A Study on the Strategies and Recommendations for Developing Circular Economy in Taoyuan City, Taiwan.

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Abstract. The "Circular Economy", as a result, would become a competitive advantage for economic development in recent years. In this study, information collection and SWOT analysis have been conducted, focusing on the resource utilization and waste management by the manufacturing, agriculture, animal husbandry, aquaculture, water resources and energy industries within the industrial zones in Taoyuan City, Taiwan. Expert opinions from the industries, government and academic circles have been integrated to plan for and provide short, mid and long-term recommendations for the policy makers. It is hoped that these efforts would help improve the structure of resource cycling and reutilization in the industries, achieve vertical integration of the whole supply chain and establish a communication platform horizontally to synergize relevant resources. The purpose is to minimize industrial waste and optimize the value of recycled waste, thereby reducing raw materials exploitation. In the R&D process, it is also important to take into account the life cycle of the products and to improve the waste re-utilization rate throughout the manufacturing process. The ultimate purpose is to reduce the environmental burden caused by economic development, facilitate the transformation from a linear economy to a circular economy and, eventually, fulfill the objective of "Zero Waste" and sustainable development.

Keywords: sustainable development, circular economy, supply chain, life cycle, Zero Waste

1. Industrial development status for Taoyuan City, Taiwan

The concept of transforming waste into usable resources is gradually taking its shape in recent years. When the re-utilization value of an object is greater than the treatment cost, it will become another kind of resource; on the other hand, if the re-utilization value is less than the treatment cost, then it will be considered as waste. In nature, the refuse is not entirely waste because it may become a valuable resource (Chang, 2012). In 2013, Jeremy Rifkin, the author of the third industrial revolution, indicated that humankind will be able to combine green energy and the energy information technology in the 21st century to bring it into the era of the third industrial revolution. Based on the development of industrial energy resources in the local market, Taiwan is now marching toward such inevitable direction (Jeremy, 2013).

Taiwan is a country lacking in natural resources. Under the premise of spurring the economy, the development of intellectual green industry and consumption towards accomplishing the goal of putting in place a sustainable process has become the most urgent and important issue nowadays (Liu and Wu, 2012). According to the alternative statistical information from factories registered by the end of December 2015, it shows that the adjusted number of factories registered in Taoyuan City was a total of 10,890 factories. In

terms of distribution area, these manufacturing industries are divided into 26 categories. In this regard, the number of machinery equipment manufacturing is 2,428 firms, which is the highest as they constitute 22.3% of the total firms, followed by metal manufacturing, 1,641 firms (15.1%); the electronic parts manufacturing, 953 firms (8.8%); the plastic product manufacturing, 899 firms (8.3%); the textile manufacturing, 762 firms (7%); and the food manufacturing, 611 firms (5.6%).

Currently in Taiwan, the number of agricultural and husbandry farms in Taoyuan City is 43,576 households with 130 in agricultural and husbandry home state, ranking at the top position. In the livestock sector, there are 393 raising farms and most of them are cattle and sheep, taking 59.8% for 235 cattle raising farms and 20. 36% for 80 sheep raising farms. In the poultry sector, the chicken raising farms account for the highest percentage, comprising 89.32% for the 373 chicken farms. In the pig sector, there are 452 chicken raising farms in Taoyuan City with 67 of them are spread over the Longtan District, the highest for its percentage of 28.63%; followed by 55 raising farms in Dayuan District (23.5%) and 49 raising farms in Zhongli District (20.94%).

In water consumption, the effective capacity of Shimen Reservoir in Taoyuan City is 20,123.600, 000 m3 and the average amount of the water supply through the regulations and storage of the dam per day is about 800,000 m3, plus a downstream uncontrolled flow rate. With the Sanxia River Pumping Station, the total water supply will run up to 1,480,000 m3. The total industrial water consumption in 2013 was a total of 266,980,000 tons.

In 2014, the total refuse disposal amount for general waste in Taoyuan City was 804,315.69 tons wherein the waste treated by incineration method was 351,595.39 tons and those treated by the hygienic landfill method was 1,113.55 tons. In aspect of bulky refuse, some 381.86 tons were treated by the incineration method and 45.74 tons were treated by the hygienic landfill method.

Regarding the amount of general waste recycled and reutilized, the amount of bulky refuse recovered and reutilized was 1,046.92 tons, that of the recovered leftovers were 104,032.34 tons, and the general refuse recovered/reutilized was 346,103.84 tons. In Taoyuan City, the average refuse product per person per day was 1.071kg and the average refuse disposed per person per day was 0.47kg.

In the aspect of announced industrial waste, the total amount of the reutilized waste under the R-type announcement being produced by Taoyuan City in 2014 was 806,838 tons; and the total amount of the reutilized waste under the R-type announcement received by the reutilization agency was 731,870 tons. The reutilization rate in 2014 was 90.7%.

2. Reference Literature

The Circular Economy is a development trend that has emerged in recent years and some proximate terms have also used such as “Green Economy”, “Ecological Economy” and “Low-Carbon Economy”; however, the “Circular Economy” is an economical system using natural resources as the core (Zou and Yang, 2015a). Since Kenneth Ewart Boulding proposed his “Spaceship Economy” concept in the 1960’s, the Circular Economy has gradually spread over the world (Kennis et al., 1968). In 2014, the “Toward the Circular Economy” as announced at the “Davos World Economic Forum” held in Switzerland where the niche and the challenge were studied for transforming the global economy into a Circular Economy in the future. The key points of such concept are as follows: (1) The concept of recycling not only spurs economic growth but creates long-term employment opportunities. (2) The Circular Economy is under its gradual growing process and will be developed globally. (3) The supply chain will play a more important role in the Circular Economy system (Ellen MacArthur Foundation and McKinsey & Company, 2014). In the meantime, the experts even anticipated that the “Circular Economy” mode may create some 100,000 working opportunities in the next 5 years and is expected to contribute USD1 trillion production value for the overall world economy by 2025 (World Economic Forum, 2015). In 2003, Japan proposed the “Basic Method for the Promotion and Transformation of a Circular Type Society” in addition to the “Circular Economy Promotional Method” initiated by China in 2009. The aforesaid programs are implemented by focusing on the 3R concept of “Reduce”, “Reuse” and “Recycle” in order to realize the goal of resource recycling and economic development through policy and statutory codes, etc. (Zou and Yang, 2015b).

In their “Natural Resources and Environmental Economy”, Pearce & Turner firstly presented the “Circular Economy” concept. The purpose is to set up a sustainable resource management structure for combining the economic system as one part of the ecological system in order to set up a “harmonic economy and environmental conditions” (Yu et al., 2015). The essential core of the Circular Economy comprises the following 4 key elements, i.e. Product Design, Reverse Logistics, Commercial Mode, Internet of Things and Policy/Statutory Codes Package. With these 4 elements available at the same time, the business shall be able to realize the Circular Economy, extend the staying time of products in the supply chain system, optimize the recovery and reuse rate and frequency, and improve profits (Gu, 2014).

It is estimated that by 2050, there will be some 9 billion people living on this planet and enjoying incremental wealth (Godfray et al., 2010); however, it will also lead to more economic demands as to deplete the resources continuously. Nearly 80% of wastes are produced in the contemporary Linear Economy, and they are discarded directly after using (Sempels and Hoffmann, 2013). According to relevant research, it indicated that over 99% of water treatment is resulting from

the product used by the consumers (Hawken, 1999). The essence of a Circular Economy is more advantageous than the previous Linear Economy and it would create more than USD1 trillion opportunities for the economy all over the world (Ellen Macarthur Foundation, 2014). Furthermore, the corporate operations according to the Circular Economy concept would be able to obtain more potential income.

During 2008~2009, the Green Economy Initiative was launched by UNEP (United Nations Environmental Programme) and its purpose is to cover the production and consuming patterns of the following four aspects: (1) Improve the welfare of humankind. (2) Maintain social fairness. (3) Prevent depletion of natural resources. (4) Control environmental risks (United Nations Environmental Programme, 2010). In the meantime, UNEP also proposed the Global Green New Deal concept, urging world leaders to transform their investment directions in order to create more working opportunities. This is the environmental plan implemented to recover and support the eco-system of the global economy to resolve the double crisis of climate change and economic recession hoping that people may be infused with the consciousness of "transforming the depletion of earth to the management and reinvestment of this planet" (Ma, 2009).

The change of the demand for Circular Economy is resulting from the change in the value chain. Its scope ranges from product design to newly established commercial and market modes, as well as from waste and resource treatment method to consumer behavioral modification (Smol et al., 2015). Until now, waste treatment has become the most touchy challenge in waste management all over the world. One of the key goals of the European Union (EU) is to achieve a sustainable development for waste management (Ravindra et al., 2015). Its purpose is to reduce the landfill treatment of organic waste or suspend its use (Lundin et al., 2004).

3. Analysis of the Development Strategy for the Taoyuan City Resource Recycling Industry

The research contained herein is conducted by referring to the challenges and issues confronted by each country in the process of developing the Circular Economy. Aiming at the promotion of the development of resource recycling and reutilization for Taoyuan City, we also invited 16 persons from the resource recycling related industries, government and academic sectors as well as the presenter of relevant research foundations and programs to carry out in-depth interviews and suggestion feedback. During the research, the SWOT approach was used to analyze the development strategies of the resource recycling industry where the focus interview and professional opinions were summarized. Shown in Table 1 and 2 are the overall analysis results.

Table 1: SWOT Analysis for Taoyuan City Resource Recycling Industry

Strength (S)	Weakness (W)
1. Stringent resource recycling management system. 2. Well-based resource recycling industrial chain. 3. The capability in recovery and treatment technology and experience in management. 4. Full-fledged electronic information industrial chain. 5. Positive promotion of legislation for approving the "Resource Recycling and Reutilization Act". 6. People's well-educated environmental concept. Higher recovery execution efficiency. 7. Well-based market mechanism in the resource recycling industry. 8. Accessible production process of the recycling industry and stabilized market development. 9. Conventional resource recycling industry. Powerful competitiveness. 10. Development of Industry 4.0.	1. Diversified central government acts. Lack of a unifying and integration (cooperation) mechanism. 2. Lack of technological process research, and the conventional resource recycling industry is prevented from further development. 3. The industry is vulnerable to the forming of the Tart Effect, resulting in a poorer response ability. 4. The resource recycling is usually affected by market price and can lead to unstable quality. 5. Diversified quality of resource recycling products and uncontrolled flow, leading to illegal use normally. 6. The recycling industry usually puts its emphasis on solid substances, the emission of gas/waste heat, discharge of waste water plus the lack and development of market size, which has led to an excessive burden for the eco-system. 7. Smaller market scale of resource recycling products. 8. Insufficient source of waste resource materials. 9. The resource recycling is run mostly by medium and smaller sized vendors. 10. Less research efforts are invested. Slower alleviation of technical level. 11. The vendor lacks the ability to plan operational strategies.

Opportunity (O)	Threat (T)
1. Government's active guidance of industrial innovation and investment in research and development. 2. Introduction of technical research. Implementation of cloud technology to reduce the consumption of electrical energy, water resources and fuel. 3. Promotion and invigoration of used-product market economy. 4. Industrial structure adjustment and integration. Creating a win-win benefit for the economy, vendor and civilians. 5. Fallow and invigorating heavy-metal contaminated farmland. 6. Invigorating low-value recycling industry. Improving its competitiveness. 7. Encouraging and subsidizing people and industry in using recycled products. 8. Setting up the quality of recycled products. Eliminating the use of products leading to excessive energy use, low quality and waste. 9. Integrating upstream, middle stream and downstream companies for the electronic information industry. 10. Rapid development of resource recycling market in China. 11. Active promotion of city-based mining sites and demonstration of site construction in China. 12. Active development of resource recycling technologies in China.	1. Massive construction of imported recycling resources processing zone along the coastal areas in China. 2. Active deployment of China and SE Asian market by European countries, America and Japan. 3. The Asia-Pacific Area is occupied by developing countries. Lower cost industries would spur higher competition for export trading. 4. Rare metal resource strategic control agreement is signed between Japan and China. On the other hand , it has not been signed in local markets as to cause resource waste, loss and exporting. 5. Local market is lacking in specific resource recycling technology that they should be transported to other countries for further treatment as to cause a monopolized market. 6. Local market is suffering from less labor resource, lower basic wage, higher working hours; thus, leading to a shortage of labor and not easy for promotion.

Table 2: SWOT Matrix for Taoyuan City Resource Recycling Industry

SWOT	**Strength (S)**	**Weakness (W)**
Opportunity (O)	(S)+ (O) Strategy – Demonstrate strength to seize opportunities.	(W)+(O) Strategy-Overturn the weakness by utilizing opportunities.
	1. Ensure the supply chain safety for the resource recycling industry. 2. Plot the strategic deployment for resource recycling. 3. Establish the logistics management information platform to achieve efficient resource integration. 4. Expand the scale of resource recycling market and appropriately liberate the importation of resource materials.	1. Strengthen the cooperation between industry and academic sectors to enrich the recycling treatment skills for the industry. 2. Establish diversified resource recycling channels to remove massive waste of resources. 3. Execute separated management for waste and waste resources to improve the resource utilization for the resource recycling industry.
Threat (T)	(S)+ (T) Strategy- Using strength to minimize the threat.	(W)+ (T) Strategy-Minimize the weakness to evade the threat.
	1. Promoting the strategic alliance for the recycling industry to aggressively expand the overseas markets. 2. Expand the international cooperation for the resource recycling to seize the overseas investment opportunities for the industry.	1. Strengthen the technical exchange cooperation program between international industry and the academic sector for the recycling industry. 2. Introduce foreign experience and recycling treatment technology. 3. Guiding and assisting the industry to achieve continuous technical upgrading.

4. Study of the Taoyuan City Resource Recycling and Reutilization Program

The Taoyuan City Resource Recycling and Reutilization Proposal is compiled according to the central government laws and the resource recovery and reutilization management system currently practiced in Taiwan as well as the existing industrial resource statistical analysis information for Taoyuan City and the resource recycling industry SWOT and competitiveness analysis results. The industrial resource recycling is a transitional process where the planned objectives of each stage will be achieved orderly and progressively. By taking "zero waste" as the ultimate principle, the Plan puts "reutilization" as the implementation purpose and "recycling" as the final target. Using "microorganism" as the operating basis and "high efficiency" as the operating method, the short-term, middle-term and long-term promotion activities are established for the resource recycling economy for Taoyuan city. As such, it is expected that each implementation objective could be achieved gradually by 2050.

4.1 Short-Term Objectives

A. Realize fundamental 3R Management in promoting the Multi-RE Policy

To realize the 3R Policy (Reduce, Reuse, and Recycle) is the fundamental task in resource recycling at the current stage. Pursuant to the regulations of the Resource Recovery & Reuse Act, approaches must be developed for "reusing" the waste resources in the first place, those that are not easily reused will be "recycled" and those that can be recycled for use as "recyclable" items. To develop the Multi-RE Policy step by step, the industries in Taoyuan City must execute the 3R basic policy in an exact way while ensuring the safety of firms in developing the resource recycling supply chain in order to achieve the cost-efficient goal.

B. Promote "City Mining" and increase the utilization of idle lands

The statistical data indicates that by the end of 2014, the size of fallow land in the jurisdiction of Taoyuan City was 10.146 hectares and that of the polluted land 218.76 hectares. By the end of 2015, the size of fallow land was 9,973 hectares and that of the polluted land was 162.56 hectares, which will be suitable for growing the biofuel crops. In a broad sense, the biofuel refers to the solid, liquid or gas composed by or extracted from biomass. As the bio-energy material is featured on safe properties and stabilized resources, it can be used to reduce the demand of Taoyuan City for imported energy.

C. Study and introduce resource recycling treatment technology

In accordance with the regulations set out in Clause 2 under Item 2 contained in Article 11 of the "Planning Promotion and Management Guidelines for an Environmental Technology Park" promulgated by the Environmental Protection Administration, Executive Yuan in Taiwan, the research and development technology shall include the following six major items, namely Research on the Environment and Clean Production Technology (Green Design), Research on Resource-based Technology and Product, Research of Pollution Prevention and Recycling/Reuse Technology, Research of Clean and Recyclable Energy, Research on Green Consuming and Statutory Codes, and Research on Database Setup. Within short-term objectives, it is required to complete the quantitative assessment of each item for use as the execution performance evaluation basis. In this way, we can check the waste resource stock database and relevant statistical data for Taoyuan City while setting up a supply chain management and matchmaking platform.

D. Studying and plotting Recyclable Energy Industry Development Plan

On September 25, 2015, an article named "Sweden to Become One of the World's First Fossil Fuel-Free Nations" was published in Sweden indicating that two-thirds of the electrical power in Sweden is from the green energy and low-carbon energy. In this respect, Sweden expects to complete its large-scale objective by reducing the emission of carbon gas by 40% as of 2020 and then realize the zero petro-chemical energy by 2050, if possible. By then, it would be a milestone accomplishment in the environmental history of mankind; and Sweden will become the first zero petro-chemical energy nation in the world. When the EU is falling far behind the realistic environment in its petro-chemical energy regulations, Sweden will play a leading role (Hu, 2015). According to the IEA 2014 Report, it indicated that nearly half of the new global power supply will come from recycled energy by 2040 where wind power will take 34%, followed by 30% from hydrological power and 18% of solar power (Cao and Zhou, 2015). From the viewpoint of resource (energy) sustainable recycling and energy conservation/carbon reduction, the biofuels can reduce the emission of CO2 and help mitigate the global warming trend in addition to the advantage of supplying other types of energy, reducing the demand for petro-chemical fuels, helping the transfer usage for the wasted farmlands, increase land utilization value, replace the fuel and elevate the safe storage of national energy. Nowadays, the development of biofuels to replace the petro-chemical fuels has become an inevitable trend all over the world and active moves should be taken by Taoyuan City for developing these biofuels.

E. Invigorate the used-product market and improve the quality of reusable products

On September 20, 2015, Taoyuan City Mayor Cheng, Wen-Tsan inaugurated the "2015 Tao-Yuan Used Furniture Auction" sponsored by the Environmental Protection Department. During the event, he pointed out approaches that will be developed for recycling used furniture, recycling the waste boards into small stool benches and reusing the wooden

products to be affordable and environmental. Through the guidance and integration of the city government, Taoyuan City is planning to extend the used product market to other industrial sectors in providing diversified options for fellow citizens in making solid contributions to the development of a Circular Economy for resources.

F. Elevate the execution efficiency of energy conservation and recyclable energy measures

Under the cooperation of the Economic Development Department and Environmental Protection Department of Taoyuan City with the Ministry of Economic Affairs, the Energy Conservation & Power Saving Plan and Energy Service Company (ESCO) was launched from 2015. The said Plan started with public units like government agencies and schools for expanding to the industries and Minsheng Community step by step. Based on the diagnosis of energy conservation, the plan was submitted to the Clients for working out the fund raising program required for energy conservation, designing the approaches for improving the Client's energy system, and executing the work improvement and engineering management in the hope of guaranteeing the energy conservation effect and verifying the energy saving effect for the respective energy equipment and equipment operations. To achieve this, Taoyuan City should expand the matchmaking service scope in order to elevate the energy conservation effect continuously by setting at 2% of the total power saved per year as the target.

G. Study of household, industrial sludge and waste water recovery and reuse program

Normally, the reuse of sludge shall include the following three directions, namely fertilizer-based, fuel-based and materials-based sludge. In this regard, an active plan should be developed by Taoyuan City to reuse the organic sludge produced by the existing sewage treatment plants in order to reduce the incineration and landfill costs.

During the draught season in previous years, usually the agriculture sector was forced to cease the crop plantings and yield the priority in water usage to industrial businesses. With the recycled water, more room will be provided for the water required by households and agriculture (Du, 2015). Currently, there are 46 sewage treatment plants in Taiwan, yielding 2.85 million tons of water treated per day. Based on 70% of the recovery rate from household sewage, with the recycling water plant fully constructed, it can provide nearly 2 million tons of additional recycled water and it can effectively fill up the water consumption gap. Therefore, Taoyuan City should work with the central government to promote the Taoyuan City Recycled Water Plant Construction Plan in order to solve the water shortage issue in Taoyuan City due to climate change and to endure a safe storage capacity for industrial water.

4.2 Middle-Term Objectives

A. Promoting the energy resource integration for the industrial parks under the jurisdiction of Taoyuan City

Most of the manufacturers in the Taoyuan City Industrial Park are using coal and heavy oil as boiler fuel and it is easy to cause poorer air quality in that area. Therefore, an effective plan should be developed to elevate the environmental quality of the industrial park and achieve the recycled sustainable utilization of the remaining energy. In this way, we may reduce the use of petrochemical fuels, reduce the emission of CO2, and minimize the pollution discharged and the environmental burden and move toward the "zero waste" goal. It is also required to continuously promote the integration linkage of energy resources in the industrial park, plot the energy resource linkage item step by step, elevate the yearly potential of recycling use and reduce the emission of greenhouse gases year by year. In addition, we also suggest that the waste reuse percentage and energy (steam) linkage should be elevated for the key promotion area in order to realize the promotion of circular-type industry and a low-carbon chemical industrial zone.

B. Accelerate the household sewage piping rate for Taoyuan City

Taoyuan City comprises 13 administrative districts, except for the Fuxin District, the other 12 districts are planned to use a household sewage treatment plant. Till the end of 2015, some 49,595 households will be completed in achieving 19.7% of the piping rate. It is planned to complete 251,447 households gradually by the end of 2028 in achieving a 100% piping rate. In total, the planned occupancy will cover some 7,610 hectares of sewage systems in the planning, design and construction of the main pipeline, secondary main pipeline, branch pipeline, household piping and associated facilities. However, the proposed program will not include the remote areas or the areas where the cost of piping rate does not meet the public service and rationale requirements.

C. Develop biomass energy

The options for developing the bio-based energy is not only limited to bio-diesel or bio-alcohol. When considering the technical threshold, the market scale and the completeness of upstream and downstream supply chain, the Densified Refuse Derived Fuel (RDF) is provided with lots of advantages and it is suggested that Taoyuan City develop the bio-based energy program during the Middle-term Stage.

D. Promote the Shimen Reservoir Mud Reuse Plan:

According to the information issued by the Northern Region Water Resources Office under the Ministry of Economic Affairs, the total mud sedimentation of Shimen Reservoir is 94,976,000m^3 as of February 2014, taking 30.72% of the 309,000,000m^3 of storage capacity designed for the dam. By excluding a million cubic meters of mud sedimentation that will be increased each year, it would at least take some 188 years to completely clean up the mud at a rate of 500,000m^3 per year. To sinter the mud of Shimen Reservoir into a light-

mass aggregate, it requires 1,1000C of high temperature because shale is required when sintering light-mass aggregate and shale is also the man component of the mud. The light-mass aggregate (light stone) features a strong hardness, light in weight that it can reduce the weight of the structural body at about 20%. Each year, Taiwan needs to import some 100,000m^3 of light-mass aggregate and the demands of the construction market are estimated at 2,000,000m^3 per year. When calculated at NTD4,000,000 per cubic meter, there should be NTD80 billions value for the Taiwan market per year. With 500,000 m^3 removed per year from Shimen Reservoir, some 600,000 m^3 of light stone can be sintered and it will be equal to NTD2.4 billion at market value. By taking account of the multi-aspect benefits, Taoyuan City should appropriately promote the mud reutilization plan. Based on the reutilization concept, the mud of Shimen Reservoir is an ideal green construction material and a natural resource for producing fertilizer. As such, much better effects could be achieved through appropriate implementation,

4.3 Long-term Objectives

The so-called "organic waste" refers to the "organics" in the chemical realm that cover the substances containing carbon, hydrogen and oxygen; whereas, the "organics' in the biological and environmental protection aspect refers to the substance "that had been in existence". In its long-term objective program, Taoyuan City should promote full-scale resource recycling and reutilization of the "waste resources produced during natural activities".

Facing the revolutionary trend of "Internet of Things" (IOT), other types of thinking mode is being developed for the "Circular Economy"; that is, the vendors will no longer sell the "product" and the consumers will no longer do the "consuming". For this reason, the true core should comprise the 4 key elements to realize the vision of a Circular Economy, extend the product's staying time in the supply chain system, and maximize the recycling percentage and frequency. To this extent, the businesses will be able to elevate their profit and consider the service solutions that they really need. In the meantime, the users may not require the "consuming behavior" but the "use" only (Gao, 2013). Under the commercial mode of the Circular Economy, apart from the self-support by the business firm, the government also needs to guide and help the businesses to execute the upstream and downstream integration and cooperation for the supply chain as well as initiate the coordination of regulatory rules and policies enforced by the central government agencies. The purpose is to change the consumer's concept and habit to promote the Circular Economy successfully.

5. Conclusions

During the industrial development over the past years, T aiwan has introduced the Circular Economy related method, t echnologies, systems, international standards and managemen t systems. Despite the fact that some items have become inter national benchmarks, lots of other items still need to be prom oted. Provided below are the main conclusions of this research:

A. The Circular Economy should be comprehensively considered through relevant aspects under the country's sustainable development strategic level structure.

B. Stimulate the overall industrial transformation through the respective industrial resource recycling and cooperate with all upstream and downstream partners in the supply chain. Then spur the development of a Regional Circular Economy through an overall industrial development.

C. In view of the diversified and intricate industrial structure in Taoyuan City, closely connected coordination ties should be established between the competent central government agencies and Taoyuan City Government to set up the scale and scope required for resource recycling and reutilization for an orderly and effective implementation from the Small Circular Economy, Medium Circular Economy and Large Circular Economy.

The "Circular Economy" is one of the economic indicators under the sustainable development framework. In nature, it is correlated with the basic principles in the eco-system, environmental protection, reduction of resource mining and recycling/reutilization and it will be evolved in an orderly and progressive manner. As Taiwan is a free competition market nowadays, a substantial commercial behavior mode will emerge naturally with a sound basic industrial resource recycling supply chain; in the meantime, consumers may present a certain extent of change in their consuming behavior.

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