經濟部

Green Economy

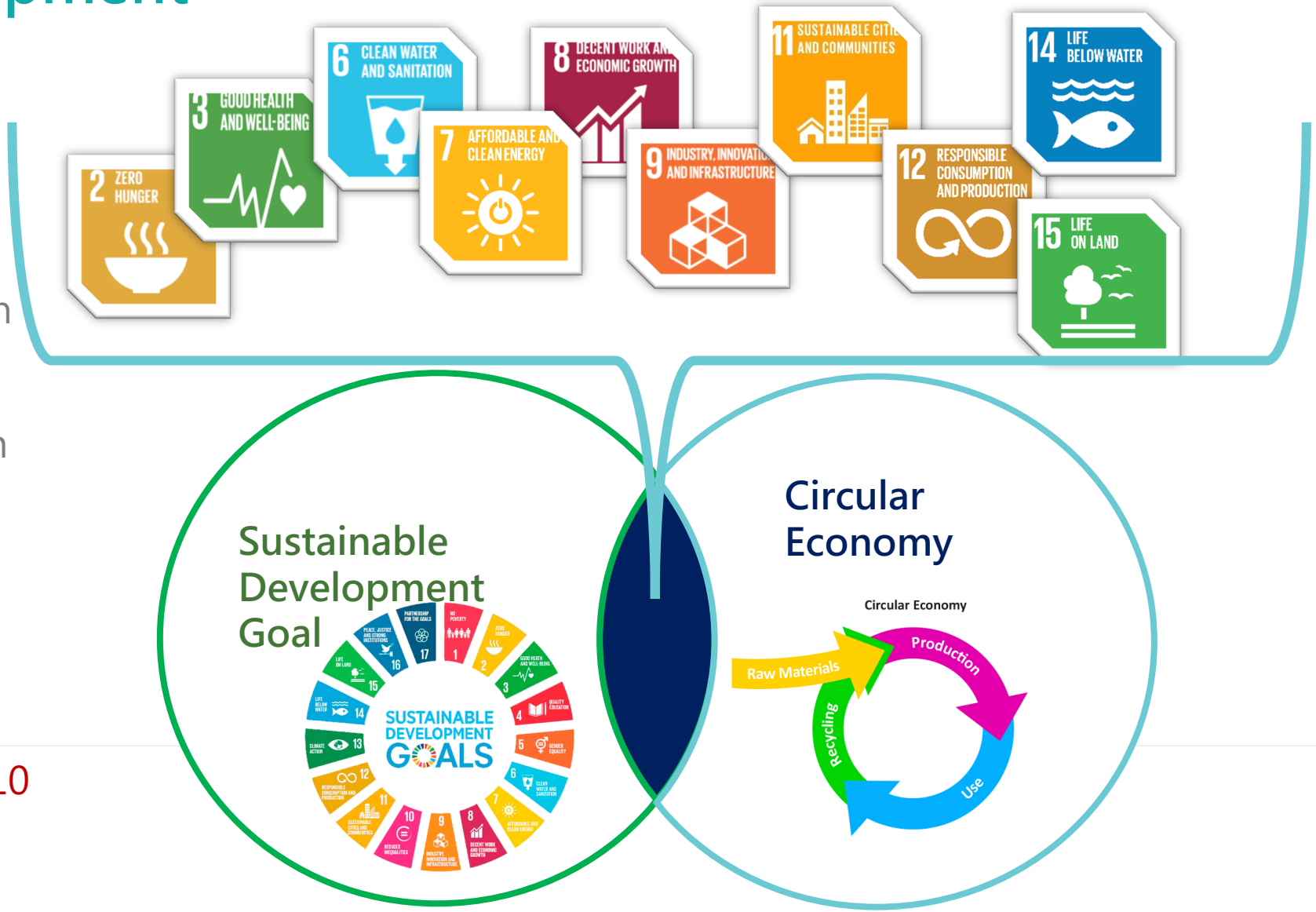
Developing a circular Taiwan

Circular Economy Prompting Office

CEPO

Circular Economy: The Key Strategy Toward Sustainable Development

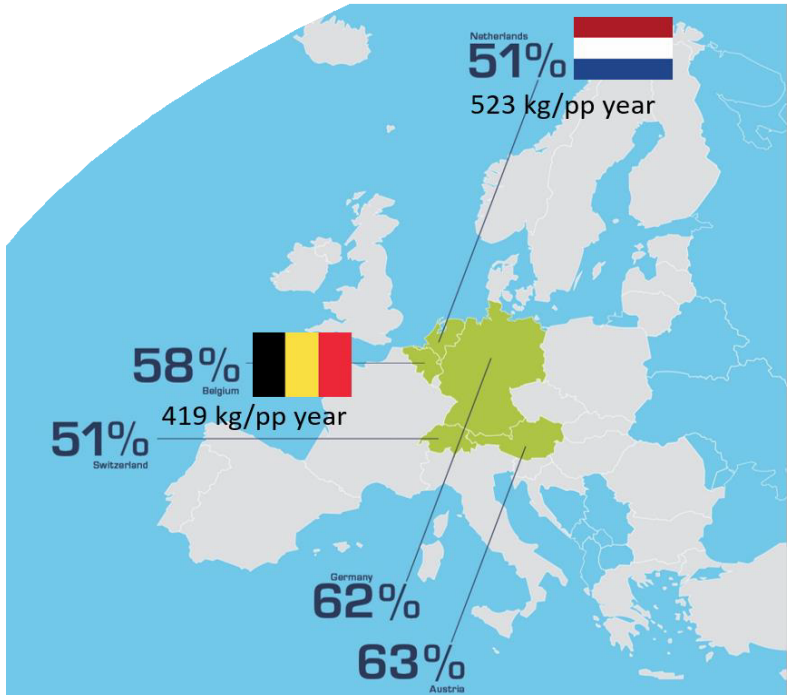
- The global population, from 2018 to 2030, will increase from 7.7 billion to 8.6 billion, and the natural resources and waste disposal on Earth will be under great pressure.
- In the 17 SDGs introduced by the United Nations, the circular economy directly engaged with 10 of it.



Compiled by: CEPO (2020) Source: Schroeder et al.(2018), Development Goals: Circular Economy and SDGs(2015)；Taiwan Circular Economy Network (2019)

Benefits for Circular Economy Development in Taiwan

- Taiwan is densely populated, lack of natural resources, and has been dedicated to implementing resource recovery and recycling for more than 3 decades. The lead manufacturers of the textile industry have started recycling and reusing plastic bottles since 1988 to produce products such as recycled clothes, shoes, carpets, staple products, films and bottles.
- Resource recycling and collection rate in Taiwan is among the top around the world, with a rate of up to 58%, which is equivalent to the ones of some European countries.



Why Promote Circular Economy in Taiwan?

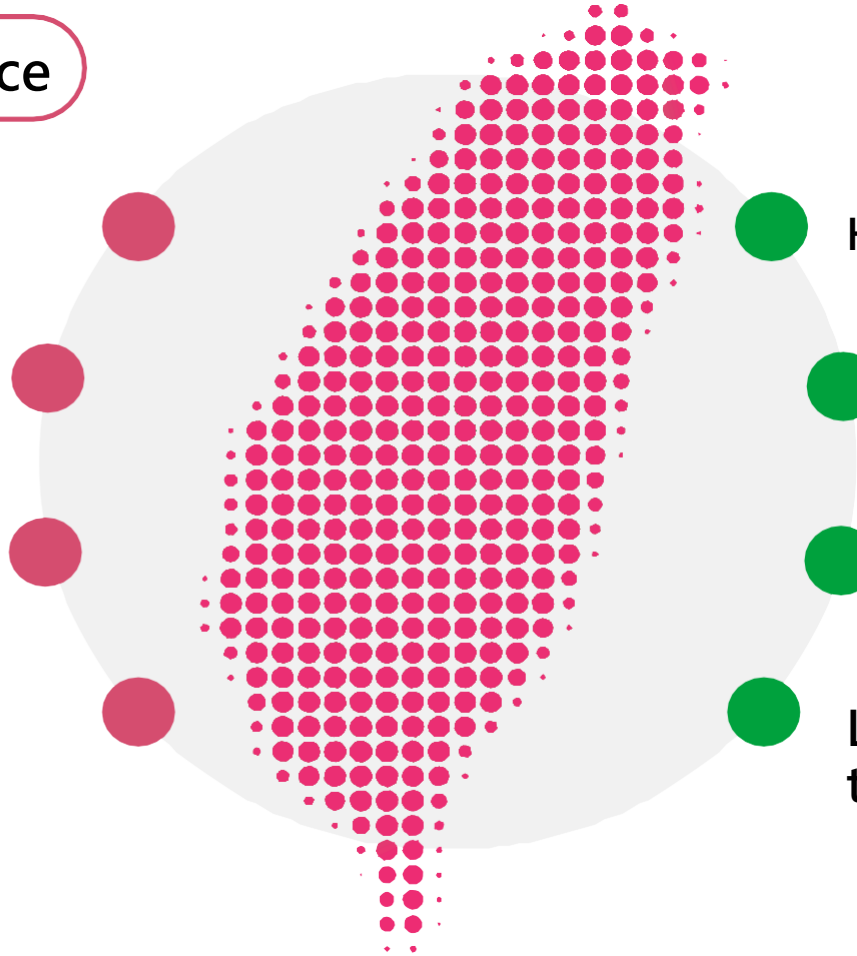
External Force

New Business Models of Leading Manufacturers

Entry limitation of international market

Limited Supply of Rare Materials

Products Specifications Stipulated by International Business Union



Internal Force

High Dependency on Imported Resources

Treatment concern on LCD Panel and Li-ion batteries

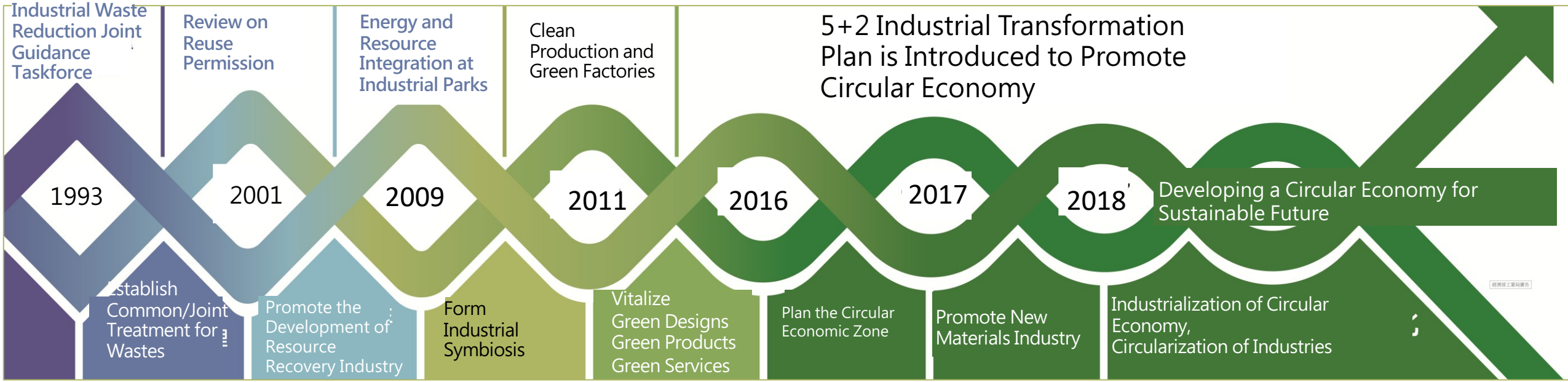
Recovery demanding of construction waste

Lacks comprehensive waste treatment process

From Recycling to Circular Economy –

Approaching of Circular Economy in Taiwan

- Taiwan has achieved fruitful results in environmental protection. At present, in addition to the 80% recycling rate of industrial waste and the output value of the resource recycling industry at NT$ 73.4 billion, the have also been many cases of successful industrial symbiosis.
- Over the years, Taiwan has not only been dedicated to implementing environmental protection and resource recycling, but also actively promoted reuse permits, energy and resource integration and other works to create a fundamental environment suitable for the development of circular economy.



On our way to Circular Economy

Overall Improvements Required to Taiwanese Industries in Terms of Global Circular Economy

Master the key points for promoting circular economy, make breakthrough and extend the efficiency by reviewing the advantages and disadvantages of Taiwanese Industries

Chemistry

- Biodegradable materials
- Recycled materials
- Upcycled circular materials
- Interdisciplinary byproduct cycle
- Chemical leasing

Consumption Industry

- Disposable packaging innovation
- Green textile development

Metal and Machinery

- Low-carbon production procedure
- Special raw material recycling
- Green transportation

Service

- Platform for product repair, lease, and second-hand products.
- New consumption economy
- Collection Management and automation.

ICT

- Ecological design of innovative products
- Extended producer responsibility
- Product repair and refurbishment
- Reducing hardware consumption by cloud technologies

Utility

- Recycled water treatment technology
- Interdisciplinary by-product cycle

Construction

- High-performance construction materials development
- Building maintenance technology
- Standard or specification of recycled construction materials
- Construction material recycling

Biotechnology and Farming

- Biomass materials / compostable materials
- Biomass circular technology
- Food consumption management
- Enzyme

Domestic Industries Start to Apply Circular Economy Spontaneously since 2012

Domestic industries have spontaneously applied the circular economy in the way of not only forming alliances among each industrial sector, but also since the second half of 2018, accelerating the development of cross-sector integrated alliances, which has contributed to policy support to introduce technical and institutional assistance.

2012.April
- C2C Taiwan Alliance

2015.July
- Taiwan Renewable Energy Promotion Alliance

2017.Sept.
- Taiwan 3T Alliance MOU (Led by TASS)

2018
- April: Ocean Plastic Coalition
- May: Taiwan SMART Cycle(Led by Chen Ya)
- June: GERA (Led by Solar)
- Sept.: 5T Circular Economy Alliance Initiation Event held (TASS

2019
- June: TCTA (Promoted by TTF and TTRI)
- Aug: 100 members included by C2C Taiwan Alliance
- Sept: 15T Circular Economy Alliance Initiation Event held (Led by TASS&SEMI
- Oct.: Taiwan Circular Economy 100 (TCE100)

Asia Pacific Circular Economy Roundtable by 2019 Taiwan Circular Economy Week (MOEA, EPA)

Developing the Circular Economy (CE) strategies

Circular Economy Promotion Plan (2018-2027) Approved by Executive Yuan

- The Executive Yuan in December 2018 adopted the "Circular Economy Promotion Plan" which was supervised by Ministers without Portfolio of EY and implemented by MOEA.
- Target major related domestic industries such as metal and petrochemical with the promotion of two major pillars and four strategies.

Key Issues

- Resource scarcity and energy consumption
- Outdated technology and high level of costs
- Environmental issues, and barriers of elimination
- Stalled investment and fierce competition

Target Industries

Metal

Petrochemical

Four Strategies

- Promote circular technologies and materials innovation, establish R&D center
- Establishing a circular industrial demonstration park
- Encourage green consumption and exchanges
- Integrate energy resources and natural resources, promote industrial symbiosis

Two Pillars

- Industrialization of Circular Economy
- Circularization of Industries

Expansion

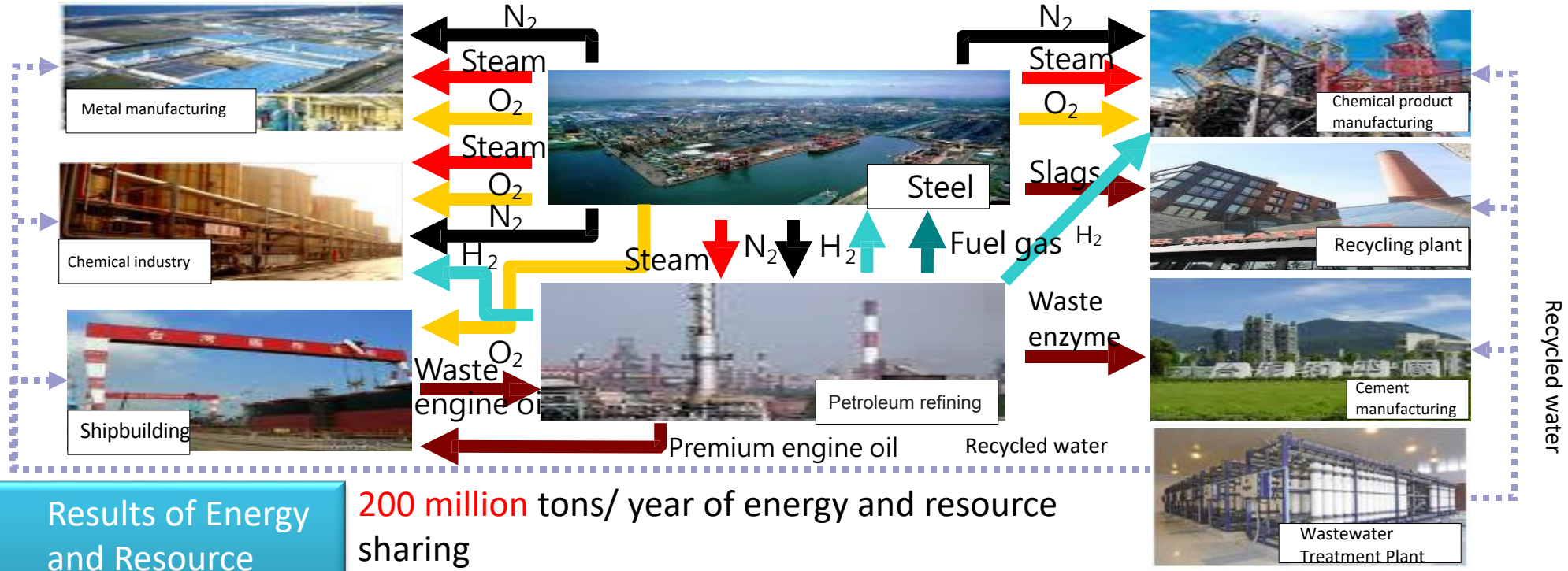
Expanding the pilot facilities park from Kaohsiung to national wide

Developing the Circular Economy (CE) strategies

The **"Guidelines of Circular Economy Promotion Office Establishment"** was promulgated for the establishment of the **Circular Economy Promotion Office (CEPO)** has 3 taskforces groups and 2 project task groups which were constructed based on individual functions, to manage the work and projects at various levels, following and managing the progress of critical issues.

Integrate energy resources and natural resources, promote industrial symbiosis-Linhai Industrial Park

- The steel industry and the petrochemical industry have the most optimized models for energy and resource integration to promote the sustainable recycling of waste heat (steam).
- The industrial gases and waste resources generated from the steelmaking and petroleum refining processes can be reused by neighboring manufacturers.



Results of Energy and Resource Integration

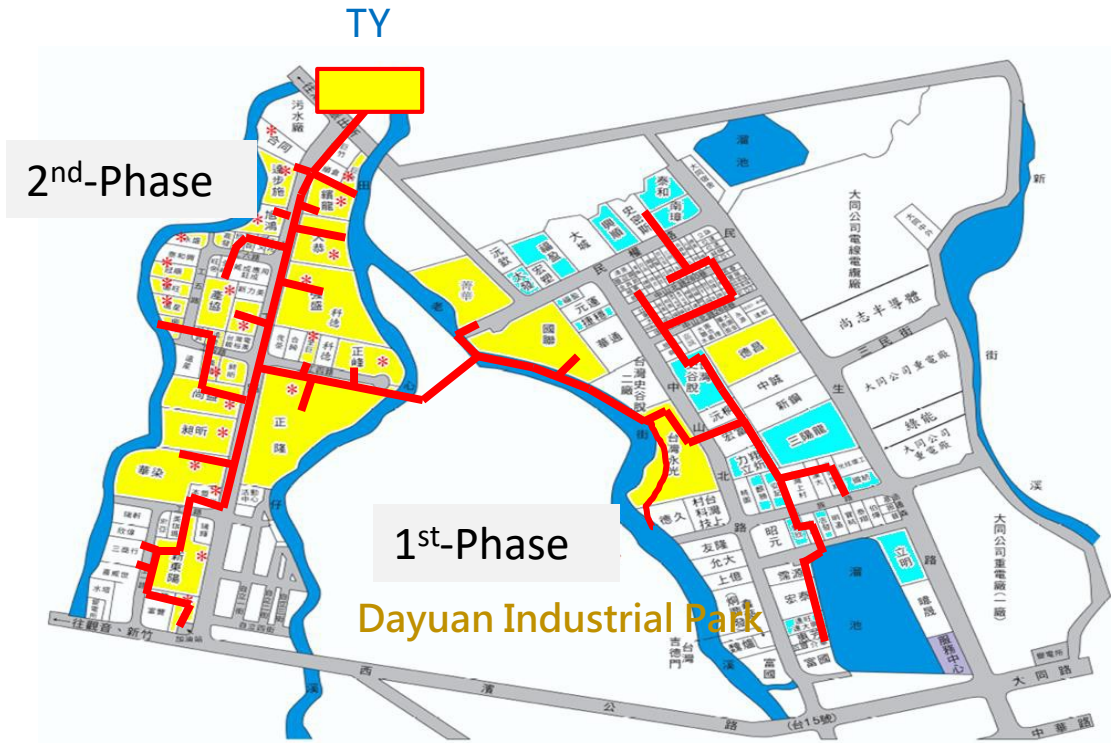
200 million tons/ year of energy and resource sharing

Save 12.3 thousand kL of engine oil

Reduce 382 thousand tons of carbon dioxide emission

Integrate energy resources and natural resources, promote industrial symbiosis-Dayuan Industrial Park

- Assisting the cogeneration plant in the Park (Dayuan Cogeneration) to supply steam to the manufacturers in the Park, and abolish 64 small-scale high-polluting boilers.
- The cogeneration unit uses paper pulp and textile sludge as the auxiliary fuel which has installed in the end of 2019. The total investment was NT$1.5 billion and would be able to expand the steam supply capacity in the Park.



10 kilometers of distribution pipelines

Results of Energy and Resource Integration

Achieve steam connections 700 thousands /year.

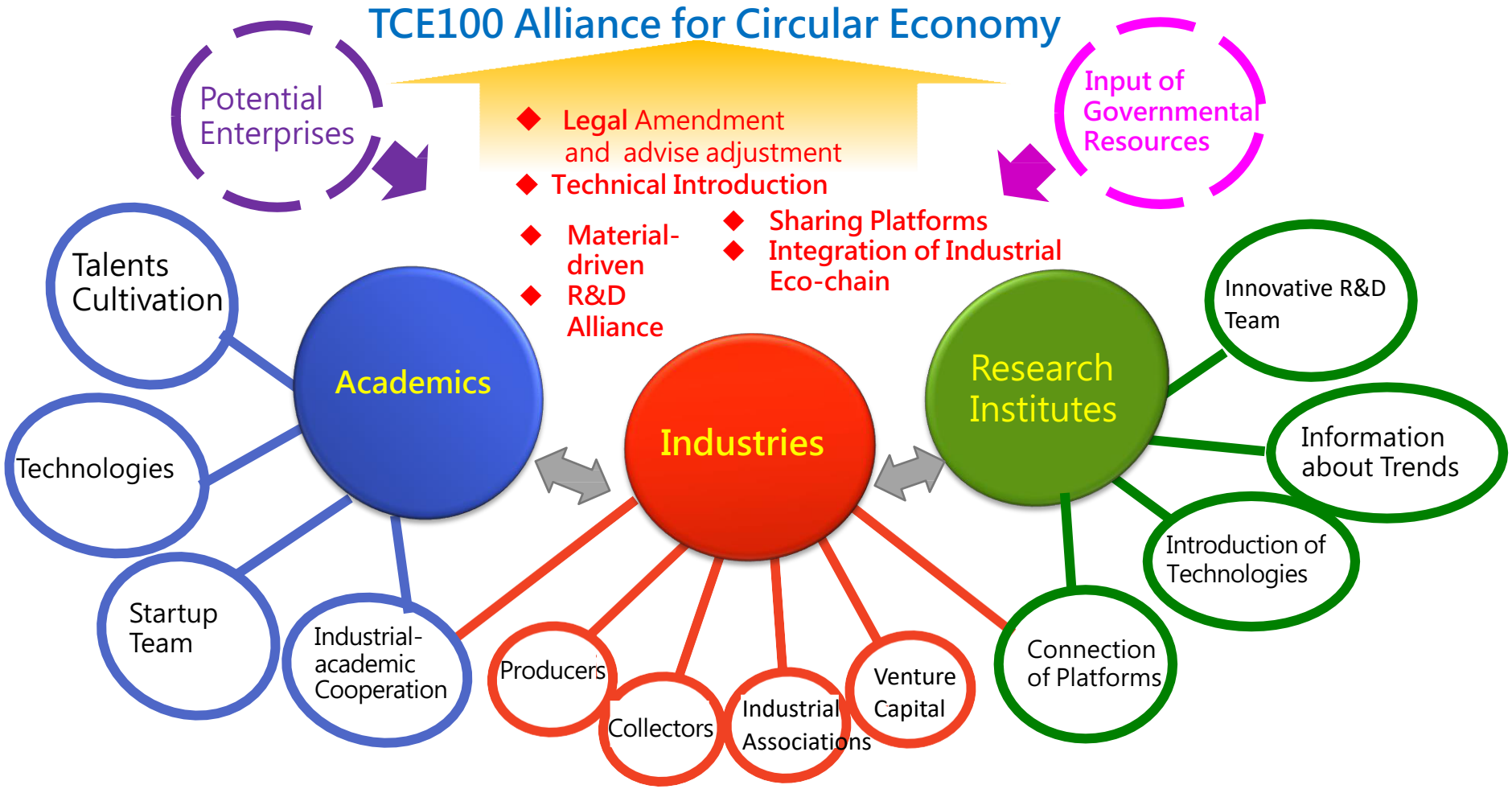
Save fuel consumption up to 54,000 kloe.

Reduce CO_2 emissions by 168,000 tons.

Create a Public-Private Partnership Platform

Future of TCE100

Create Niches
Connect to the World



Create a Public-Private Partnership Platform

TCE100
Taiwan Circular Economy Alliance

Create a platform to facilitate the cooperation among the industries

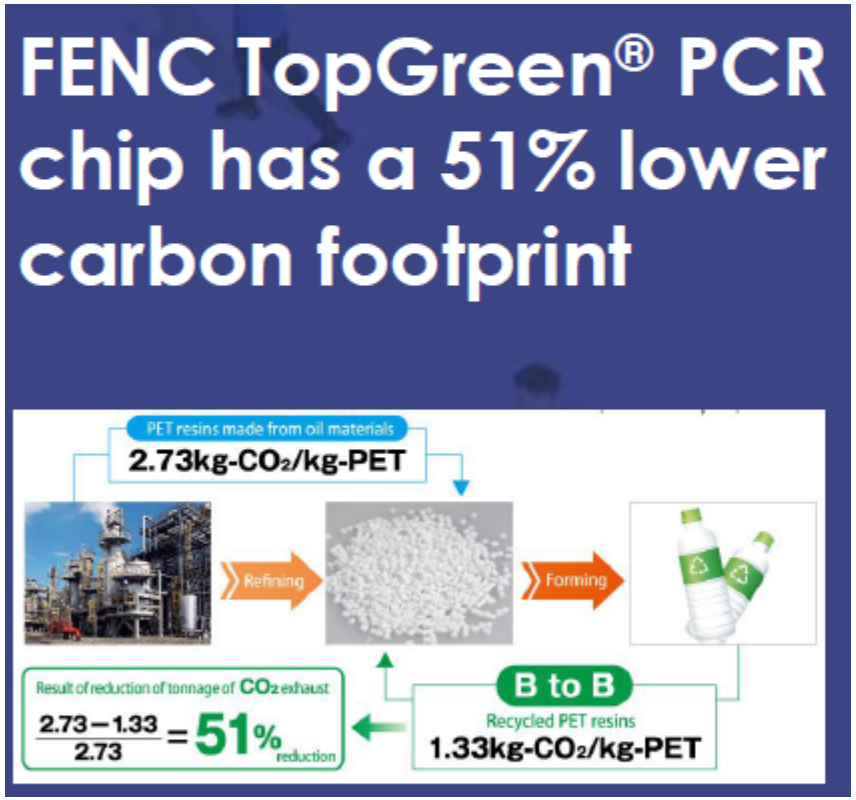
- Based on the concept of "Industrial Promotion by Government Support", the key leaders from all fields of industries, the government sectors, the academies, and the research institutes were gathering to join and commit to fully support the implementation of circular economy in Taiwan.
- The ceremony of TCE100 was held at the venue of APEC on Oct. 17 of 2019, where were 115 companies to join.
- Experts from all fields are invited and currently, 218 institutions from industrial, academic, and research are joined the TCE100.

Launch Event of the New Era of Circular Economy

- To practice the circular economy concept internally : such as, developing key material technologies, designing recyclable products, and planning innovative business models.
- To start the cooperation between enterprises with energy and resource externally: The network of energy and resource circular industry symbiosis systems development, from "chain" to "network", and expand the scale from "regional integration" to "cross-disciplines interaction".
- To collaborate for "resource circular system" development: Master and channel the dynamic needed domestically and internationally, construct the production and consumption arteriovenous circulation, and shape to an endless sustainable industrial circulation model.

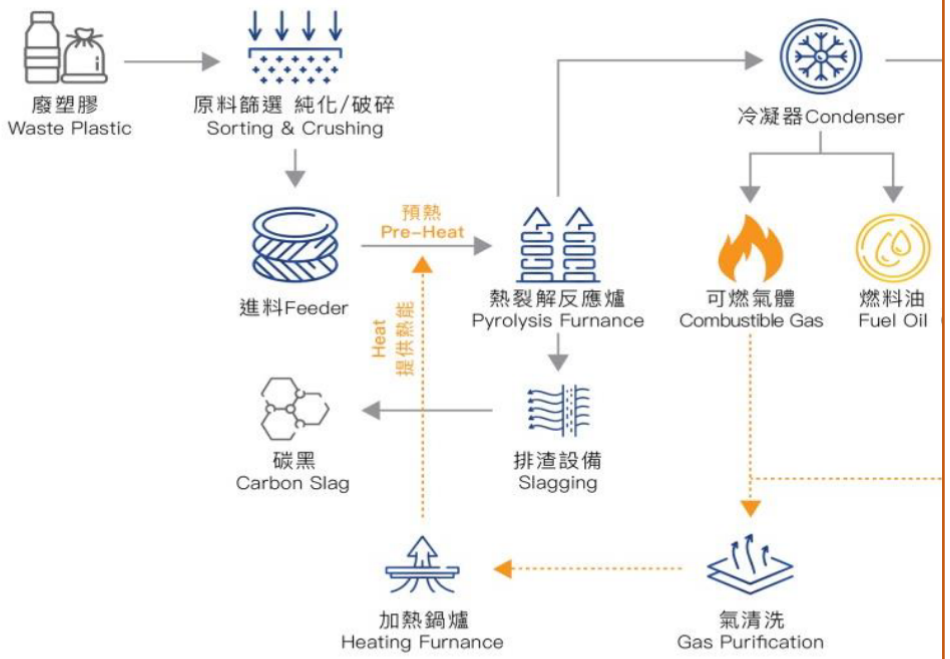
Cooperation opportunities in the future

Waste PET bottle remanufacturing



資料來源：遠果新世紀

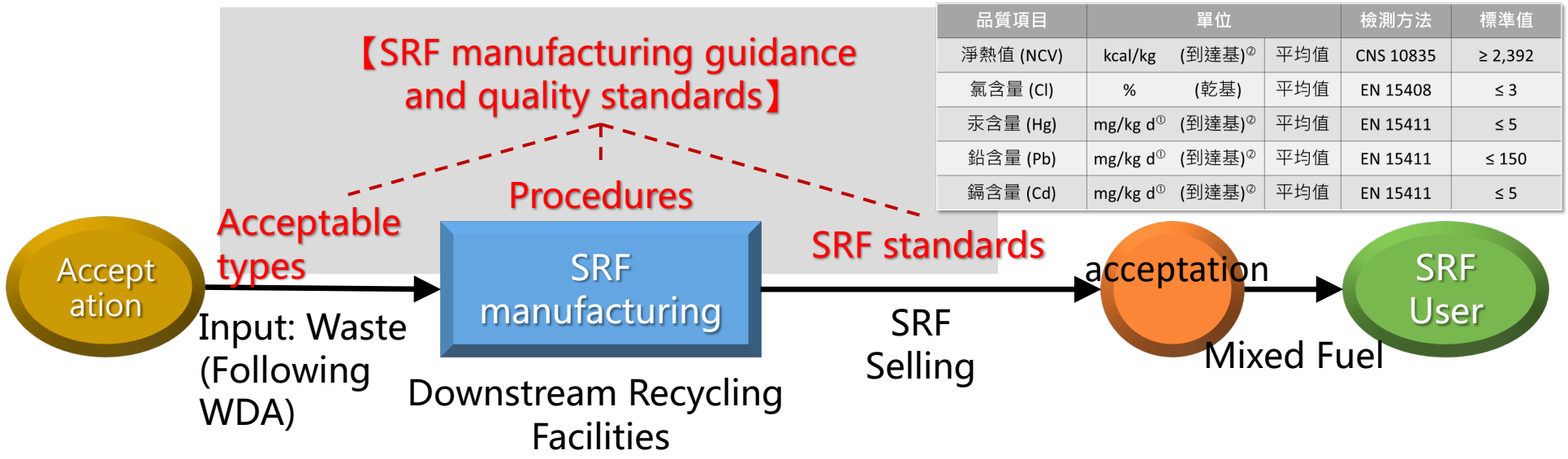
Waste plastic pyrolysis, shall generate S<50ppm LIGHT ENDS



資料來源：海神全球股份有限公司

Cooperation opportunities in the future

- Solid recovered fuel, SRF：
  - Using the combustion acceptable waste as the fuel , and qualified the fuel quality standards

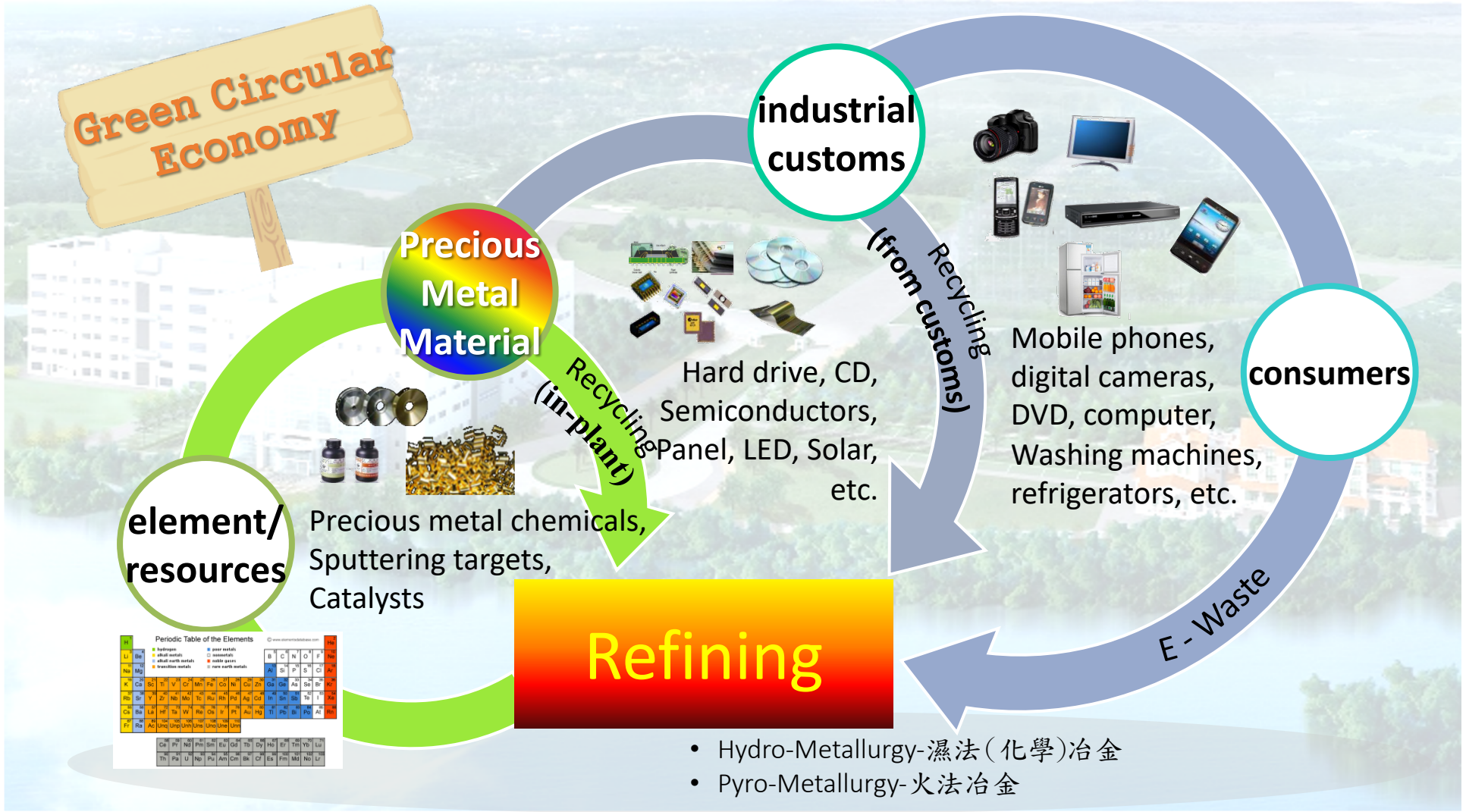


品質項目	單位			檢測方法	標準值
淨熱值 (NCV)	kcal/kg	(到達基)②	平均值	CNS 10835	≥ 2,392
氯含量 (Cl)	%	(乾基)	平均值	EN 15408	≤ 3
汞含量 (Hg)	mg/kg d①	(到達基)②	平均值	EN 15411	≤ 5
鉛含量 (Pb)	mg/kg d①	(到達基)②	平均值	EN 15411	≤ 150
鎘含量 (Cd)	mg/kg d①	(到達基)②	平均值	EN 15411	≤ 5

Paper Reject

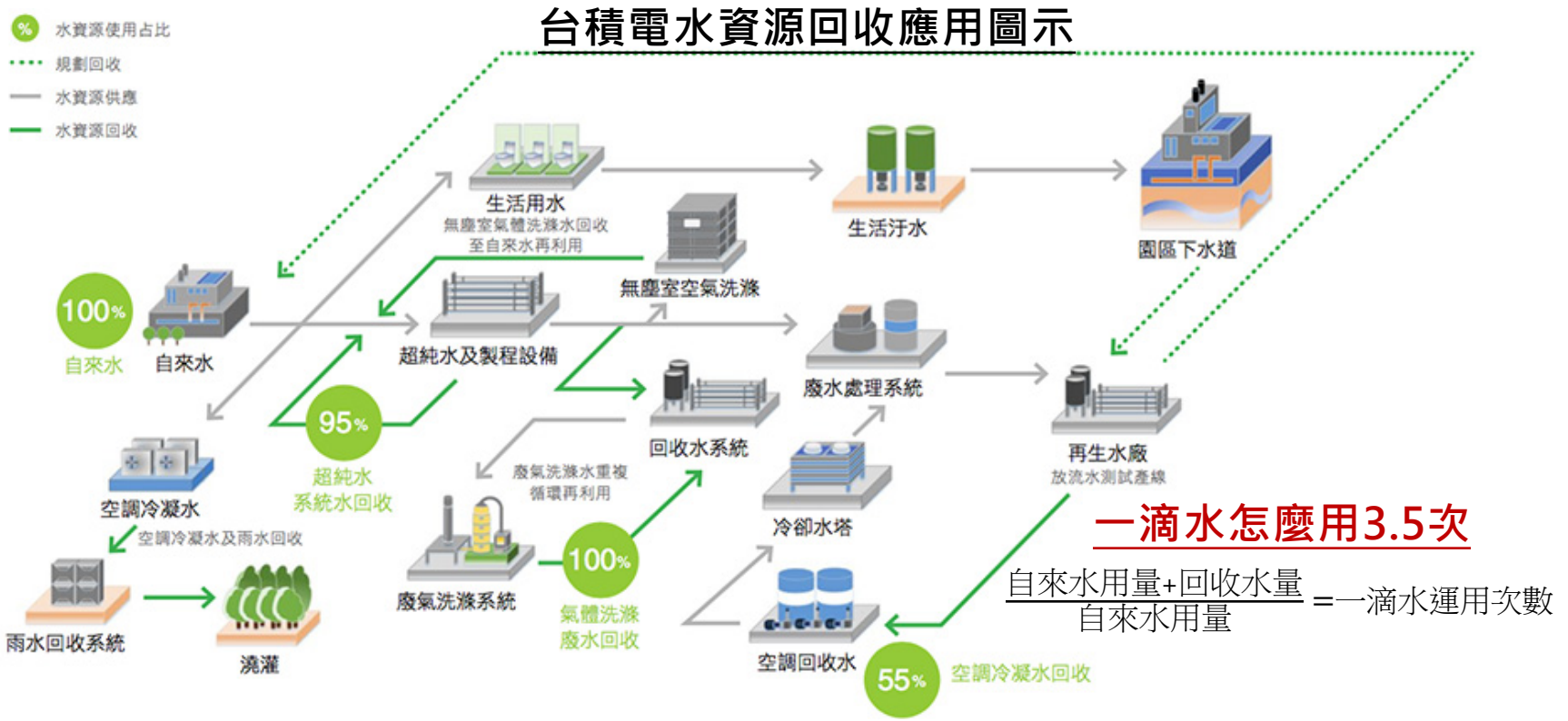
SRF, Solid Recovered fuel

Cooperation opportunities in the future

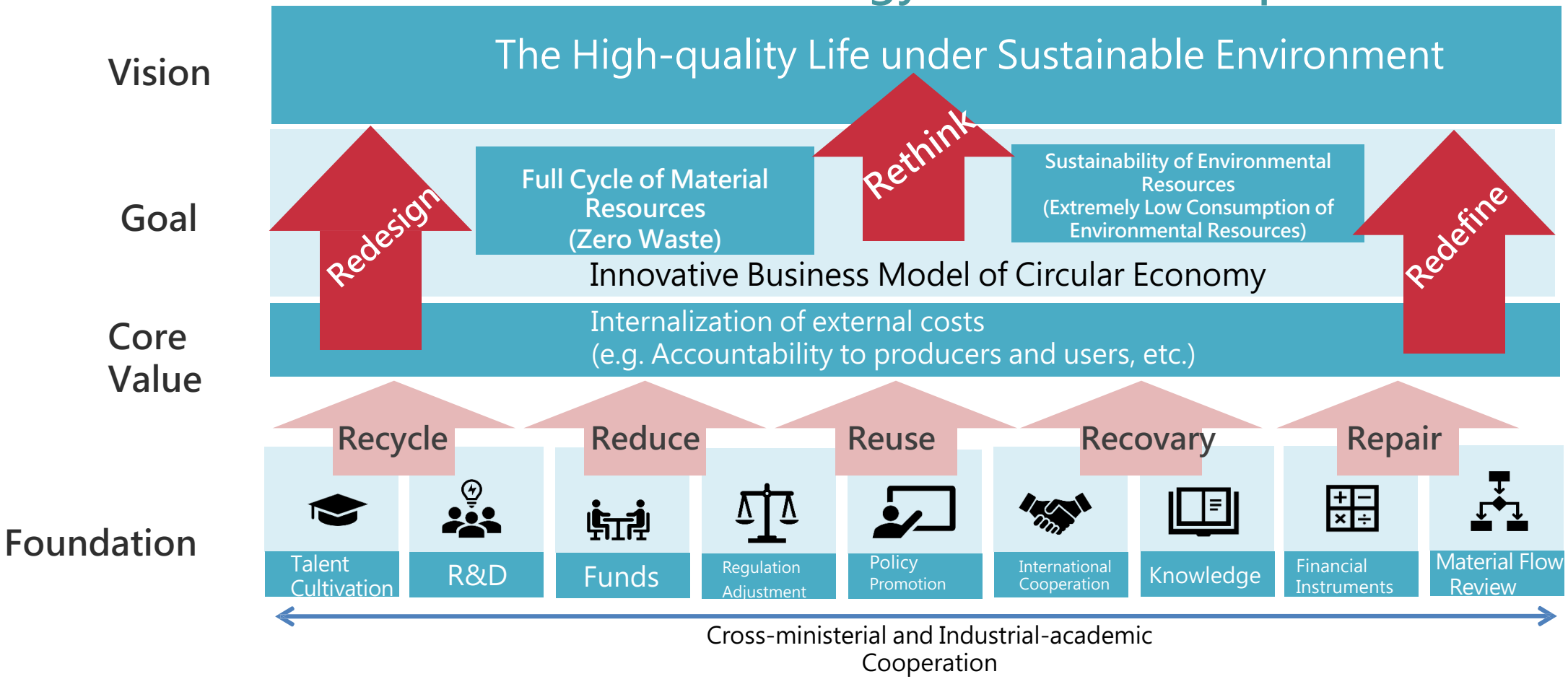


Cooperation opportunities in the future

- ✓ According to the World Economic Forum's 2020 Global Risk Report: there is a high impact risk from "A significant decline in the available quality and quantity of fresh water, resulting in harmful effects on human health and/or economic activity.
- ✓ TSMC continues to strive for effective usage of each water drop to 3.5 times, recycling rate achieve 90%.
- ✓ China-Steel, daily water recycling volume is 7,500,000 tonnes, recycling rate for 98.3%
- ✓ Recycled Water plant finished 2nd phrase development in Kaohsiung, shall provide 450,000 recycled water daily.



Develop an Economic Model based on Institutional System, and with the Focus on Technology and Market Aspects



"**Wastes are misplaced resources** "is the core concept of circular economy, following with the utilization of renewable materials and energy, in the production and consumption value chain, product can being " redesigned" , and " redefined" the business models and "rethink" the manufacturing channels recycling treatment business to improve the economy growth.

Thanks for your listening