POST EVENT REPORT

7 JULY 2018 | GUIYANG, CHINA
ECO FORUM GLOBAL ANNUAL CONFERENCE GUIYANG 2018 • SUB–FORUM
BUILDING GREEN CIRCULAR CITIES

HOSTS | ICLEI—Local Governments for Sustainability East Asia Secretariat
Eco-Forum Global

CO-ORGANIZER | Guiyang Municipal People's Government
Globally, over 54% of the population lives in cities, consuming 75% of the natural resources and generating more than 70% of greenhouse gases (GHG) and waste. It is estimated that by 2050, the number of population living in urban areas will reach 6.5 billion. The actions and development models of cities affect to a large extent the future of mankind and exert a decisive impact on the achievement of the United Nations Sustainable Development Goals and the Paris Agreement.

Sustainability has been considered an important indicator of urban transformation and development in many countries, and resource efficiency improvement recognized as one of the features of sustainable cities. In the process of high-speed urbanization in East Asian cities, the traditional model of “acquisition-use-discard” linear development has led to negative effects on the environment and the life of residents, including mounted waste, insufficient landfill space and increased waste disposal cost. Urban economic development is subject to volatility of initial resource prices, which not only hinders the future development of cities, but also undermines the quality of life of residents. By practicing the principle of circular economy that retains the value of resources in cities based on minimizing unnecessary waste and maximizing resources efficiency, cities can pioneer sustainable development and lead the national and even global transition towards a circular economy.

On July 7, 2018, the Session on Building Green Circular Cities was co-hosted by the East Asia Secretariat of ICLEI—Local Governments for Sustainability (ICLEI) and the Secretariat of Eco Forum Global (EFG) under the framework of the EFG Annual Conference Guiyang 2018. Local governments, research institutions and business representatives from Finland, the Netherlands, Norway, Japan and China shared upon invitation the policies and strategies of actions for transition towards green circular cities. While the Session presented the policies and stories and discussed the challenges facing East Asian and European cities, ICLEI East Asia introduced the concept and plan to launch the Green Circular Cities Coalition.
AGENDA

14.30-14.45  OPENING
Moderator | Shu ZHU Director, ICLEI East Asia

Yan CHEN  Mayor, City of Guiyang, China
Monika ZIMMERMANN  Deputy Secretary General, ICLEI—Local Governments for Sustainability
Alex ZHANG  Director, Eco-forum Global

14.45-15.55  GOOD PRACTICES & STRATEGIES ON CIRCULAR CITIES
Moderator | Merlin LAO Program Manager, ICLEI East Asia

Gang LI  Mayor Liupanshui, China
Minna ARVE  Mayor, Turku, Finland
Hui LUO  Deputy Mayor, Suining, China
Hiroshi YAKUWA  Director, Waste Disposal Facilities Division, Proper Disposal Planning Department, Resources and Waste Recycling Bureau, Yokohama, Japan
Qiang ZHOU  Deputy Director, Development and Reform Commission, Shanghai, China
Hisao NAKAMURA  Director, Environmental Industry Promotion Division, Environment Bureau, Kitakyushu, Japan
Jing YU  Deputy Director, Development and Reform Commission, Shenzhen, China

15.55-16.00  SIGNING CEREMONY

16.00-16.10  COFFEE BREAK & NETWORKING

16.10-16.25  INTRODUCTION OF THE INITIATIVE OF GREEN CIRCULAR CITIES COALITION
Moderator | Merlin LAO Program Manager, ICLEI East Asia

Shu ZHU  Director, ICLEI East Asia

16.25-17.00  INTRODUCTION OF THE INITIATIVE OF GREEN CIRCULAR CITIES COALITION
Moderator | Konrad OTTO-ZIMMERMANN Senior Advisor, ICLEI East Asia

Harald FRIEDL  CEO, Circle Economy, the Netherlands
Huanzheng DU  Professor, Tongji University, China
Jet CHANG  Vice President, Circular Economy, TOMRA Group, Norway

17.00-17.30  PANEL DISCUSSION
Moderator | Merlin LAO Program Manager, ICLEI East Asia

Hiroshi YAKUWA  Director, Waste Disposal Facilities Division, Proper Disposal Planning Department, Resources and Waste Recycling Bureau, Yokohama, Japan
Hisao NAKAMURA  Director, Environmental Industry Promotion Division, Environment Bureau, Kitakyushu, Japan
Yi Yang LIU  Head of Department of Development and Strategies, Trinabess
Ya Jie SONG  Global Institute of Environment for Sustainable Development (GIESD at Yale University)
Yue XIAN  Founder and Chief Executive Officer, Sitech

17.30-17.35  CLOSING
Shu ZHU  Director, ICLEI East Asia
OPENING

The production activities of humans are accompanied by high-speed consumption of the Earth’s limited resources. As industrialization and urbanization speeds up, problems such as energy resource consumption, GHG emissions and environmental destruction will become increasingly prominent. The improvement of resource use efficiency has risen to a global issue of concern, and the huge amount of waste generated in energy consumption and the massive disposal cost has posed a major challenge to cities around the world.

“It has always been customary to think about economic development and production in a one-way mode. However, the one-way, consumption-based development mode is by no means sustainable,” said Monika Zimmermann, Deputy Secretary General of the ICLEI Worldwide Secretariat, “urban development should not base on pure consumption of resources, we need to think about how our production could be redesigned and reorganized in an effective and circular way, to avoid waste and increase sustainability.”

Alex Zhang, Director of the Eco Forum Global Secretariat, added that “the past take-use-discard model of development, though yielded significant results, has brought a lot of serious consequences on the living environment. In the pursuit of sustainable development goals, the redesign–reuse–repair–remanufacture–recycle–recover approach will catalyze the transition of cities towards a low-carbon and resource-efficient society.”

In the post-Paris Agreement era, cities around the world are actively exploring low-carbon, eco-friendly green development models in pursuit of sustainable development. The Chinese city of Guiyang has been fully committed to green development over the years. It has adopted a multi-pronged approach to low-carbon, circular and green development in the industrial, construction, transportation sectors. Through industrial restructuring and afforestation that takes into account biodiversity, Guiyang reconsidered the relationship between human activities and the environment and restored the value of natural resources. Guiyang City Mayor Yan Chen shared the city’s practices in improving the systems for green development. The city has introduced the first local regulations on constructing circular economy in China—the Regulations on Building Guiyang into a Circular Eco-City, and have implemented statistical indicator and evaluation systems which are expected to spur Guiyang's transition towards a green circular city.

Shu Zhu, Director and China Representative of ICLEI East Asia introduced the Green Circular Cities Coalition the Network is planning to initiate, presenting an opportunity for cities across the world to become global leaders in urban circular transition. The Coalition provides a platform to connect cities, experts, businesses, and other relevant stakeholders to foster urban development transition through knowledge and experience exchange, mutual learning and technical support.
GOOD PRACTICES AND STRATEGIES

The densely populated urban areas breed an endless potential for innovation and provide the main force driving the global transition towards the circular economy. Cities that accommodate a variety of industries and economic activities can serve as the best field for experimenting and implementing circular economy programs.

Representatives of seven cities in China, Finland and Japan were invited to share their practices of promoting the transformation towards the circular economy at the local level.

CHINA

LIUPANSHUI

Gang Li  | Mayor, Liupanshui

Circular Development Measurements: reusing coal washing water in a closed loop; re-making gangue sintered bricks out of waste coal; re-designing land use forms

Located in western Guizhou Province of China, Liupanshui City is the largest coal base and major coking coal base in regions south of the Yangtze River. It has been identified as a growing resource-based city in the national layout and since the 1960s, built into an industrial city based on coal industry. The four pillar industries include coal, steel, electric power and building materials, account for 31.2% of the city’s total economic output.

Nevertheless, Liupanshui experienced an ecological crisis resulted from extensive development and environmental damage in the process of rapid industrialization. During the worst days, the forest coverage rate registered only 7.55%; the total suspended solids in the air reached 4.4 times the national standard; and the water quality attainment rate of rivers fell below 30% due to serious pollution from mining water, coal washing water and domestic wastewater.

In recent years, in accordance with the requirements of the Central Government, Liupanshui City has made active efforts to tackle environmental pollution and ecological deterioration in the endeavor to build an ecological civilization that features harmony between human beings and nature. The major measures taken to promote green circular cities include practicing pollutant emission standards, promoting waste reuse, restoring the ecological environment and constructing an eco-economic system.

Liupanshui has pooled funds to build facilities for desulfurization and dust removal to reduce the emissions of sulfur dioxide and soot, and has shut
down enterprises that fail to meet the emission standards. By the end of 2017, all 58 coal washeries within the city have realized the closed-loop utilization of coal washing water, greatly reducing the annual amount of silt coal discharged into rivers. Mines have been equipped with sewage treatment facilities to ensure all mining water has been treated before discharged. Polluted rivers have been restored to cleanness. The rate of good urban ambient air quality climbed up to 94% and the rate of compliance with surface water quality standards reached 100%.

In terms of solid waste reuse, Liupanshui has developed skills to produce new building materials such as gangue sintered bricks, hollow blocks, aerated concrete blocks and thermal-insulating blocks, which improves the economic return while mitigating the damage of waste to the environment. Technological innovation has also been applied to minimize the waste of resources by converting 95% coal content of silt coal into clean coal.

Due to steep mountains and barren soils, planting corn on sloping fields has caused serious soil erosion and rocky desertification in Liupanshui. In the worst case, the area subject to rocky desertification in the city was as high as 6,628 square kilometers, accounting for 66% of the national land area. Since 2000, Liupanshui has vigorously converted farmland to forests and largely reduced corn planting. By the end of 2017, the forest coverage rate in the city increased to 56.94%. Biodiversity also gradually recovered following the expansion of forest area. At present, there are over 2,000 species of plants and nearly 200 species of wild birds in Liupanshui, up from around 60 species back in the 1980s.

In order to construct an eco-economic system that could make the industrial sector environmental-friendly, Liupanshui promotes the development of emerging industries such as new energy and new materials and integrating traditional heavy industries into green circular development through reduction, reuse and intelligent transformation based on technological advancement.

**SUINING**

Hui Luo | Deputy Mayor, Suining

Suining City, Sichuan Province is a state-recognized ecological shield situated in the upper reaches of the Yangtze River. Suining has been mainly engaged in agriculture and animal husbandry, and adopted the philosophy of green development in 2007 to improve the quality of agricultural and livestock production by integrating emerging technologies.

Suining puts an end to pollution-intensive heavy chemical projects and places focus on high-tech industries. Seizing the development opportunities brought by the Belt and Road Initiative for Sichuan Province, Suining will create a modern logistics port based on its natural geographic advantage, and boost cultural tourism by virtue of the Guanyin culture developed by integrating the natural endowments, historical traditions and humanistic features.

As a central and western city short of science and technology resources, Suining has signed cooperation agreements with Chinese universities to establish an offshore entrepreneurship base for overseas talents, in a bid to transform into an economically competitive emerging city in the process of ecological civilization construction in China, reform and opening up in Sichuan.
Shanghai is one of the international financial, trade and shipping centers and the most developed city in China. Situated in the easternmost part of the Yangtze River Delta, Shanghai has grown rapidly into China's largest port since its opening in 1843, and became the world's busiest container port in 2010. Given a total residing population of 24 million and a gross domestic product of 3 trillion yuan in 2017, the city produces as much as 90 million tons of municipal solid waste annually.

Waste to energy is crucial to the sustainable development of cities. In order to achieve the circular economy and comprehensive resource utilization, Shanghai has implemented waste-to-energy programs for municipal solid waste in different sectors, focusing on source reduction, comprehensive and deep utilization.

In the industrial sector, about 500 companies practice cleaner production every year to limit the annual production of industrial solid waste in the city to about 15 million tons. At the same time, the transformation of industrial parks for circular development continues at deeper levels, including the comprehensive utilization of metallurgical slag and the efficient use of solid waste from coal-fired power plants, in maintaining the comprehensive utilization rate of industrial solid waste at 97%.

Agriculture with a large economic scale generates 1.4 million tons of straw annually, although it accounts for less than 1% in the municipal industrial structure. Shanghai has essentially placed a comprehensive ban on straw burning and raised the comprehensive utilization rate of straw to 94%. About 100,000 tons of straw is used annually for mechanized returning, organic fertilizer, feed, edible fungi and biomass power. Shanghai has also carried out abatement-oriented transformation in livestock and poultry production, including biogas utilization and ecological return in large farms and closure of small and medium-sized farms.

In order to reduce construction waste from the source, Shanghai actively improves the classification and collection system, and through the terms of land transfer contract, forcibly promotes prefabricated buildings, as well as fully furnished houses and green buildings. Released in 2017, the Regulations on Administration of Construction Waste Disposal in Shanghai further clarified the scope, proportion and quality requirements for mandatory use of construction waste-to-energy products.

Shanghai implements process-wide classified transportation of municipal solid waste which is divided into four categories: dry waste, wet waste, recyclable waste and hazardous waste. The dry waste is burnt in the ten incineration plants located citywide, and the wet waste can be reused after treatment in the upcoming large-scale and sporadic waste-to-energy facilities with a waste processing capacity of 70 million tons. In addition, Shanghai has recently launched a plan to establish an integrated network for recycling of renewable resources and classified collection, and transportation of solid waste at the community/street level, so as to improve the coordination of collection centers, transfer stations and distribution plants.

The green circular development of cities denotes the development of quasi-market economy and moreover quasi-public welfare. It needs a certain degree of government support, in addition to the operation in a business model of enterprises. By replacing incentives with subsidies, Shanghai has arranged 230 million yuan of subsidies to support 79 projects in recent years, and organized the comprehensive departments and industrial authorities to implement environment-friendly waste reduction programs for different industries.
SHENZHEN

Jing Yu | Deputy Director, Shenzhen Development and Reform Commission

Circular Development Measurements: reusing incinerator bottom slag; re-designing electric bus system

Shenzhen, Guangdong Province links Hong Kong in the south and neighbors Dongguan in the north. It is an important center of securities and capital markets in China and an international economic center. In 2017, the municipal gross domestic product attained 2.24 trillion yuan.

Since 2012, the proportion of natural gas and electric power used in Shenzhen has been on the rise while the proportion of coal and oil has gradually declined. As of 2017, the proportion of clean energy in energy consumption has increased by 10.3%. At present, clean energy accounts for over 85% of energy supply for power generation. In terms of waste disposal, Shenzhen began waste incineration in 1999 and is currently capable of disposing 20,000 tons of waste daily and turning ash into resources to meet the basic needs of the city.

Shenzhen regards green development as an important productivity and core competitiveness of the city. The municipal objectives of circular economic development and safeguard set in the 13th Five-Year Plan for Development of Strategic Emerging Industries in Shenzhen include supporting industries to initiate a new round of strategic layout, deepening the reform of ecological resources and water prices, improving the charging policy for medical waste disposal, advancing the transformation of national parks towards the circular economy, and accelerating the implementation of programs for ecological civilization demonstration zones in the eastern Yantian District and Dapeng New District.

The Shenzhen Municipal Government has made active efforts to conserve energy and reduce emissions, including targeted annual assessments of municipal and district governments, and energy conservation and consumption reduction in the construction, transportation and industrial sectors. By the end of 2017, more than 120,000 new energy vehicles were introduced to achieve pure electrification of buses, and it is expected that in 2018, all taxis will be electrified and 30,000 electric logistics vehicles will be put in place. In 2017, more than 300 companies in the city completed cleaner production audit on a voluntarily or compulsorily basis.

In promoting green circular development, the Shenzhen Municipal Government has scaled up financial support for 64 projects in the fields of new energy, energy conservation and environmental protection, and provided special funds in installments for strengthening environmental governance, improving water quality at the river basin level, upgrading waste disposal facilitates, implementing ecosystem protection and restoration programs, and enhancing comprehensive utilization of resources.
Turku is the oldest city with a wealth of scientific and cultural assets in Finland, it identifies sustainable development as a key urban development agenda and considers circular economy a critical path towards sustainable development. Since 2015, Turku has launched a raft of circular economy projects and activities at the municipal level to work together with partners, stakeholders, universities and citizens to create a sustainable future for the ancient city. In 2016, the city further introduced a regional road map on circular economy.

Turku has already kicked off works on circular economy. According to Risto Veivo, the Development Manager of Turku, the municipal services and activities on climate, environment, energy, resource utilization and circular economy taken by Turku aim at building a climate-positive city that produces no waste and manages its consumption of natural resources on a sustainable level.

Turku City Government provides solutions to fully integrate waste classification and recycling into the daily life of citizens. Wastewater treatment and reuse has been practiced with residual sludge converted into biofuels and fertilizers, and the waste heat generated in the wastewater treatment process is used in central heating/cooling systems. Soil materials and industrial by-products could be reused through physical and virtual platforms. The concept of sharing economy has been integrated into citizens' daily life. Besides public spaces such as municipal libraries that all citizens have access to, a number of equipments have also been made available through rental services. In addition, citizens and students also carry out new practices on sharing economy from time to time. Turku University has recently launched a new pilot project on the chain of food production, distribution and consumption. To make possible sustainable energy systems, solutions that retain and store more energy in the city for recycling and reuse are required, so as to minimize energy demand of primary production.

While local governments play an important role in the process of building green circular cities, multi-shareholder cross-sector cooperation is initially the key to success. Local universities in Turku have nurtured quality institutions and talents in natural science and chemistry to undertake challenging projects. The Smart Chemistry Park gathers emerging small and medium-sized enterprises that explore high-tech, circular bio-economy. Many entrepreneurs in the Park have a background in chemistry and chemical industry and could work closely with universities and institutions. The infrastructure and development opportunities provided by the Park enable entrepreneurs to fully combine chemistry and materials science with business.

Turku believes that inter-city cooperation and experience exchange are beneficial and necessary to building green circular cities. Practical activities designed by ICLEI, such as the Green Circular Cities Coalition initiative, will provide an inspiring platform for cities so that appropriate programs can be adopted, and support cities in identifying key issues and best stories through work in focus areas.
Yokohama, Kanagawa Prefecture has developed vigorously into the second largest city in Japan since its port was opened in 1859. Yokohama was one of the 20 city designated by government ordinance, and was further selected as one of the “FutureCity Initiative” cities by the Government of Japan in 2011.

From the 1960s to the 1990s, the municipal population swelled 2.5 times and the municipal waste surged 16 times in Yokohama along with the fast growth of the Japanese economy. In particular, from 1960 to 1970, the waste volume of the city increased rapidly by six times, which was far beyond the capacity of municipal landfill. Five waste incineration plants were built by the municipal government between 1973 and 1984 to fully incinerate waste and decompose organic matter, which reduced the volume of waste by third-fourths and prevented waste-related pests and diseases. In 1990, another two waste incineration plants were established, but waste disposal and management remained a major challenge faced by the municipal government.

Circular Development Measurements: reusing waste heat to generate electricity; recycling down quilts and furniture; remanufacturing metals extracted from mobile phones

In dealing with the situation, the City Government launched the Yokohama G30 Plan, designated to improve the incineration and landfill efficiency by recycling waste separated into 10 categories and 15 items. The responsibility for waste disposal was divided to manufacturers and users in stages. In the case of containers, manufacturers are responsible for re-commercialization and reuse of waste; consumers are obliged to properly sort the containers post-purchasing and usage; and the Municipal Government

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KITAKYUSHU, JAPAN

Hisao Nakamura | Director, Environmental Industry Promotion Division, Environment Bureau, Kitakyushu

In 1901, the Kitakyushu Area of Fukuoka Prefecture was identified as a major industrial development town for the following 100 years and was recognized as one of the most important heavy industrial cities in Japan. From the Meiji period to World War II, industry developed rapidly and population surged in the Area.

In 1963, the City of Kitakyushu was founded through the amalgamation of five cities in the Area, and became one of the designated cities of the Japanese Government, attracting massive investment and construction. However, the high degree of industrial development has led to serious environmental pollution and ecological catastrophe in the city. Located in the Northwest of the city, the 10-kilometers long Dokai Bay was severely polluted by factories along the coast, and became known as the “Sea of Death”.

In the 70s, in response to citizen groups’ request that “children would like to see clear water and blue sky”, the Municipal Government decided to work closely with businesses and citizens to overcome pollution. Through various basic research, municipal promotion, and industrialization policy support, Kitakyushu renewed itself as a manufacturing city with a rich ecological environment. The City has not only been selected as a Japanese environmental-friendly “FutureCity” in 2011, but has only been identified the first model city for urban green growth in Asia by the Organization for Economic Cooperation and Development (OECD).

Launched in 2001, the Kitakyushu Eco–Town Project is the first eco–town park project in Japan.

Circular Development Measurements: recycling scrapped cars for remanufacturing and reuse; recycling clothes for remanufacturing and reuse; reusing waste heat from incineration plants for power generation

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It has attracted investment subsidies from the Central Government, and enterprises in the Eco Town received construction subsidies by the Municipal Government.

Kitakyushu Eco–Town is designed and constructed in line with the Kitakyushu Strategy for Environmental Industry Promotion and local policies for environmental conservation and industrial promotion. According to basic research and experiment direction, Kitakyushu Eco–Town comprises of Comprehensive Environmental Industrial Complex and Hibiki Recycling Area for commercialization, Experimental Study Area for technology research and experimental study, and Kitakyushu Science and Research Park for basic research and education.

With businesses, administrative departments and research institutions in the Town working closely together to promote research on waste treatment and recycling technologies and implement environmental protection industrialization projects, and the Eco–Town has evolved into a base of research and development of environmental technology and resource recycling. Currently, enterprises in the Town can recycle a wide range of waste materials, including scrap cars, waste plastics, nylon products, mobile phones, small electric appliances, old and used batteries. A car-to-car closed loop has been formed with an annual capacity of about 8,000 vehicles (recycling of car bodies, external parts, engines, transmissions, and etc.) and a closed loop to “make clothes from clothes” has also been put into practice. The heat generated by incineration is used for power supply to enterprises in the Town. Owning to the successful practices, the Eco–Town annually attracts 100,000 visitors from all over the world.

As of 2018, Kitakyushu Eco–Town has attracted around 77 billion yen of direct investment from the Government and companies, and have created nearly 1,000 employment opportunities. The carbon dioxide emission reductions increased from 304,000 tons/year (14 projects surveyed) in 2005 to 433,000 tons/year (22 projects surveyed) in 2016.

In order to further expand the green market and support sustainable development, the Municipal Government has developed guidelines and provided subsidies for technology development and advancement by levying the Kitakyushu City Environmental Future Tax on industrial waste landfill. The targeted areas at this stage include waste treatment and recycling technologies, environmental conservation technologies, environmental-friendly products, recovery of rare metals and resources, development of new energy, expansion of hydrogen energy and bioenergy use.

In terms of international cooperation and exchanges, the Municipal Government has cooperated with 161 countries/regions on 208 projects since 2004, which involves the training of 8,700 personnel and the dispatch of experts to provide guidance on local environmental protection. In addition, the Municipal Government has carried out 143 sustainability projects in cooperation with 106 Japanese companies scattered in 57 cities.

Kitakyushu continues to improve its waste treatment and resource recycling policies in line with the principle that “locally generated waste is recycled and reused within the range of Kitakyushu.” As there are currently many raw materials and products imported from overseas, the municipal government must consider incorporating these manufacturers and products into the circular chain. Furthermore, since not all waste can be effectively recycled and reused, the Municipal Government also needs to think from the perceptive of manufacturers, users and consumers when designing relevant policies and systems. The development of fair and secured systems has been a critical challenge for the Kitakyushu Government.
STRATEGIES TOWARDS GREEN CIRCULAR CITIES

Science and technology created by humans has brought prosperity to business and convenience to life. In the context of urban economy and structure, however, most cities are still facing the challenges of minimizing resource consumption and properly disposing of waste to ensure the quality of the environment, water and air.

In the aforementioned stories of seven cities we see the motivation and potential of local governments are carrying to take initiatives in building green circular cities; nevertheless, a number of problems appear yet to be addressed. The solutions and innovative strategies developed by companies and research institutions are important pillars supporting local governments to achieve the vision of green circular cities. In this session, business representatives and experts from the Netherlands, China, and Norway were invited to share prevailing practices around the world and to further explore the possibilities of action escalation and experience replication.

ENTERING THE ERA OF CIRCULATION

Human civilization has evolved from primitive civilization and agricultural civilization to industrial civilization that features linear production from mass production, consumption and abandonment, and further to ecological civilization that upholds rational production, moderate consumption, and recycling. Noting this, Professor Huanzheng Du of UNEP-Tongji University Institute of Environment for Sustainable Development, highlighted that the transformation towards green circular cities and the establishment of resource recycling industries require the change of underlying principles and lifestyles.

Harald Friedl, CEO of Circle Economy, quoted the latest report from the Netherlands and pointed out that only 9.1% of the global economy is circular. In other words, more than 90% of the resources are discarded immediately after usage, rather than being recycled through the value chain.

With plastic packaging as an example, Jet Chang, TOMRA Vice President of Circular Economy further explained “the current model of plastic economy is non-sustainable and linear.” Statics suggest that of the 300 million tons of plastic products manufactured every year around the world, 78 million tons are used on packaging. Of these packaging plastics, 32% are discharged to the nature without appropriate disposal; 40% are landfilled; 14% burnt in incineration plants; and only 14% are recycled in a real sense. While more and more people have started to advocate reduction and reuse, Chang believes that a basis of legislation is still needed in achieving a truly circular economy with closed loop recycling.

POLICIES: RULES FOR URBAN OPERATION BALANCING PUBLICNESS AND MARKETABILITY

Despite the public nature of the ecological environment, the value and residual value of resources are determined by the market. Currently, there are sufficient technologies for recycling and reusing resources and waste in many consumer markets, but it is difficult to effectively stimulate the recycling practices of industries due to the lack of economic value. In light of this, Prof. Du emphasized that the key to green circular cities lies in not only waste disposal and resource reuse technologies, but also public policies and regulations that take both the publicness of the environment and the marketability of resources into account. While improving the market value of reused materials, business models that facilitate economical recycling of industrial and social resources should be established. In addition, transparent information flow is also critical in ensuring that the recycling process does not further cause harm to the environment.

In China, the Central Government has been taking the lead in formulating policies for urban waste management concession, space subsidy, waste reduction subsidy, green procurement and extended producer responsibility system, and developed
systematic solutions for urban waste disposal, including top-down assessment indicators. At the city level, local governments have adopted different approaches that are yet to be systematically integrated. In the future, a full-fledged institutional system will be established on the basis of the existing circular economy demonstration cities.

Harald Friedl, CEO of Circle Economy, shared its framework to implement the circular economy in cities. Under this framework, local governments can break away from the narrow and one-way thinking of traditional administration, and through integrated and systematic analysis, find out to what degree substances including metals, organisms, water are recycled at this stage, such as metals, organisms, water and energy. Further, they can integrate resources based on mobility and use comparison, identify actions that increase circularity, and stimulate new cooperative mechanisms to practice circular economy. Harald Friedl suggested seven elements of circular economy to examine the material flows of cities, namely “prioritizing regenerative resources”, “designing for the future”, “integrating digital technology”, “collaborating to create joint value”, “rethinking the business model”, “using waste as a resource”, “preserving and extending what’s already made”. Circle Economy has applied this framework to the Netherlands, the United Kingdom, Belgium in Europe and Laos in Southeast Asia, and through cooperation with governments and businesses, they assisted the local governments in analyzing the material flows of cities and designing the road maps on circular cities, pursuant to which local governments develop action plans and carry out practical projects.

For instance, the Dutch city Amsterdam completed its analysis of material flows and developed circular city strategies and programs four years ago. Since then, pilot projects of circular economy beneficial to commercial development, citizens and humans have been implemented, covering agriculture, construction and engineering (construction companies provide subsidies and cash-backs and recycle reclaimed materials), food production and logistics, and water circle. Through these projects and activities, the city has not only effectively reduced carbon dioxide emissions, but has also created employment opportunities. According to a research report, about 8.1-9% of the total jobs in the Netherlands are sustainable and directly linked to circular economy. This shows that the practice of circular economy is not only beneficial to the environment, but could also be an opportunity for cities to foster new economic and employment models.

BUSINESSES: PRACTITIONER OF INNOVATIVE THINKING

In addition to government support in system, policy and urban spatial planning, the engagement of businesses is a key to building green circular cities. Jet Chang, TOMRA Vice President of Circular Economy, introduced the successful case of the bottle-to-bottle (B2B) closed loop recycling value chain established by a German chain supermarket. The supermarket owns and operates its own PET pre-form/bottle production, beverage filler for white brands, reverse vending machines, and recycler for collected materials. Another example was vehicle recycling. In many countries, enterprises have devoted to vehicle recycling, ranging from dismantling end-of-life vehicles, collecting engines, tires, gearboxes, glass and other parts, to recovering valuable materials such as cables, copper and aluminum for re-selling or remanufacturing. Businesses are not only the practitioners of the circular economy, but also the promoters of innovative solutions. Through a comparison of waste segregation approach in Europe and China, Chang suggested that machinery can accurately segregate waste into wet waste and dry waste, reducing the cost of manual treatment and the error rate, and increasing the opportunity of resource recycling.

Prof. Du shared the outstanding practices that combine recycling technologies and business models in China, such as straw recycling, PE bottle remanufacturing, power battery recycling, waste tire recycling, and aircraft tire remanufacturing. Among them, the garbage collection services introduced through the Ant Forest and Alipay stands as a successful story of integrating environmental protection, public education and the advancement of ICT. Amid public awareness raising of demonstration cases, more companies will follow and adopt the circular economy approach.
The discussions between experts and city delegates revealed that both governments and businesses are indispensable in realizing the vision of green circular cities. Thus, during the panel discussion, delegates were invited to further explore:

How could governments coordinate and cooperate with businesses, so as to magnify the synergy in promoting the transition towards green circular economy in cities?

Hiroshi Yakuwa, Director of the Waste Disposal Facilities Division, Resources & Waste Recycling Bureau, City of Yokohama, shared his years of experiences serving in the municipal government. According to him, businesses will actively study the relevant provision and explore possibilities and effective responses, after government decrees are issued and placed into force. For instance, both the Central Government and local governments in Japan have already enacted regulations on waste sorting and container recycling. Once such policy was introduced, businesses began to experiment with different practices. Approaches deficient in economy would naturally be eliminated during the process. “Japanese businesses tend to conduct prediction, research & development (R&D) on technologies and products that meet the future needs of the society, the state, businesses and consumers,” added Hisao Nakamura, Director of the Environmental Industry Promotion Division, Environment Bureau, City of Kitakyushu. This
includes the R&D and industrialization of recycling waste produced by themselves. As a result, in many cases, businesses turned out ahead of governments in technology and development, whereas governments need to consult and keep pace with businesses in a timely manner.

Yiyang Liu, Head of the Department of Development and Strategies at Trina Solar, stressed that photovoltaic power itself is clean energy. Although the market price remains high, the payback period can be shortened to two years with continuous technological advancement. In addition, the end-of-life photovoltaic panels can be recycled, with the recovered aluminum sheets directly used at road pavements. However, the recycling has low economic efficiency since the raw materials of photovoltaic panels are mainly the commonly seen non-metallic element silicon and low-content silver. To address this, the practice prevailing in Europe is to pre-collect future recycling funds from consumers when selling photovoltaic panels. Liu believes that, if there is more consideration and appropriate policy design for the use of renewable energy at the municipal level, entrepreneurs will naturally find a way to survive in the market.

Yue Xian, co-founder and CEO of SITECH presented another example of businesses out-paced governments with the intelligent electric vehicles-sharing system. Intelligent electric vehicles equipped with a sharing system help cities to achieve sharing transportation and overall GHG emissions reduction. They can be deployed in different tiers of cities according to battery life in the life cycle of electric vehicles. The newly-launched electric vehicles with a longer battery life are placed in cities with large transportation demand. Following the decline of battery life, the electric vehicles will be refurbished and distributed to smaller cities to operate for another three to five years. Thereafter, the batteries will be removed from vehicles and used as energy storage before disassembled for mineral extraction at the end of life. The design not only maximizes the energy efficiency of electric vehicle batteries in the life cycle, but also makes up for the shortfall of urban public grid in charging vehicles as the demand for shared electric vehicles grows.

As noted by Hisao Nakamura and Hiroshi Yakuwa, the coordination and cooperation between local governments and businesses is a process of continuous interaction and repeated exploration. In the process, both sides should exchange ideas and information through dialogue and communication with an open and cooperative attitude to accelerate the development and transition towards circular cities.
According to the above discussions, we find that the transition towards circular cities is not only a continuous and dynamic process but also a disruptive innovation revolution. In the traditional process of urban development, the municipal government leads the formulation of regulations and policies on the basis of a considerable degree of consensus and shared philosophy among different stakeholders. Enterprises and citizens then adjust the business models and consumer behavior accordingly. However, the development of circular cities does not completely follow this linear pattern, but rather involves disruptive innovation. Before the municipal government introduces norms, businesses and citizens already go one step further to challenge the existing systems and regulations. This situation urges the municipal governments to adjust the pace and cooperate with the market in an experimental spirit to explore new urban development models and institution. This particularity will undoubtedly bring more pressure to the governance system—While making timely responses to various developments, local governments must design appropriate policies that fully reflect the society’s overall interests and fairness.

Local governments in China and Japan have formed respective frameworks of urban development and planning related to circular development; however, if taking a close look into these frameworks we will find that most circular cities are still in the beginning phase. Some cities have introduced regulations as the foundation for the circular transition, but such regulations do not dynamically adapt to the market situation and technological innovation. In some cities, while the waste disposal planning and system have been in place, in order to cultivate the market and to regenerate the value of resources, local governments still need to strengthen the connection and communication with businesses during the stage of policy shaping and framing. In this forum, we also notice that business representatives expressed the intention to cooperate with local governments. In this regard, the Green Circular Cities Coalition is initiated in order to effectively connect local governments and relevant stakeholders such as businesses, citizens and researchers. Through direct dialogue with stakeholders, local governments can rapidly grasp the current market situation and technical information, and will strengthen the capacity to accelerate the circular transition.

Developing circular cities is an iterative process of integrating comprehensive scientific analyses and legal system adjustment. A wide range of sectors are involved in the transition and innovation towards circular cities, including building materials (the cases of Liupanshui and Shanghai), manufacturing and textiles (the case of Yokohama, Turku), agricultural and food, furniture, transportation (the case of Kitakyushu), and municipal solid waste (the case of Shenzhen). Each value chain can contribute to enhancing the circularity, and one chain interactively affects the other. Local governments thus need to adopt cross-domain and trans-disciplinary systems thinking to examine the city’s potential of circularity. Local governments also need to take a holistic perspective to analyze the demand and supply of resources in the urban area. Only having identified the material flows in cities can local governments formulate appropriate strategies and road maps that overcomes the silo effect.

From cities’ cases, we notice that many cities have launched initiatives on circular development in different value chains, but cities tend to focus too much on “single sector” when formulating strategies and policies. There has not yet been a holistically circular city plan that takes into account existing industrial potential, transportation corridors, geographical location, spatial planning, and material flows. For example, converting farmland to forests and reducing corn planting may increase urban biodiversity, but the positive and negative impacts on the circularity of agriculture remain unknown and ambiguous. The Green Circular Cities Coalition assists cities in providing a comprehensive diagnostic city scan to better understand the correlation between different sectors and the impacts on urban circularity. Such scan will be the foundation of a circular city action plan which reflects the interaction among different value chains in the urban circular economy.

The transition towards the circular economy enables cities to cope with current environmental challenges such as air pollution and GHG emissions reduction, and meanwhile to prosper the economy (employment and investment) and to enhance social inclusiveness. From Kitakyushu, Yokohama to Amsterdam, we find that circular development has generated significant synergistic effects on the reduction of GHG emissions. In the post-Paris Agreement era, cities play an increasingly important role. The circular practices, including redesigning the development model and reusing and regenerating resources within cities, will curtail GHG emissions due to the decrease of the exploitation of raw resources and will reduce air pollutants in the process of waste disposal. The transition towards the circular cities will foster innovative business models and stimulate the demand for talents and investment in emerging industries. Traditional leading enterprises will no longer dominate the market, and pioneering disruptive innovation will create a large number of new jobs and opportunities that reduce social inequality.

Civil servants and government leaders are expected to possess excellent skills of coordinating various departments in order to adopt circular actions and to achieve sustainable development goals.

Cities are the leverage points to overturn the traditional ‘extract—consume—dispose’ linear development paradigm. Cities gather talents and capital, which cultivate diverse economic activities and new innovation every day. By gathering talents in pursuit of a better life, cities are a playground and live lab for experimental and innovative thinking. In this forum, we notice that cities from all over the world are on the road to be circular cities no matter it is a mega-metropolitan with 24 million population in Asia or a small town with 0.2 million citizens in Europe. There are no shortcuts and standard solutions of this circular journey. Governments, businesses, and citizens must learn from trials and errors and gain experience from successes and failures. The Green Circular Cities Coalition facilitates city-to-city dialogue and sharing, helps cities identify challenges and potential opportunities, and develops strategies that will accelerate the circular transition.
The Green Circular Cities Coalition is managed by ICLEI — Local Governments for Sustainability, the leading global network of over 1,500 cities, towns and metropolises with the mission to promote global sustainability through local actions. The Coalition Secretariat is hosted by ICLEI East Asia.

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