanisms, and replace natural raw materials. • Develop emerging technologies and promote material banks, improve pellet quality and provide complete information. 	MOI MOEA EPA MOTC PCC
Biomass	<ul style="list-style-type: none"> • Reduce food losses along with production supply chains and food waste at the consumer level. • Improve the recycling value of waste, promote material, feed, fertilizer, and energy cascade utilization. • Build a material source map, cultivate a regional resource and energy center, and strengthen the industrial chain circulation. • Develop high-value applications of residues and improve resourcing and energization technology to enhance performance. 	COA MOEA MOI EPA MOHW NSC SINICA
Chemicals	<ul style="list-style-type: none"> • Source reduction, optimize the production, sorting and recycling process to increase circular value. • Establish a regional circulation model to increase the production capacity of high-value chemicals. • Industry matchmaking, cross-regional resource links and chemical leasing. • Technology research and development, improving recycling and purification technology to extend the life cycle of chemicals. 	NSC MOEA EPA

Key actions(2/3) - Products

Action	Measure	Division of labor	
Textile	<ul style="list-style-type: none"> • Improve production concept, promote innovative design and sustainability. • Create green consumption, promote sharing economy, reuse, green consumption and green procurement. • Strengthen sorting and recycling, promote diversified recycling processing system and material sorting . • Promote resource recycling, develop recycling technologies and promote recycled material verification. 	EPA MOEA	
Electrical and Electronics	<ul style="list-style-type: none"> • Establish the guideline of product reparability index label to encourage consumers to repair and reuse, extend the product life cycle. • Build diversified recycling systems and models , connect producers and importers to establish reverse recycling services. • Establish an economic incentive mechanism, promote green design, improve reuse technology and the application of recycled materials. 	EPA MOEA	
Energy storage and batteries for electric vehicles	<ul style="list-style-type: none"> • Strengthen the source management system of lithium batteries and promote the labeling of positive electrode materials and the platform of recycled materials. • Strengthen the use of recycled materials, and reuse precious metals during the battery raw material manufacturing process. • Accelerate the formulation of battery recycling regulations and economic incentives to regulate recycling capacity. • Promote the development of lithium battery innovation technology and high-value recycled technology, and guide the related industries. 	EPA MOEA	
Solar panels and wind turbines blades	Solar panels	<ul style="list-style-type: none"> • Invest in the design of easy-to-disassemble solar panels, extended producer responsibility, and strengthen the high-value utilization of recycled materials to give differential subsidies to drive investment. 	EPA MOEA
	Wind turbines blades	<ul style="list-style-type: none"> • Establish a recycling pilot plan, promote industrial collaboration mechanisms, match the cement industry to use, encourage self-recycling and develop easy-recycling designs. 	

Key actions (3/3) - Energization, Tools

■ Energization

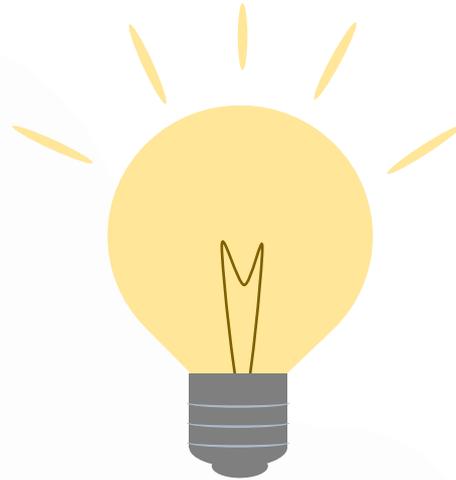
Action	Measure	Division of labor
Waste to Energy and Biomass Energy	<ul style="list-style-type: none"> • Optimize the material collection system • Improve operation technology and waste-to-energy innovative technology • Facilitate the disposal processing of derivatives • Incentive measures 	COA MOEA EPA

■ Tool

Action	Measure	Division of labor
Digital Product Passport	<ul style="list-style-type: none"> • Promote digital product passport management system in line with international certification • Improve key target product flow tracking and environmental information disclosure , and improve the key target product resource recirculation system 	EPA MOEA



Highlights





Disposable products source reduction - Strategy 1



Public



2002

2005

2011

2018

2019

2022

Plastic bag

Must pay for the bag

Disposable tableware

No plastic container provided

Disposable tableware

"Not to be provided for use within public sector or private schools."

Drink cup

Recycling bonus or discount(1-2NTD) for self-prepare cup

Plastic bag

Added 7 types of control items

Microplastics

Restrictions on manufacture, import and sale

Straw

For dine-in, plastic straws shall not be provided.

Disposable tableware

Not available in shopping malls and hypermarkets

Drink cup

Self-prepare cup discount (5NTD), borrow a reusable cup, prohibit the use of plastic materials



Building a circular business model - Strategy 1



Renting instead of owning: extending product life

Circular Village
Taisugar company



Business computer service
Bestyfield company



Furniture rental service
IKEA



Circular sharing service: raising the resources efficiency

eco-friendly cup
Rental Service
uCup



Smart scooter
sharing system
Lockists



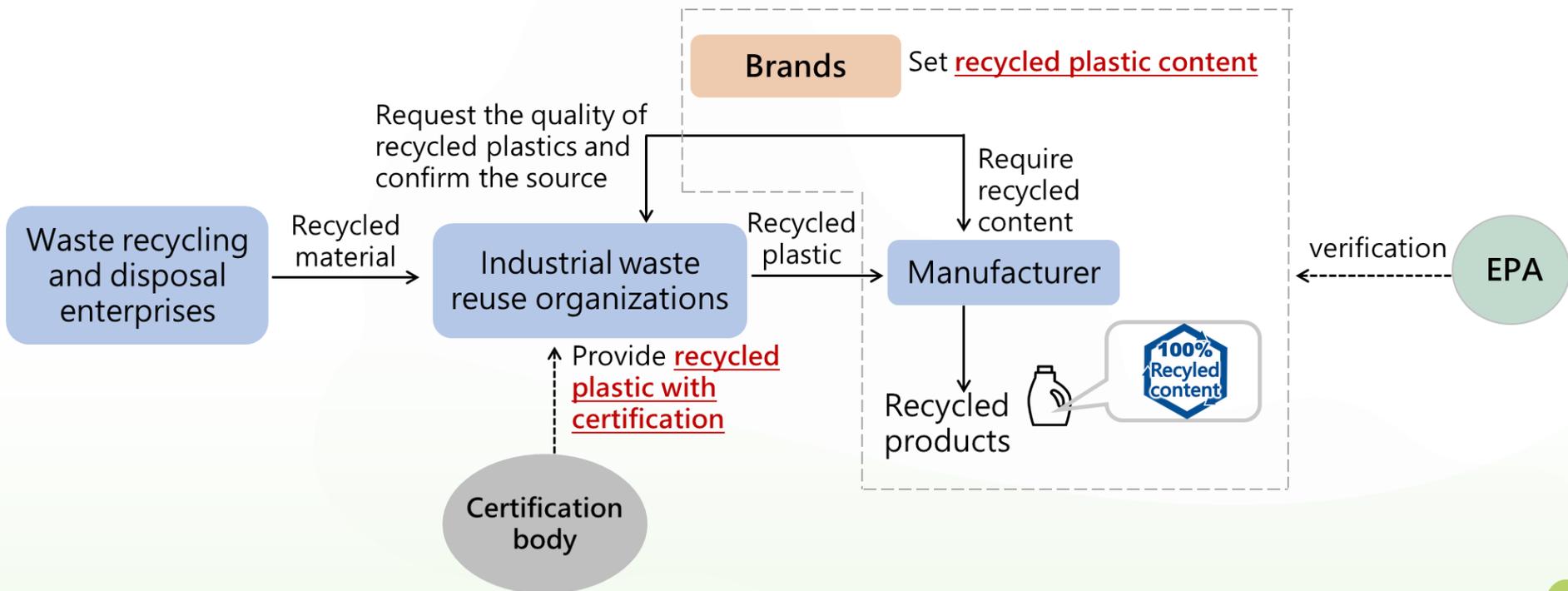
Home appliance rental
sharing platform
電電租



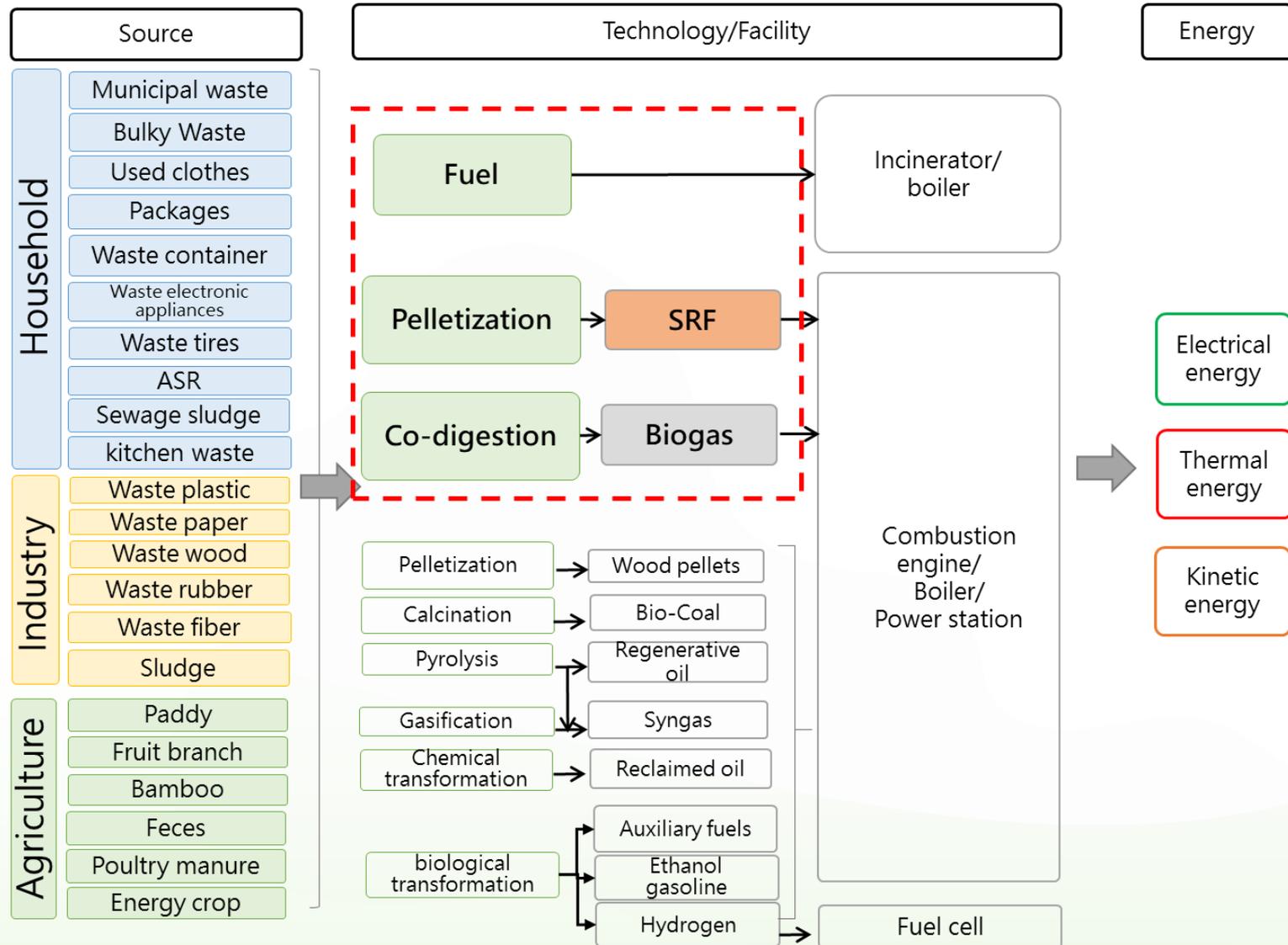
Recycled materials addition - Strategy 1

Add recycled materials to plastic packaging

timeline	2025	2030
The proportion of recycled materials added to plastic packaging	25%	30%



Combustible waste resources and biomass energy(1/2) - Strategy 2



Combustible waste resources and biomass energy(2/2) - Strategy 2



Anaerobic digestion to produce biogas for power generation

A Set co-digestion facility

- Assistance with anaerobic digestion facility setup

B Livestock wastewater reduction and centralized treatment

- Establish entry quality, consolidation methods and charging standards

C Collect other biomass

- Assistance in collecting other sources of biomass

D Application- liquid digestate

- Evaluate the feasibility of land irrigation
- Discussion on subsidies for organic fertilizers

E Waste water

- Treatment of liquid digestate meets waste water standards and multiple utilization methods

F Incentive

- Tariff adjustment and feeder capacity setup
- Apply for a offset project to obtain a reduction amount

Co-digestion
6 dimensions

Recycling of Inorganic Waste Materials - Strategy 2



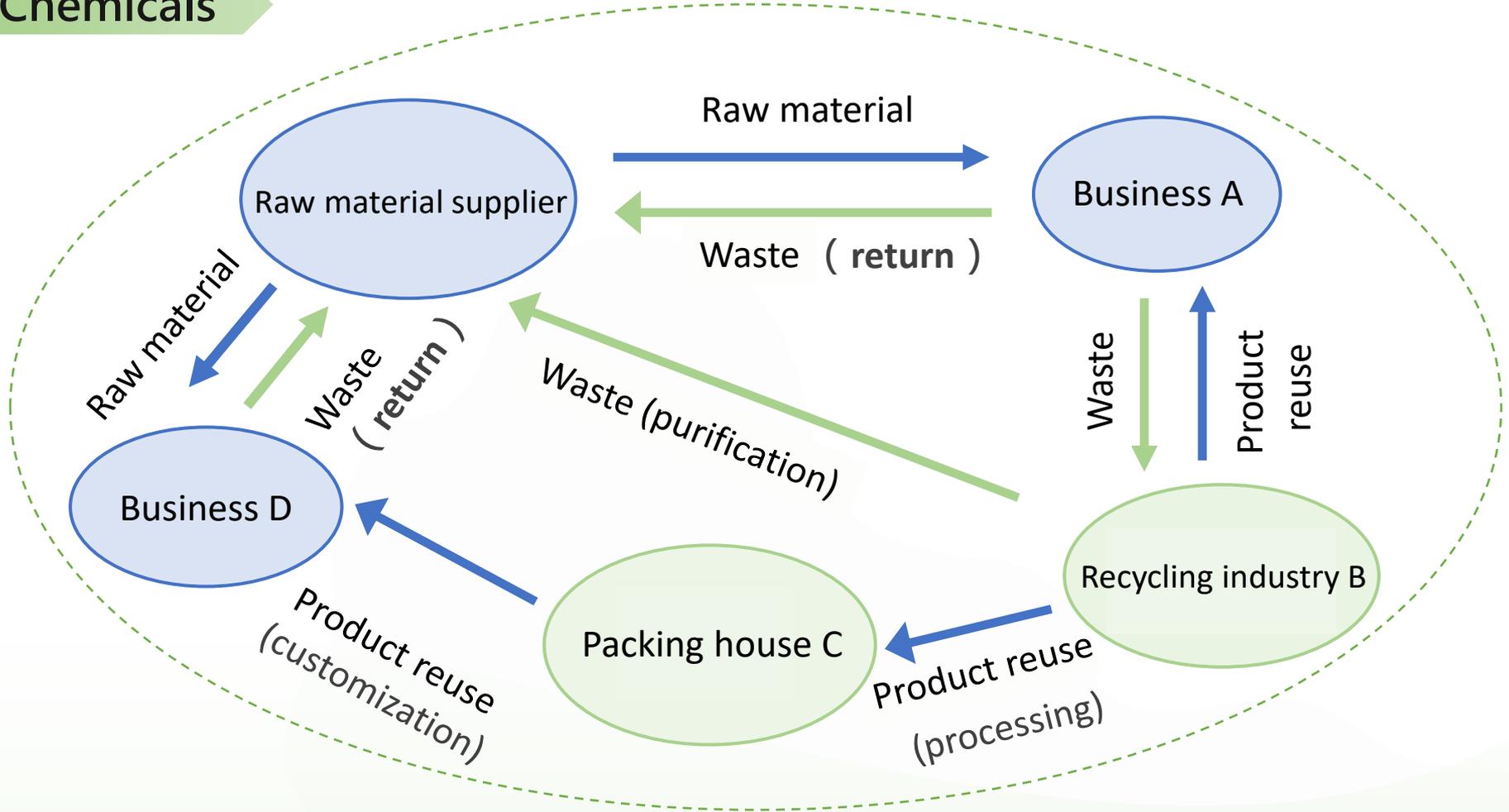
- On 26 September 2022 , Executive Yuan approved the "Outline Plan for Promoting the Application of Recycled Aggregate in Port Filling Projects " .
- Referring to the model of Taipei Port, complete the inventory of northern, central, and southern port areas , and plan to fill BOF and incineration recycled pellets.
- Short term: the amount of land reclamation in the northern port area will be increased, and on-site tests of incineration recycled pellets will be conducted.
- Mid-to-long term: the use of recycled pellets will be promoted in the central and southern harbor areas, and stable disposal will be ensured for the next 20 years.

Filling location	organizer	Preliminary work	embankment engineering
Taipei Port	MOTC	2022-2024	2024-2046
Taichung Harbor	MOTC	2021-2023	2023-2046
Zhangbin Industrial Zone	MOEA	2024-2026	2026-2034
Kaohsiung port	MOTC	2022-2024	2024-2047

Circular Supply Chain(1/2) - Strategy 3



Chemicals

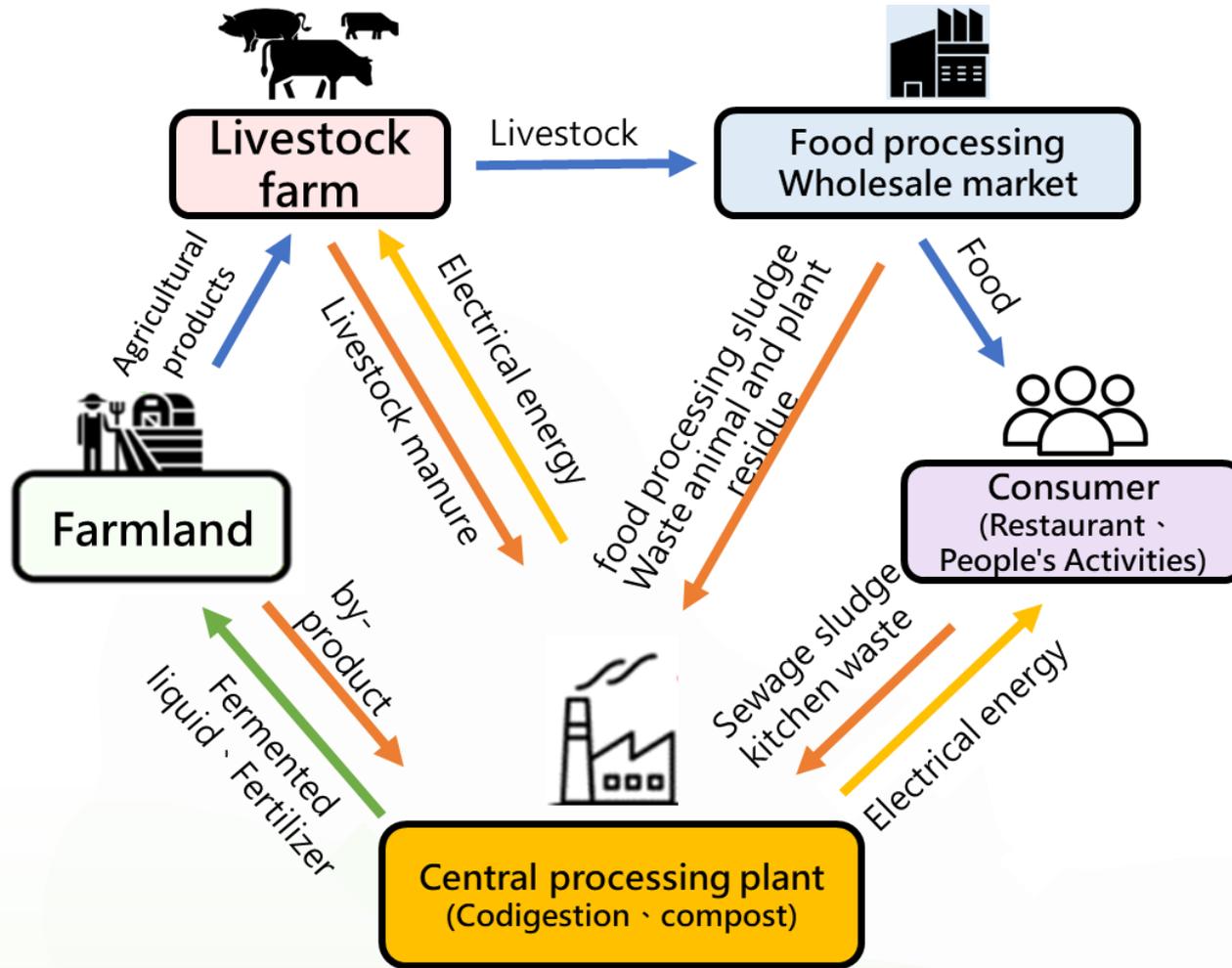


- Different purity levels of chemicals can be used in different industries.
- Improve the competitiveness of reused products through purification or customization

Circular Supply Chain(2/2) - Strategy 3



Biomass



- Biomass material produced by various industries undergo common anaerobic digestion treatment and the resulting biogas, liquid fertilizers, organic fertilizers are recycled and then applied to farmland as nutrients.

Digital Product Passport - Strategy 4

Central competent authorities

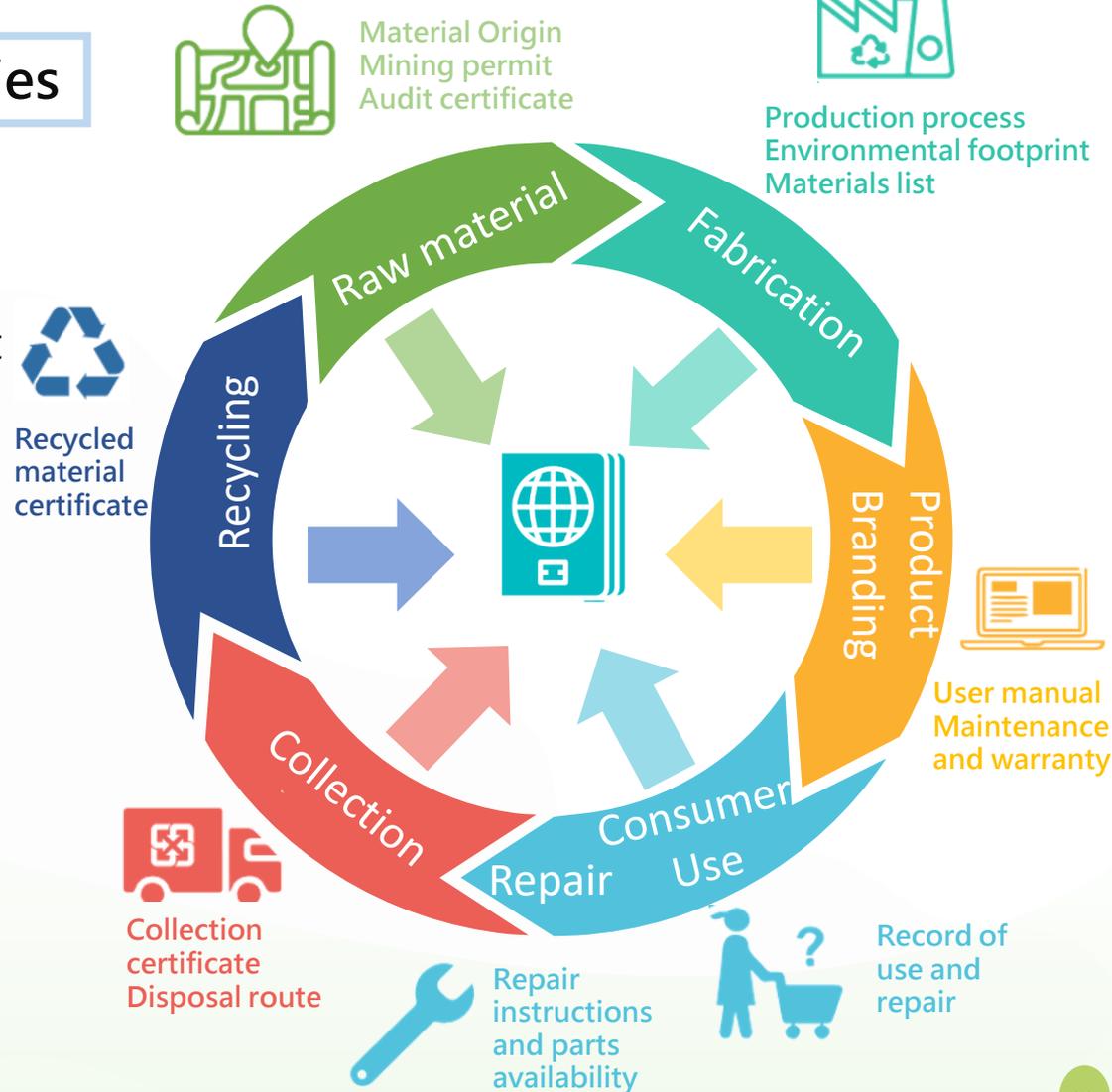
- Create the digital product resume to track the use of substances
- Provide product environmental information to consumers (product carbon footprint, use of recycled materials, repair, recycling, etc.)

Manufacturer

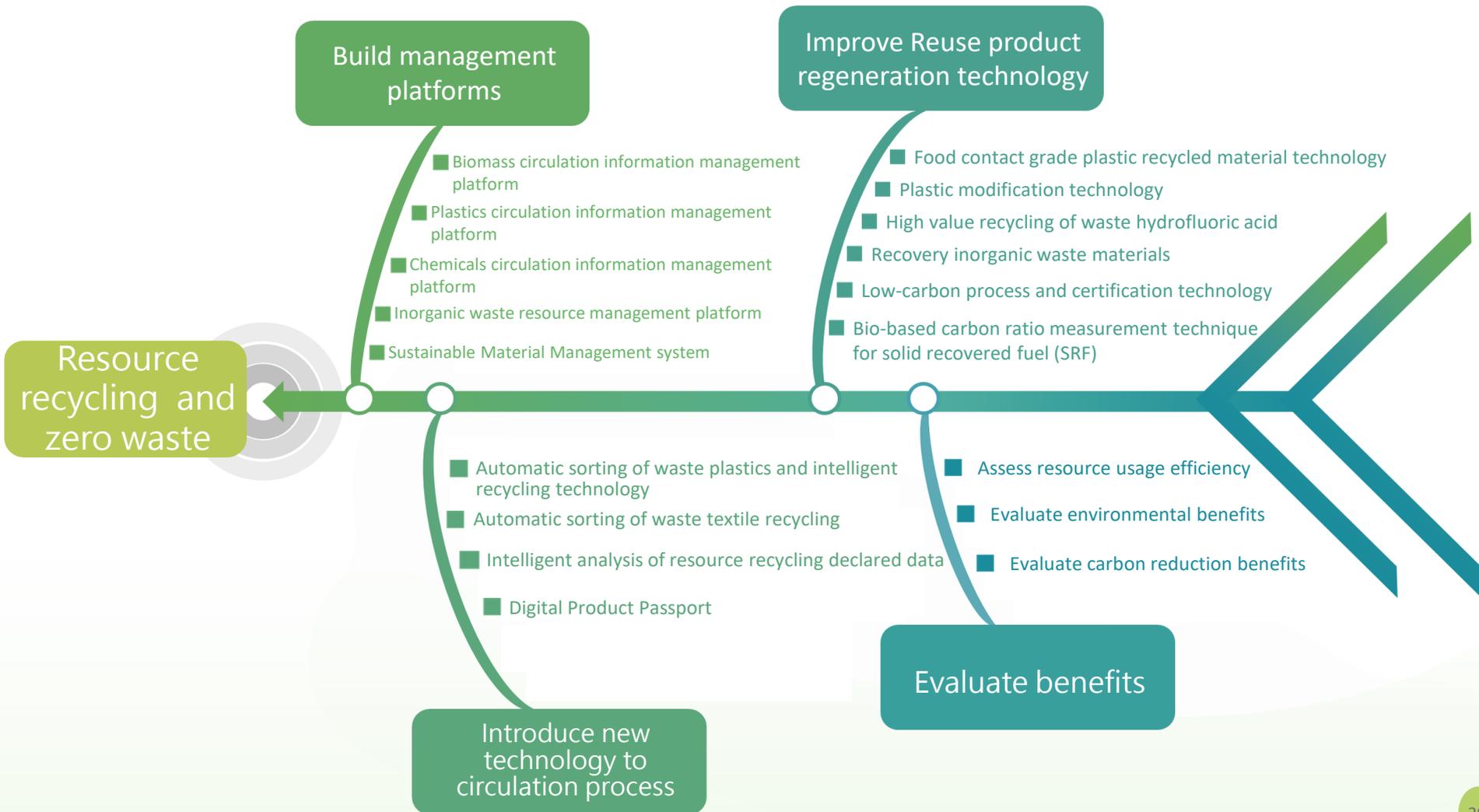
- Provide product information
- Green design, Green production

Consumer

- Obtain product environmental information
- Green consumption



“Resource Circulation for Carbon Emissions Reduction Technology Plan”



Supervision and Evaluation Mechanism



Establish the "Renewable Resource Recycling and Reuse Promotion Committee", set up 5 divisional groups, and the relevant ministries and councils will divide the work according to the promotion strategy, timeline and measures.



Departments which are responsible must report their progress, achievements, and the following year's work plan based on the aforementioned planning direction.



Ministries and councils shall submit quarterly reports on the implementation results to the subcommittees and a committee meeting will be held every six months to review the progress of the work.



Eepilogue

- EPA will continue to cooperate with other ministries and councils to reduce raw material usage, enhance resource efficiency, ensure proper waste management, and achieve net zero emissions.
- The four major promotion strategies will be improved on green design, source reduction, resourcing or energization from waste, well-functioning circulation network, and innovation of laws and regulations.

THANK YOU

