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WCEF 2018 WORLD CIRCULAR ECONOMY FORUM JAPAN

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Summary of the Second World Circular Economy Forum: 22-24 October 2018

The second World Circular Economy Forum 2018 (WCEF2018) took place from 22-24 October 2018, in Yokohama, Japan. The world's biggest global gathering on circular economy solutions brought together more than 1,100 leading experts and decision-makers from more than eighty countries to discuss their future visions. The WCEF provides a platform for in-depth consideration of the role that a circular economy can play as a vehicle for de-coupling economic growth from the ecological impact of natural resource consumption and as an important means to meet the challenges of the Sustainable Development Goals (SDGs) and the UN Framework Convention on Climate Change (UNFCCC) Paris Agreement on climate change. Ministers from Finland and Japan attending the Forum described the potential of the circular economy to renew the global economy.

The Forum was jointly hosted this year by the Finnish Innovation Fund Sitra and the Ministry of the Environment of Japan (MOEJ). The State Minister of the Environment in Japan, Tsukasa Akimoto, announced that Japan will advance the circular economy when the world's third biggest economy takes up the presidency of the group of 20 countries (G20) in 2019. The Minister of the Environment in Finland, Kimmo Tiilikainen, announced that Finland's EU presidency of the EU Council of Ministers in 2019 will be a fantastic opportunity to promote the solutions of circular economy and to fight environmental collapse and climate change.

In a video message to participants, the Prime Minister of Japan, Shinzō Abe, explained that his country wished to share its experience of natural resource conservation and take the lead on circular economy within the international community, notably when Japan uses its Presidency of the Group of 20 (G20) in 2019 to raise the related challenges of plastic waste and marine pollution, climate change and biodiversity. The importance of co-operation was highlighted by Jyrki Katainen, Vice-President of the European Commission, who described the circular economy as the "industrial leg of fighting climate change."

Participants attended seventeen plenary and parallel sessions with more than one hundred speakers showcasing the best circular economy solutions for business, cities and finance. Participants attended sessions examining links between the circular economy and the fourth industrial revolution, food systems, finance and investment, business solutions, lifestyles and consumption, plastics, education, climate change, research and development, rural development, and value chains. A series of related meetings, networking opportunities and bilaterals took place in parallel with the WCEF2018, including a number of ministerial engagements. The latter included a signing ceremony for a Memorandum of Cooperation in the field of the Environment to intensify cooperation between the Ministry of the Environment of Japan and the Ministry of the Environment of Finland. Side events continued on Wednesday, 24 October.

In This Issue

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Sitra initiated and convened the first World Circular Economy Forum (WCEF2017) from 5-7 June 2017 in Helsinki, Finland.

Anticipating a background theme in the deliberations in Yokohama, Mikko Kosonen, President, Sitra, reflected on the need for a compelling vision of a desirable future while conceding that the world is passing through a remarkable time of geopolitical turmoil and global environmental challenge. He called on participants not to allow fear of the unknown or change to limit actions for a circular economy.

The core messages that emerged from the WCEF 2018 called for immediate action across all countries and regions:

- **The world lacks a shared Circular Economy vision:** There was a call for a prosperous future and a globally shared positive long-term circular economy vision. This was identified as a potential foundation to build action-oriented international, national and local strategies with measurable goals as well as inspire grassroots activities. The World Circular Economy Forums were described as platforms to support this work.
- The SDGs were identified as an excellent basis to build a global Circular Economy strategy which defines a trajectory for advancement by 2030, 2050 and beyond and how to get there. The G20 and UN meetings were identified as ideal decision-making tools to build a global circular economy strategy and together tackle global challenges of climate change, polluted environments and unemployment. The circular economy was said to be an essential part of meeting the Paris Agreement goal of limiting global warming to well below two degrees Celsius, as there is growing recognition that renewable energy and energy efficiency measures alone will not suffice.
- **Circular economy is good for business, trade and job creation**: The core messages underlined the need for a shared global vision for a circular economy that can correct current political emphasis on national interests and help remove and prevent harmful obstacles to international trade and collaboration such as trade tariffs and protectionism. Increased trade of knowledge and services combined with local production close to markets were identified as contributions to lowering environmental impact through less required transportation and more efficient supply chains. There was a call for product and service solutions that enable the circular economy to be allowed to spread across global markets freely.
- **Urgent need for stronger leadership and international collaboration:** There was a call for collaboration to help build a global circular economy by 2050 and create a planet where the economy and the environment are no longer in contradiction. This was accompanied by a call for strong political and business leadership to shift away from a linear economic paradigm, which was described as the root cause of global challenges such as climate change, polluted environments and unemployment.

The key messages from the opening speeches at the WCEF2018 included:

- The era of mass consumption and production is not sustainable;
- The circular economy must play a role in meeting the challenges of climate change and the SDGs;
- Every entity, from governments to individuals, can set and share actions to help create a circular economy movement;
- Japan will share its experience of resource productivity and raise the WCEF2018 outcomes at the Regional 3R Forum in the Asia-Pacific and other regional bodies, the UN General Assembly (UNGA), UN Environment Assembly (UNEA4), and the G20 and adopt a leadership role on circular economy;
- A transition to a circular economy is underway and is the only way to preserve life on Earth within planetary boundaries;
- Alongside climate change, biodiversity loss and over-use of natural resources, the global sustainability crises include social inequality; and
- The root causes of over consumption of natural resources and energy must be addressed.

At the final plenary it was announced that WCEF2019 will be hosted again by Finland.

A Brief History of the Circular Economy

Against a background of global population growth, the current economic model of ever-increasing production and consumption, which is also associated with acute patterns of unequal distribution and social exclusion, is already presenting substantial challenges. These include scarcity of and unequal access to natural resources and energy, as well as climate, social and geopolitical disruption. The Earth community has already crashed through four out of nine critical "planetary boundaries" or risk thresholds (climate change, species extinction, deforestation and land use change, nutrient loads) identified by the Stockholm Resilience Centre. The role of circular economy as the "industrial leg" of efforts to combat climate disruption was underlined by a Sitra-commissioned study on the role that the circular economy can make to keeping global warming below 2 degrees Celsius. The study, *Re-configure: The Circular Economy – A Powerful Force for Climate Mitigation*, shows that switching to the circular use of the four materials (steel, plastics, aluminum, and cement) responsible for the largest GHG emissions could help reduce EU industrial emissions by 56% (300 MT) annually by 2050, more than half the amount necessary to achieve net zero emissions.

In response to the emergence of these converging crises, the concept of "circular economy" has been coined to inform the design of an alternative economic model based on entirely different principles. The circular economy decouples virgin and non-renewable resource use from economic growth and seeks to put an end to an era of overconsumption – an era that has caused climate change, alarming loss of biodiversity and the over-use of natural resources.

The notions of a circularity and non-linear thinking are not new and can be glimpsed in rich historical and philosophical traditions, including the Japanese teachings of the 13th century philosopher Dogen on inhabiting "being time" with total intention and care, and in the conserver ethic of "Mottainai mind," which was taken up by Wangari Maathai's Green Belt Movement to

promote the 3Rs. The work on circular economy also builds on contemporary ideas developed by the Ellen MacArthur Foundation and others such as Walter Stahel (performance economy), William McDonough and Michael Braugart (cradle-to-cradle design), Janine Benyus (biomimicry); and Amory and Hunter Lovins and Paul Hawken (natural capitalism), and Gunter Pauli (blue economy systems).

Rather than using up natural resources and disposing of products when they are damaged or no longer needed, a circular economy will maximize the use of materials and retain their value. The vision of a circular economy is founded on a key intuition as described by one of the pioneers in the field, William McDonough, who once observed that: "Design is the first signal of human intention." A circular economy is based, *inter alia*, on the purposeful design and production of more durable, repairable, reusable and recyclable products, also harnessing disruptive new technologies (e.g. Blockchain, artificial intelligence, the "internet of things") and the other services and intelligent digital solutions associated with the Fourth Industrial Revolution. Waste is designed out of the production system as it comes to be regarded as a valuable resource. Products are shared, leased or rented, rather than necessarily owned by an end user.

In recent years, the Finnish Government has expressed the ambition for Finland to be a pioneer in the bioeconomy and circular economy by 2025, aiming to create sustainable well-being and a successful carbon-neutral circular economy over the next five to ten years. In this process, Finland has stimulated dialogue and cooperation between different sectors and parties in society such as business people, policy makers, scientists and civil society.

Over the course of 2016, Finland developed the world's first national Road Map toward a circular economy, "Leading the Cycle – Finnish Road Map to a Circular Economy 2010-2025." It was drafted under the direction of the Finnish Innovation Fund Sitra, in co-operation with the Ministry of the Environment, the Ministry of Agriculture and Forestry, the Ministry of Economic Affairs and Employment, the business sector and other key stakeholders. The Road Map, which is currently being revised and updated, aims to help cultivate and enable a shared mindset and capabilities for promoting the circular economy among all stakeholders and determine the most effective means to bring about a systemic change in the economy. For Sitra the circular economy implies a far-reaching societal change.

The Road Map's design allows it to be scaled up at both the national and international levels. The Road Map included the organization of the first WCEF in June 2017.The Road Map has five focus areas: a sustainable food system, forest-based loops, technical loops, transport and logistics, and joint actions.

The Japanese government has been a leading advocate of the 3Rs (reduce, reuse and recycle) and Circular Economy, known in Japan as the Sound Material Cycle Society, and has shown its leadership in the international and regional arenas including through the G8/G7 processes and the Regional 3R Forum in Asia and the Pacific. Japan enacted the Basic Act for Establishing a Sound Material-Cycle Society in 2001 and the Fundamental Plan for Establishing a Sound Material-Cycle Society in 2003. The fundamental plan has been revised every five years and the fourth plan was adopted in June 2018, which contains a new approach for Japanese policies on the circular economy.

- On 19 October 2018, the Ministry of the Environment, Japan, launched a "Plastics Smart" campaign, a multi-stakeholder initiative that promotes actions on addressing marine plastic waste.
- Japan took advantage of WCEF2018 to strengthen its leadership and commitment to taking a circular economy discourse to a wider range of international fora and fulfilling its presidency of G20 in 2019.

In parallel with Finland's actions, the European Commission has been working on policy and guidance in the area of circular economy. In 2015, it adopted a Circular Economy Package, which includes revised legislative proposals on waste to stimulate Europe's transition towards a circular economy, stating that this "will boost global competitiveness, foster sustainable economic growth and generate new jobs." In 2016, the EC published a review of the implementation of the Action Plan, and established a Circular Economy Finance Support Platform together with the European Investment Bank. As part of continuing efforts to implement the Circular Economy Action Plan, in January 2018 the Commission adopted a new set of measures, including a European Union (EU) Strategy for Plastics that calls for all plastics packaging to be recyclable by 2030.

In addition, China and the EU have signed a joint Memorandum of Understanding on Circular Economy Cooperation at the 20th EU-China Summit in 2018.

Report of the Meeting of the World Circular Economy Forum 2018

Grand Opening

The Grand Opening of the second World Circular Economy Forum on Monday, 22 October, was accompanied by the beats of the traditional drummers of Fukushima, Japan, and an introduction by moderators, Peter Woodward, Quest Associates, and Yukari Takamura, University of Tokyo. Describing the circular economy as a "disruptive agenda," Woodward invited a series of keynote speakers to set out their Circular Visions Towards 2050.

Circular Visions Towards 2050 – Keynote Speeches: In a video message to participants, Shinzō Abe, Prime Minister, Japan, highlighted the country's role in leading the world's efforts to move towards a circular economy based on its 3Rs approach and supporting technologies. Abe also noted Japan's decision to manufacture medals for the Tokyo 2020 Olympics and Paralympics Games using metals mined from discarded consumer electronics. On marine plastic litter, he underlined Japan's efforts to strengthen regional and international cooperation.

Mikko Kosonen, President, Sitra, called for an urgent transition, driven by climate change, and described the circular economy as a vehicle to de-link economic growth from consumption of natural resources. He called for a compelling vision in the face of environmental and geopolitical turmoil, and urged that the WCEF become a platform for sharing solutions through partnership.

Yoshiaki Harada, Minister of the Environment, Japan, described how the hands of an "Environmental Doomsday Clock" have accelerated since the 1992 United Nations Conference on Environment and Development ("Earth Summit"), due to population and climate change pressures. He noted the importance of the SDGs and the Paris Agreement, and called for a break from mass production and consumption in order to build a civilized economy based on resource circulation. The Minister also described plans to share Japan's Plastics Smart Campaign on public-private initiatives to tackle marine pollution and wise consumption with the World Economic Forum (WEF), Global Environment Facility (GEF) and the Platform for Accelerating the Circular Economy (PACE).

Kimmo Tiilikainen, Minister of the Environment, Energy and Housing, Finland, called for strong leadership from and close collaboration by governments and enterprises to advance the circular economy. He noted that Finland is currently updating its national circular economy roadmap, and recalled the recent publication of a national plastics roadmap. He called for World Trade Organization negotiations to be restarted with a view to aligning the trade regime with the circular economy.

Fumiko Hayashi, Mayor, City of Yokohama, described efforts in Japan's largest municipality to reduce waste generation, including food waste, and efforts to share lessons learned with cities in other countries.

Two Japanese high school students presented personal visions for 2050. One proposed a vending machine that accepts recyclables in exchange for coupons for admission to amusement parks. The other emphasized the importance of environmental education.

Jyrki Katainen, Vice-President, European Commission, described the Commission's decision to put the circular economy at the heart of EU economic policy. He said countries can no longer rely on relentless resource-intensive growth and that there must be efforts to maximize value from resources while minimizing waste. He underscored that no nation or group of nations can achieve this alone, and that the public sector needs the full and active cooperation of the private sector.

Noting a sea change in attitudes regarding the circular economy, Naoko Ishii, CEO and Chairperson, GEF, identified three main explanations: the rising price of natural resources, huge business opportunities, and technology that enables monitoring and tracking. Ishii called on policy makers to pursue innovation, regulation, and the creation of a multi-stakeholder coalition.

Describing the Organisation for Economic Co-operation and Development's (OECD) research, Masamichi Kono, Deputy Secretary-General, OECD, stated that "we pride ourselves in applying an economic perspective, and a life cycle approach." Kono highlighted findings in a new OECD report, "Global Material Resources Outlook to 2060," released to coincide with the Forum, that show rising incomes together with innovation and technology will significantly affect materials use. He also warned that "we are not going to reach our Paris goals if we continue business as usual," and advocated a whole-of-government approach to sectors such as waste, chemicals and trade.

Izabella Teixeira, Co-Chair, UNEP International Resource Panel (UNEP-IRP), presented key messages on consideration of future generations, and the need to bring science, politics and business together in pursuit of a circular economy. She pointed out that large increases in material resource use are unsustainable, and that changing the way we use resources will require new lifestyles. Teixeira underlined the importance of inequality in distribution and access to materials, in addition to the link between resource use and carbon emissions.

Panel Discussion on Circular Visions Towards 2050: In the ensuing discussion, participants addressed the challenges of accelerating and scaling-up the economic transformations necessary for a circular economy. Katainen stressed the importance of raising consumer awareness of smart purchasing decisions and the need for feedback from the private sector on a redesign of the regulatory environment. Kono noted the need to talk more about: reflecting environmental externalities in pricing; the importance of making information available to consumers; and education through re-skilling, up-skilling and training. Teixeira underlined the importance of understanding natural resource circularity as the next step.

Conclusion: Moderators Woodward and Takamura encouraged participants to use social media to disseminate news about the circular economy, which they described as one of the "world's best kept secrets." Participants were invited to take part in a networking session.

Unlocking the 4th Industrial Revolution: Technology Potential in Accelerating the Circular Economy

At this parallel session on Monday, a panel on the Fourth Industrial Revolution and the circular economy was introduced by Antonia Gawel, Head of Circular Economy Initiative, WEF and Makiko Eda, Chief Representative Officer, WEF Japan. Eda described conversations across the education, health and transport sectors on applications for artificial intelligence. The session built on the PACE work around the application of Fourth Industrial Revolution technologies in solving pressing problems in the transition to a circular economy.

Speakers: Kate E. Brandt, Sustainability Officer, Google, discussed corporate efforts to incorporate the circular economy into the company's infrastructure, products and culture, noting the contribution of machine learning, geo-mapping and cloud computing. She described the installation of air quality monitoring sensors on Google Maps street view cars to provide air quality data maps, and the use of cloud computing and geo-mapping to measure and visualize the Earth's vital signs, including forests, fisheries and global surface water.

Harald Tepper, Philips, noted plans by the company to attribute 50% of revenues to circular economy initiatives, and to increase capacity to take back all large-scale equipment by 2025.

Leanne Kemp, founder of the blockchain company, Everledger, predicted that the next generation internet will enable a worldwide ledger, which she described as a new data construct that can enable the transfer of value. She explained how blockchain technology has been used to trace

the provenance of diamonds, from mine to market, and wider applications of systems to monitor the carbon neutrality of mining for the diamond and jewelry industries.

Léon Wijnands, Global Head of Sustainability, ING, outlined the contribution of banking to the Fourth Industrial Revolution through technology, market standards and innovation. He noted that interest rates can be lowered for companies moving towards sustainability.

Sara Chandler, Apple, outlined the company's challenges, including a goal to make all new products without taking anything from the Earth. She said the company is already powering its global operations using renewable energy, plans to use only recycled or renewable materials in manufacturing, and will pioneer safer materials.

Conclusion: Gawel summed up the session's key words as: innovation, leadership, collaboration and action.

Building a Sound-Material Cycle Society: Learnings from Japan

Kazuhiko Takemoto, Director, United Nations University Institute for the Advanced Study of Sustainability, moderated this parallel session on Monday, on good practices and solutions for advancing the circular economy in Japan, focusing on the country's fourth plan for establishing a Sound Material-Cycle Society.

Speakers: Shinichi Sakai, Professor, Kyoto University, explained that Japan's new plan, adopted June 2018, sets a medium- to long-term trajectory and sets out measures for implementation. He outlined five pillars of the strategy: a sound social-ecological and material-cycling sphere; appropriate waste management and environmental restoration; international resource circulation; resource circulation throughout the entire product life cycle; and disaster waste treatment systems. Sakai said the plan sets indicators for monitoring progress by FY2025 on: doubling resource productivity and the projected market share of business related to sound material-cycle society from FY2000.

Tokutaro Nakai, Director-General for Environmental Policy, Ministry of Environment, Japan, outlined the newly adopted Fifth Basic Environment Plan, noting that this government decision highlights Japan's commitment to the SDGs and the Paris Agreement. He stressed the core concept of a "regional circular and ecological sphere" approach that formulates integrated and coordinated environmental efforts by involving local communities and information and communication technologies (ICT) to achieve resource circulation and life in harmony with nature.

Panel: In a panel discussion, participants shared experiences and best practices. Takuya Kitatsuji, Director General for the Environment Bureau, Osaka City, highlighted the city's basic environmental plan and efforts to promote plastic resource circulation and reduce food and packaging waste.

Tetsuro Sakuka, Executive Director, International Environmental Economic Affairs Department, Environment Bureau, Kitakyushu City, outlined his city's Eco-Town Project which promotes a recycling society, with support from companies and research facilities. He noted that Kitakyushu City was selected by OECD as an SDGs Model City in April 2018.

Oriana Romano, Policy Analyst, Cities, Urban Policies and Sustainable Development Division, OECD, outlined her project on economics, governance, and implementation of the circular economy in cities. She said lessons from Japan could include city-to-city cooperation and collaboration across different levels of governments.

C.R.C. Mohanty, Environment Programme Coordinator, United Nations Centre for Regional Development (UNCRD), outlined UNCRD initiatives, including the Regional 3R Forum in Asia and the Pacific.

Yoshihiro Yamamoto, Director-General for Environment Regeneration and Resource Circulation Bureau, Ministry of Environment, Japan, highlighted Japan's key message for chairing the G20 in 2019: development and diffusion of innovation should lead to "high quality of life" by contributing to solving environmental, social and economic problems.

Panel: A panel discussion centered on: the importance of global partnership for local solutions; the need to increase the profile of the 3Rs on the political agenda; and learning lessons from circular economy culture in Japan.

Circular Food Systems in Cities

Moderator Ashima Sukhdev, Ellen MacArthur Foundation, set out three questions to be addressed at this parallel session on Monday: what is the role of cities in redesigning food systems? What are the best-in-class solutions? How can those solutions be replicated across cities in different countries and at different scales?

Speakers: Jocelyn Blériot, Executive Officer, Ellen MacArthur Foundation, said the Foundation's urban biocycles paper, addressing food systems, will be presented at the WEF in January 2019, followed by the development of open-source tools that city authorities, food producers and retailers can use to take proof of concepts to proof of scale. He called cities "an underappreciated entry point" for addressing food system challenges, with three levers for activation: influencing food production in surrounding areas; valorization of byproducts; and enabling shifts, through public procurement policies and access to existing supply and retail networks.

Kazuo Fukuyama, Director General, Resources and Waste Recycling Bureau, City of Yokohama, outlined his city's efforts to reduce its food waste by 20% by 2021 through public awareness and environmental education activities, collaboration with local restaurants, and the conversion of food waste to create compost and generate biogas for power and heat.

Noriko Ishizaka, CEO, Ishizaka Sangyo Ltd., described how a Japanese recycling plant for construction and demolition waste created a neighboring farm to promote awareness and education about forestry, farming, food production and food waste.

Yoshie Munakata, CEO, B. Grove Inc., discussed GrowNYC, which has promoted urban food farming, environmental education and recycling since the 1970s in New York City, and a food project in the Japanese municipality of Toyohashi that supports consumption of locally-grown food.

Yvonne Yang, ICLEI East Asia Secretariat, explained her organization's City Food Network that supports cities' capacity to study their urban food systems and how they can maximize value while minimizing waste.

Miriam Otoo, Senior Economist, International Water Management Institute (IWMI), discussed projects to promote greater use of organic waste and fecal sludge to meet the nitrogen and phosphorus needs of local agriculture, and issues of scaling up projects.

Koichi Takahashi, CEO, Japan Food Ecology Center (JFEC), described how food waste is being used to replace expensively imported animal feed.

Asked about challenges to scaling-up, Otoo stressed having clear objectives and full understanding of how the local market functions before starting projects. Yang emphasized the policy and institutional environment, information transparency and local government facilitation.

Conclusion: Moderator Sukhdev emphasized: cities are an underappreciated entry point for addressing food systems; the need to move from a vicious to a virtuous, regenerative cycle; and the importance of re-connecting urban and peri-urban communities of interest.

Circular Finance and Impact Investment

This parallel session on Monday focused on the important role of investment in the circular economy, examining aspects such as international financial institutions, the role of investment mechanisms, and access to capital.

Moderator Timo Mäkelä, Senior Advisor, Sitra, opened the session by asking how mainstream financial institutions can respond to the circular economy by bringing understanding to current needs and responding with appropriate new means.

Speakers: Naoko Ishii, CEO and Chairperson, GEF, calling for a transformation of the current economic system, expressed optimism given the growing scientific evidence base for change, increasing resource costs, and consumer-led demand for doing things differently. Ishii commended the climate finance taskforce, and growing enthusiasm for environmental social governance (ESG) investment.

Mika Pyykkö, Project Director, Sitra, reviewed impact investment, and called for a greater focus on SDGs three (health), eight (economic growth), 16 (peace and security), and 17 (partnerships). He stressed the importance of responsible investing 2.0, which moves beyond avoiding harmful industries to creating positive outcomes, doing well and good simultaneously.

Rintaro Tamaki, President, Japan Center for International Finance, attributed the potential for, and a lack of, optimism around traditional financing for the circular economy to the banking sector's conservative mindset, and strict regulations that limit the sector's actions. He advocated for greater reliance on long-term investors like pension funds and insurance companies.

Verónica de la Cerda, Partner and CEO, TriCiclos Chile, shared experiences on pursuing investment funding for an innovative business, and underlined the importance of changes in large companies that can help realign the risk and return calculations necessitated by a new circular economy paradigm.

In self-declared provocative remarks, Massimiano Tellini, Global Head, Circular Economy, Intesa Sanpaolo, stated that sustainability is failing, and that some financing leads to negative impacts. He emphasized his bank's focus on the circular economy as a key consideration for determining where it makes investments, and called for a new cultural mind-set if the finance industry is to achieve its potential.

Conclusion: The moderator closed the session by stating that when it comes to impact investment, there remain significant needs in the current financial system.

Plenary: Social, Environmental, and Economic Benefits from Circular Economy in Developing Countries

This plenary session on Monday afternoon looked at the contribution of the circular economy to addressing interlinked social, economic and environmental challenges in developing countries. In particular, speakers stressed options for adapting and scaling up innovative approaches in regions and countries in ways that will contribute to realizing the SDGs. The discussion was moderated by Peter Woodward and Yukari Takamura.

Keynote Speakers: Hidetoshi Nishimura, President, ERIA, outlined some of the findings from a research report, "Industry 4.0: Empowering ASEAN for the Circular Economy," on essential drivers and technologies. He called for greater inter-sectoral collaboration, outlined a circular economy readiness framework, and described how Singapore and Malaysia currently occupy the highest ranks in terms of readiness for the circular economy. He described a number of technical, social and economic benefits from the circular economy that will require regulatory support, and noted that regenerative economic models have gained traction in the region because they will contribute to overcoming resource constraints.

Lu Dongsen, Director, Division of Circular Economy Development, China, reviewed current circular economy practices in his country, focusing on waste management and extending to changes in manufacturing geared to reducing resource use. He outlined initiatives in China's latest Five-Year Plan, including pilot projects, a focus on investment, demonstration cities, sustainable business models, clean production, and circular economy laws and regulations. He spoke of transformations in the mining and agriculture sectors, and the clustering of companies in industrial parks.

Country Presentation: Luc Gnacadja, President, GPS-Dev, explained the importance of agriculture to Benin's economy and the challenge soil degradation poses to its growth, calling soil loss "the forgotten waste of linear economy" that must be addressed in any circular economy model. He noted efforts to phase out perverse subsidies.

Izabella Teixeira, Co-chair, UNEP-IRP, emphasized that circular economy implementation in a huge, resource-rich country like Brazil requires: having a new understanding of how resources are used and how to keep them in circulation; accounting for the innovative role the private and financial sectors must play; influencing consumption behaviours; tailoring different approaches for cities on different scales and in different

regions within a country; and addressing inclusion, rural development and social welfare needs, without which circular economy will not be sustainable.

Novrizal Tahar, Director, Solid Waste Management, Ministry of Environment and Forestry, Indonesia, described plastic's increasing percentage in his country's municipal solid waste generation, and reviewed his government's application of circular economy policies. Tahar explained how, starting in 2012, the government's focus on circular economy includes various regulations on waste, as well as national objectives on solid waste management through 2055.

Lee Young-kee, Director General, Environmental Resources Research Department, National Institute of Environmental Research, Republic of Korea, presented a framework with ambitious waste reduction and diversion goals for 2027.

Noting that the circular economy remains an aspiration, Keith Alverson, Director, International Environmental Technology Centre, UN Environment, highlighted: the need to think outside the box in order to identify appropriate pathways for countries at different stages of development; and the importance of understanding each stakeholder's constraints in terms of finance, technology, and knowledge. He stressed that the role of UN Environment is to provide platforms for mutual learning.

Conclusion: Moderator Takamura highlighted the need to increase cooperation with financial institutions leading to an acceleration in the pace of change and in the scaling of actions on the ground.

Plenary: Enabling Circular Lifestyles and Consumer Solutions

On Tuesday, Moderators Takamura and Woodward introduced this Plenary, focusing on visions for circular lifestyles and transforming consumption. Speakers addressed the question of how individuals can move towards more circular lifestyles and the significance of individual decisions in determining resource consumption and achieving a circular economy.

Speakers: Markus Terho, Project Director, Resource-wise Citizen, Sitra, explored ways in which consumers have inherited and extended the habits of hunter gatherers, linking ideas of happiness to the accumulation of stuff. Noting that the majority of emissions reductions under the Paris Agreement will be realized at the individual and household level, he described the significant impact of linking the adoption of low carbon impact behavior to primary motivations such as health and earnings. He explained that people who believe they are living sustainability enjoy greater life satisfaction.

Fumiaki Koizumi, Chief Operating Officer, Mercari Inc., described the multi-billion yen mobile phone platform for consumers who wish to exchange and re-use unwanted goods. He described how the platform emerged from an observation that smart phones are used in both rich and poor countries, and can be used to create a consumer-to-consumer market for the exchange of reusable goods that are otherwise discarded as waste.

Takayuki Kitajima, Representative Director and General Counsel, Unilever Holdings Japan KK, explained the three pillars and 50 targets of Unilever's Sustainable Living Plan adopted in 2010 and progress made in realizing 80% of the targets. He detailed how Unilever expects to realize its 2017 commitment to ensure 100% of its plastic packaging is fully reusable, recyclable or compostable by 2025. He explained five approaches: rethinking product design; driving systemic change; working with government; working with consumers, particularly regarding collection and sorting; and exploring innovative approaches through new business models.

Titoy Francisco, Executive Vice-President, Coca Cola Japan, discussed the Coca Cola Company's "World Without Waste" commitment announced in 2018 to: achieve 100% recyclable packaging by 2025; 50% recycled material content in packaging by 2030; and to collect and recycle every bottle and can sold globally by 2030. He closed by inviting all participants to work with Coca Cola to address the packaging problem.

Lewis Akenji, Director, Sustainable Consumption and Production (SCP), Institute for Global Environmental Strategies (IGES), declared that "we are not going to go circular by simply sticking an eco-label on a plastic bottle." He presented key anticipated changes in society by 2050 as: constraints due to interlinked environmental and resource pressures; widening gaps in inequality as well as polarization; and the speed of societal-level changes. Akenji pointed out that current average global per capita lifestyle carbon footprints of 4.5 tonnes of carbon dioxide (CO2) must be reduced to 1 tonne by mid-century, which is below India's current level.

Anu Mänty, Senior Lead, Sitra, stated that "everything we do matters" when it comes to our environmental impact, and reviewed her organization's launch of a sustainable-lifestyle test, already used by 10% of the Finnish population. She said results showed that 3% of individuals are categorized as a "threat from the past," and 2% as "a hero of sustainable everyday living." Noting that people sometimes find it difficult to know where to start making changes, she said Sitra promotes a list of "100 ways to be smart and sustainable."

Showcasing Circular Business Solutions

Moderator Kari Herlevi, Project Director, Sitra, introduced the format of this session on Tuesday, in which two short presentations were followed by 90-second pitches from a dozen invited circular business model innovators. Participants then circulated and broke out for table discussions with the innovators of most interest.

Julien Guerrier, Director, Executive Agency for Small and Medium-sized Enterprises of the European Commission (EASME), discussed the economic case for a circular business model. He suggested that the large attendance by business at WCEF2018 was testament to how convinced many are about the merits of the new model. He described how realizing a circular economy will require regulatory changes, innovation and coalition building. On the first, he pointed to how the EU Circular Economy package has changed mindsets in governments and businesses alike, and expressed hope that the recently released plastic strategy would further strengthen support. Regarding innovation, he said EASME has one billion Euros to invest in research during 2018-2020 to promote the circular economy, with a focus on: public awareness; innovation

in new business models, new types of governance and financing; and promoting work across sectors and value chains, from design to end user.

Jyri Arponen, Senior Lead, Business Development, Circular Economy, Sitra, explained the history behind Sitra's development and the content of their Circular Economy Playbook and circular economy project accelerator known as Loop, which is a collection of concepts, best practices and tools to guide businesses in identifying opportunities and developing a plan to realize circular advantage. He briefly explained how Loop works, and outlined examples of ventures it has promoted in the food and plastic sectors.

During a 90-second "pitch" segment, the following enterprises presented:

- Aleš Mihelič, Gorenje Group, on laundry as a service-led business model;
- Lisa Elfström and Jan Boström, Sundahus, on using and designing buildings as repositories of high-value materials that can be recovered;
- Krista Huhtala-Jenks, Maas Global, on establishing mobility as a service through their Whim app;
- Jeanet van Antwerpen, Schiphol Area Development Company (SADC), on understanding diverse solutions to the circular economy, and how these can change; and ways to challenge established companies;
- Léon Wijnands, ING, on providing a platform for sharing challenges in realizing circular models at the micro level and ING's circular economy project accelerator developed in cooperation with Accenture;
- Hery Henry, Wipak, on innovations in sustainable packaging, including: climate-neutral packaging; invisible barcodes for tracking packaging; and GEA Oxycheck, which measures oxygen levels inside food packaging to reduce spoilage;
- Stefan Caba, EDAG Engineering GmbH, on FiberEUse, a reusable lightweight car platform using plastics reinforced with carbon fibers and glass fiber;
- Yoshiki Takeoka, Kaneka Corporation, on its biodegradable polymer PHBH, which is bio-based, compostable and fully degradable in both soil and marine environments;
- Wolfram Palitzsch, Loser Chemie GmbH, on recycling of photovoltaic waste;
- Cesare Rapparini, Aroma System, on coffee capsules made with a new generation of bioresins that are compostable and biodegradable, and efforts to develop a compostable wine bottle; and
- Edoardo Peterlini, SOFTline s.r.l., on an informatics app for pay-as-you-throw models of municipal waste management that brings together different databases to more accurately calculate what citizens should be paying monthly for the waste they generate.

Circular Economy for Plastics

This parallel session on Tuesday focused on increasing understanding of opportunities for innovation in the plastics sector. Daniel Calleja, Director General for Environment, European Commission, moderated and noted that while global production of plastic will double in the next twenty years, "we do not want to demonize plastics; we want to make plastics circular."

Speakers: David Katz, Founder and CEO, Plastic Bank, highlighted the urgency of interrupting plastic waste flows before they end up in the ocean. He described his organization's focus on a circular economy for plastics. Katz declared that "plastic is money," and showed how his organization pays people in developing countries for recovering plastic waste, to then start savings programs or pay for education, using "100% social plastic."

Panels: Calleja introduced the first panel on innovative solutions for raising awareness. Verónica de la Cerda, Partner and CEO, TriCiclos Chile, said "that waste is no more than an error of design." She called for doing more than recycling, by shifting incentives to support a circular economy, and helping consumers understand consumption's impact.

Regina Dube, Director General, Water Management and Resource Conservation, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany, noted that "we have to address the whole value chain of plastics," using extended producer responsibility. She said this starts with product design, to increase the possibility of making useful products from recyclates.

Karl-H. Foerster, Executive Director, PlasticsEurope, emphasized the need to collaborate with all stakeholders and that plastic should be collected before landfilling because it has value; otherwise, "we waste the waste." Foerster said Europe is experiencing a level of populism when it comes to discussion of plastics.

During the next panel, Calleja outlined the focus on innovation, scaling, and how consumer behavior is influenced. Lena Pripp-Kovac, Head of Sustainability, Inter IKEA Group, described their products and declared their "first ambition is to use only renewable and recyclable materials by 2030." She noted that plastics are not always bad, but that what matters is how they are used. Pripp-Kovac then explained the importance of product design, which includes consideration of materials upstream and downstream, and also a focus on function.

Dave Muenz, Senior Vice President, ESG Division, Kao Corporation, described his company's focus on design that allows people to achieve "more sustainable fashion," such as with reusable packaging. She said this requires a focus on consumer habits and practices, to gain the acceptance necessary for behavior change, and to "help consumers recognize what they need to do."

Aimee T. Gonzales, Executive Director, Partnerships on Environmental Management for the Seas in East Asia (PEMSEA), called for going beyond technical innovation, to a "cultural mind shift." Gonzales emphasized the cost of inaction compared to that of waste management: "prevention is better than cleanup."

Education for the Circular Economy

Moderated by Peter Woodward, this parallel session on Tuesday considered how circular economy thinking needs to be integrated in the thinking processes for all future professionals. Woodward invited participants to look at ways to accelerate learning towards enjoying life in a circular economy.

Speakers: Michiharu Kono, Director, Office of Environmental Education, Ministry of the Environment, Japan, discussed linkages between the circular economy and the role of the SDG on education. He outlined Japan's role in promoting education for sustainable development, including awards to promote new approaches that make links to multiculturalism and human rights, and pedagogies using dialogical and subject-centered approaches.

Kirsi Sormunen, Board of Directors, Sitra, and Chris Grantham, Executive Director, Circular Economy, IDEO, addressed skills required for the future circular economy-based industries and working life in a question-and-answer session.

The panel discussed: the power of the realization that the economy is a human construct and the potential to re-design it while enshrining a new purpose, geared towards the circular economy; the important agency of children as educators for adults; the role of large corporations in designing scalable solutions; the need for companies to become masters of unpredictability as learning organizations, drawing from design- and systems thinking, biomimicry, complexity, and collaborative approaches; the exemplary role of Stanford University's design school, which is extending opportunities for design thinking and problem-solving to all undergraduates; the role of corporations in cultivating cultures of risk-taking and creativity; and the insight that the way companies create value is the key to the values they are trying to create. Asked about the power of senior executives and incumbents to reproduce traditional values in companies, Grantham explained that developing a new sense of purpose is a "kind of fitness," which he cultivates by walking in nature and listening to music.

Kaisa Koistinen, Director, Economic Information Office, TAT, Finland, described her organization's "Me & MyCity" education programme, which supports schools in Finland. The holistic learning approach to economy, working life, entrepreneurship and society also focuses on the circular economy, and immerses both teachers and students in practical learning. She said the approach focuses on and respects the early capacity of children to develop their innate interest and motivation, which can sometimes be limited by adult expectations.

Megumi Muto, Director General, Global Environment Department, Japan International Cooperation Agency (JICA), and "mother to her 15-year-year old son and 'educator' in the field of environment and biology," described a series of case studies sponsored by Japan's overseas development programme. She focused on an African Clean Cities Platform, which promotes waste and environmental education with hundreds of volunteers, with partners including UNEP, UN-Habitat, and the City of Yokohama. Operating in 35 African countries, the programme is linked to Japan's commitment to the SDGs.

Conclusion: Woodward noted the important role of awareness raising, education and skills linked to more holistic, design-based approaches to support the roll-out of the circular economy. He also cautioned that there are many other forces at work in society that influence education, including forces focused on accumulation. He reflected on the striking importance of cultivating a clear sense of purpose in both schools and business, as part of recognizing a new context.

Circularity in Global Value Chains

On Tuesday, moderator Sofie Bouteligier, Policy Advisor, International Policy Unit, OVAM, opened this session, which focused on the potential market for recycled materials such as plastics and metals and how international trade can support the transition to a circular economy.

Speakers: Shardul Agrawala, Head of the Environment and Economy Integration Division, OECD Environment Directorate, stressed the need for considering linkages between trade and the circular economy in terms of various trade flows of secondary goods and materials as circular economy policies are often implemented within national boundaries. He then outlined potential impacts, including: structural changes in terms of import demand for primary and second materials; challenges around transforming infrastructure, labor force structure, and digitalization, particularly in developing countries; and opportunities such as an increase in trade in services and circular procurement.

Jane Korinek, Economist and Trade Policy Analyst, Policies in Trade and Agriculture Division, OECD, emphasized the need for the international trade regime to move towards decoupling from economic growth and natural resource use. Citing an example of waste and scrap metals, she pointed out that competitive advantages for recyclers of scrap metals do not currently exist.

Scott Vaughan, CEO, International Institute for Sustainable Development (IISD), noted that the global value chains are complicated and fragmented, and stressed the need for emerging national norms on plastics and recycling to be coupled with private sector voluntary standards. He noted the importance of considering what corporate social responsibility (CSR) means in terms of trade in the context of the circular economy.

Ron Voglewede, Global Sustainability Director, Whirlpool Corporation, pointed out that a variety of definitions exist for waste materials and there is not much talk about the high utility of materials in the private sector. He said that life cycle analyses could help drive better utility on secondary materials and enhance tracking and transparency.

Michikazu Kojima, Senior Economist, ERIA, underscored the need to pay more attention to the negative impacts of trade. He said that finding an appropriate level of regulation for the trade in waste could benefit business.

Takako Satoh, Executive Councilor and General Manager, Ricoh Group, introduced her company's "Comet Circle concept," an environmental impact reduction scheme which includes not only the scope of the Ricoh Group as a manufacturer and sales company, but also the entire life cycle of their products. She emphasized the importance of a multi-layered approach in terms of repairing and updating products to ensure long term use.

Discussion: The ensuing discussion focused on: the need to integrate a circular spirit in the entire supply chain; how to convey a circular signal to markets; benefits of using digital tools to reduce trade barriers; policy alignments between domestic and international levels; potential use of procurement as a driver for innovation; the challenge of ensuring stable prices for secondary materials; and the potential impact of China's ban on importing plastics.

Conclusion: Malena Sell, Ministry of Foreign Affairs, Finland, underscored the need for enhancing dialogue on trade and circular economy to map the issues of: definitions, standards and harmonization, and traceability.

Sustainable Consumption: A Driver for Circular Economy and Climate Benefits

On Tuesday, moderator Tim Kasten, Deputy Director, Economy Division, UN Environment, opened this session, which focused on how market demand and consumer decisions play a fundamental role in promoting circularity in economies and reducing greenhouse gas emissions.

Speakers: Roald P. Lapperre, Director General for the Environment and International Affairs, Ministry of Infrastructure and Water Management, The Netherlands, highlighted his country's goal to achieve a 50% reduction in reliance on raw materials by 2030 and full circularity by 2050, and stressed the importance of circular public procurement and its contribution to greenhouse gas (GHG) emissions reduction. He illustrated his country's Green Deal Circular Procurement initiative, which encourages the careful purchase of goods, including those aligned with the circular economy. This is achieved through multi-stakeholder partnerships.

Hironori Hamanaka, Chair, ICLEI Japan, highlighted the experience of the town of Shimokawa in maximizing the use of its forest resources for sustainable energy use, linked with other activities to develop a new social system to cope with a "super-aging society." He said Shimokawa achieved a thermal self-sufficiency rate of 49% in 2016 thanks to the use of forest biomass, at the same time contributing to a region-wide reduction in carbon dioxide emissions by 18%.

Yuichi Moriguchi, Professor, University of Tokyo, noted that the G7 has recognized improved resource efficiency as indispensable to meeting climate change targets in a cost-effective manner. He also stressed the importance of science-based policy making while addressing trade-offs between resource and climate issues.

Mari Pantsar, Director, Sitra, stressed the importance of the special Intergovernmental Panel on Climate Change (IPCC) report, "Global Warming of 1.5 ºC," which had not been discussed in detail at the Forum. She pointed out that the report omits any reference to the contribution of the circular economy to GHG mitigation. She highlighted Sitra's recent report, "The Circular Economy: A Powerful Force for Climate Mitigation," showing that a more circular economy could result in deep cuts to emissions from heavy industry.

Anders Wijkman, Chairman, Climate-KIC, echoing Pantsar, called for climate policy makers to seriously consider the linkage between climate change mitigation and material use and management. He stressed the importance of: product design if materials are to be effectively recycled; and the role of retailers in sharing the benefits of a circular economy.

Discussion: Moderator Kasten invited participants to engage in a poll on whether consumption is given attention in circular economy discussion: 30% agreed that it is "rarely covered in discussion," and 2% believed "this is the first event in which it is discussed."

Conclusion: Panelists shared take-home messages, including: the possibility of learning from energy saving behaviors of consumers for material saving; the importance of promoting a concept of sharing to influence consumer behavior; and the importance of multi-stakeholder partnerships.

Mobility Revolution and Future Transportation for the Circular Economy

This session on Tuesday focused on new transportation options and insights into mobility for the coming decades. The panel was moderated by Hidetoshi Nishimura, President, ERIA.

Speakers: Shizuo Abe, Executive General Manager, Toyota Motor Corporation, discussed the future direction of the electric vehicle (EV). He outlined three necessary conditions for vehicle electrification: environmental performance, better cars in terms of. range and price, and business continuity. Abe presented notable issues for EVs as costs, need for battery development, and electrical charging infrastructure. He said that to reduce CO2 emissions, the optimized EV will differ by region and country. Other issues he highlighted included stable access to rare metals, effective use of end-of-life batteries, and treatment of end-of-life vehicles.

Sumio Tanaka, Director, Mobility Service Promotion Office, Softbank Corp, presented on Packet Rapid Transit (PRT), a pilot project on EV public transportation in Manila focused on short distance travel and mass transit. Tanaka considered key features of the PRT which can operate as a "train without rail," and as vehicles that transform from the trackless train mode in peak commute hours to an on-demand mode in off-peak.

Krista Huhtala-Jenks, Head of Ecosystem & Sustainability, MaaS Global Oy, noted that the largest transportation expense people have is the private car. She described her organization's smartphone app, Whim, a "mobility solution" which uses a monthly subscription model so customers do "not even think about the [transport] modes that [they] are taking," with Whim's "guarantee that we'll get you there." She reported that within a year after launch, the company has provided nearly 2 million trips in Helsinki, Birmingham and Antwerp. Huhtala-Jenks declared that "all of us individually owning a vehicle is not efficient," and that moving to a mobility service model is creating more business for everybody.

Hideo Suzuki, Managing Executive Officer, Nippon Steel & Sumitomo Metal Corporation, discussed recyclability of materials for automobiles. He noted the preferred characteristics for automobile production: low environmental impact in production, light weight, high efficiency, high recyclability, and low environmental impact throughout the vehicle life cycle.

Discussion: The moderator invited participants to consider the likelihood of a revolution in car ownership, given ongoing issues with EVs, including energy storage. In concluding remarks, Nishimura stated that "mobility as a service will definitely change our landscape" and lifestyle.

Circular Economy's Frontier of Knowledge

Moderated by Bas de Leeuw, Managing Director, World Resources Forum, participants at this Tuesday session discussed scientific research and innovation on a number of circular economy projects at the frontiers of knowledge.

Speakers: Takashi Shimazu, Director, Toyota Central Research and Development Labs, detailed his work on the technical challenges for carbon dioxide (CO2) recycling as a contribution to the circular economy. Shimazu outlined his laboratory work on artificial photosynthesis and the conversion of CO2 to organic matter, using solar energy. He explained that the process generates an organic compound using only water, CO2, and sunlight, offering a way to address climate change and the need for alternative sources of renewable energy. He described the challenge of reducing the cost of the process and the diversification of product usability.

Helen Mets, President, Resins and Functional Materials, DSM, noted the contribution of scientific advancements in materials to the circular economy. She highlighted the very recent rise of human activity, in geological time, that has overturned nature's balance and created a legacy of waste that she would not wish to leave to her children. She noted DSM's work to support the SDGs on nutrition and health, energy, resources, and design for circularity. She displayed a sample of non-toxic recyclable carpet and described a product to reduce methane output from cattle.

Nabil Nasr, Associate Provost for Academic Affairs and Director, Golisano Institute for Sustainability, Rochester Institute of Technology, launched a research report by UNEP-IRP, "Redefining Value," regarding sectoral material flows and regulatory impacts in a number of countries, including China and Brazil.

Panel: During a question and answer session, the panelists discussed the economic viability of artificial photosynthesis, and the social justice dimension of the circular economy.

Speakers: Giorgos Demetiou, École des Ponts Business School and ENPC, underlined the likely impact of technological developments in big data, blockchain, artificial intelligence and the "internet of things" on restorative and regenerative design for the circular economy. Karl Vranken, Research Manager, Sustainable Materials Management, VITO, noted that it has only been since the 1500s that time has appeared linear, and called for a return to viewing time as cyclical. He also called for closer involvement by personnel in the information technology (IT) industry.

Conclusion: Moderator de Leeuw agreed on the need to break down silos to engage the IT sector on the circular economy.

Circular Economy and Rural Development

Moderator C.R.C. Mohanty, UNCRD, introduced this Tuesday session on exploring how to promote the circular economy in rural areas, and considering means of implementation.

Speakers: Luc Gnacadja, President, GPS-Dev, described degraded land as the largest source of waste in African countries. He argued that the circular economy cannot develop in African countries without restoring degraded landscapes, and any circular economy model must be truly regenerative and restorative, a "bio circular economy."

Ashok Khosla, Chairman, Development Alternatives, stressed that a circular economy must also be inclusive, particularly in the rural context. He suggested three keys to success in bringing the circular economy to rural areas: putting people in charge of their economies, through local production and consumption; providing support to the right kinds of entrepreneurs at the local level; and ensuring that "key interveners"—entrepreneurs who make other entrepreneurs possible—are provided with access to capital. He discussed the role of social enterprises such as Development Alternatives.

Hannele Pokka, Permanent Secretary, Ministry of Environment, Finland, discussed three ways Finland is promoting circular economy in rural areas: turning all lumber mills into bio refineries in which every aspect of wood from forests is used; promotion of biogas systems using animal manure; and nutrient recycling to improve water quality.

Hiroyuki Sato, CEO, Amita Corporation, discussed how the company partnered with the small town of Minamisanriku to rebuild the town after it was devastated by the 2011 tsunami, using circular economy concepts, including construction made with certified local wood, certified aquaculture, a community garden, a biogas project and altered waste management practices.

Venkatachalam Anbumozhi, Senior Economist, ERIA, discussed the advantages of promoting "eco-industrial clusters" in rural fringe areas as a way to address three key challenges in bringing circular economy to rural areas: the resources available are not the same as those for cities; businesses are reluctant to come to rural areas; and inequity. He stressed the importance of public policy support to making such clusters a success.

Akmal Siddiq, Director, Asian Development Bank, said that the circular economy does not yet work in rural areas of Africa and Asia and will not do so until policymakers take the challenge seriously and get government involved in a supportive role for transformative interventions. He also opined that circular economy will not work in rural areas until farmers are assured a decent living.

Asked by Mohanty about the role of government, Pokka suggested government can push new initiatives forward and provide pilot financing, Anbumozhi said they should provide enabling policies, Siddiq suggested government can lead a society in making the necessary changes, and Gnacadja and Khosla suggested they can provide supportive policies that reduce perceived risks for private financing.

Conclusion: Mohanty summarized the session by noting that promotion of circular economy in rural areas is still in its infancy, and that fundamental enabling and supportive policies, as well as market interventions, and strong participation by the private sector are needed. He also noted that the circular economy must be regenerative and inclusive.

Grand Finale - International Co-operation for the Circular Economy

On Tuesday afternoon, moderators Takamura and Woodward opened the final plenary, outlining the future circular economy vision towards 2050. They underscored the importance of shifting away from a linear to a circular economy, including through: a 3Rs approach; integrating circularity into the entire global supply chain; optimizing the use of digital technology; strengthening collaboration across and between sectors and countries; enhancing finance and investment in sustainable business; and enhancing education to amplify a sense of "Mottainai mind" (no waste thinking) through peer-to-peer learning.

Janez Potočnik, Co-chair, UNEP-IRP, noted that SCP is an essential ingredient for the delivery of the SDGs and that the circular economy is an essential instrument to lead SCP. He called for: circular economy agenda be presented not only at UN Environment Assembly (UNEA), but also at the UN High Political Forum (HLPF) and UN General Assembly (UNGA); forming new partnerships with existing international conventions, such as UNFCCC and Convention on Biological Diversity (CBD), science-policy platforms such as IPCC, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and UNEP-IRP, and with international organizations such as UN Environment, the UN Conference Trade and Development (UNCTAD), and the UN Industrial Development Organization (UNIDO). He also stressed the importance of: identifying specific solutions for the least developed countries with a social focus; working more closely with business sector through reliable, fair, and clear policies: and re-defining sovereignty and including circularity in global governance.

Daniel Calleja, Director General, DG Environment, European Commission, noted that the circular economy provides a great opportunity to integrate environmental issues into social and economic opportunities. To move the circular economy agenda forward, he highlighted the need for the international community to: take a more systemic approach; develop more convincing narratives for consumers and younger generations; collaborate better through multi-stakeholder partnerships involving individuals; deliver integrated global solutions; and promote responsible leadership.

Hiroshi Kuniyoshi, Deputy Director General, UNIDO, pointed out that to be fully realized, the circular economy needs to be pursued globally. He cautioned that international cooperation is also needed to ensure that the pursuit of circular economy does not create new global inequalities.

Panel Discussion: Asked by the moderators whether it was realistic to expect global alliances to realize a circular economy under the current political conditions in the world, Janez and Calleja agreed there was little alternative, given current global environmental challenges. Asked what could be done to ensure a fair transition to circular economy, Calleja stressed the need to support small and medium-sized enterprises (SMEs). Kuniyoshi said G20 leaders need to think carefully about how they can lead the world into a truly global circular economy. The recurring themes were natural resources, manufacturing, transportation, services, food, living, plastics and capabilities.

Closing Plenary

The conference was closed by representatives of the two main institutional organizers, Tsukasa Akimoto, State Minister of the Environment, Japan, and Mari Pantsar, Director, Sitra. Akimoto thanked participants from around the world. He noted that the 20th century model of mass production, consumption and disposal is no longer acceptable, and said that resource constraints and pollution, as well as climate change, make the circular economy indispensable. Akimoto declared Japan's leadership and support of circular economy, and presented three proposals for actions.

First, every government, company, and citizen should set specific circular economy actions, depending on their roles and responsibilities, and with differences depending on the region or country. Akimoto noted that Japan had achieved high growth despite a scarcity of resources and land, and this required efficiency and a reduction of waste, in part based on its first plan for establishing a circular approach to materials systems in 2003.

He called for an international movement focused on circular economy that includes promotion of effective education, and brings outputs from WCEF2018 to international organizations and other conferences. He proposed a "Circular Economy Day."

In a third proposal, he called for expanded action for a circular economy as the future approach to economic growth in companies. This will involve aligning innovation, public-private collaboration, and ESG investment with the circular economy.

The State Minister described how Japan had started a new campaign called "Plastics Smart," to support circular economy and pledged Japan will bring the output of the WCEF2018 to UNEA4 and the G20 and "lead the world."

Pantsar stated that over an "exciting two days," WCEF2018 had made clear that the transition to a regenerative model of the economy is already under way. She declared that "the only way that we can succeed [is by] living within the planetary boundaries." Pantsar noted that while considering the global sustainability crisis as consisting of climate change, biodiversity loss, and the overexploitation of natural resources, she recognizes an important fourth dimension: "the crisis of social inequality." Pantsar explained that the most recent IPCC report, focusing on the effects of 1.5 degrees of global warming, missed a key solution in its recommendations: circular economy. She said transforming economies will bring better possibilities, and that the circular economy, in essence, is about sustainability: "every single step forward matters … every species we can save in our natural environment matters … [and] every tonne of CO2 that we can avoid" is important too. Pantsar emphasized that the circular economy can also be a source of well-being and economic growth, stressing it is also important to consider the world we are passing on to future generations.

Pantsar stressed that inclusive development is possible, while maintaining an awareness of planetary boundaries. The result will be a world where "well-being of people will not depend on how much we consume"; consumers will focus on services instead of materials and products. She announced that the next WCEFs will be held in Helsinki, Finland on 3-5 June in 2019 and Canada in 2020, and closed by thanking all partners, contributors, and the moderators. The Co-organizers include the Ellen MacArthur Foundation, ERIA. OECD, European Commission, UN Development Programme (UNDP), and UNEP. Partners included IGES, the World Economic Forum's PACE Network, and UNCRD.

Pantsar said she is confident this movement will grow in scale and significance, "making circular economy a reality all around the world."

The moderators closed the Forum at 5:30 pm.

For more information on the WCEF visit www.wcef2019.com

WCEF Visions 2050: Main Outcomes

At the conclusion of the World Circular Economy Forum 2018 the organizers at Sitra published WCEF Visions 2050, outlining the main findings and themes of the Forum. The main themes were natural resources, manufacturing, transportation, services, food, living, plastics and capabilities.

Participants agreed that the world is at a critical point in history where society needs to make the choice between a sustainable future built on the principles of circular economy or continuing with the current economic model and consumption patterns that are not only a threat to social, ecological and economic systems globally but have effects that can already be seen around the world.

Circular economy was identified as the key to fight climate change, rapid loss of biodiversity and growing inequality, necessitating an examination of root causes of current problems, and considering questions of scale, including links between global and local scales and finding common ground between the private, the public and citizens.

On the main themes, the organizers highlighted the following analyses and possible solutions:

- **Natural resources and manufacturing:** the economy is still based on fossil fuels and unsustainable extraction of natural resources; products and materials are mainly used once before ending up in landfills; production processes are optimized to work in only one direction, from, extraction to consumption and disposal. Forests and fertile lands have been left barren and polluted. A circular economy can enable a future in which:
  - products are designed with care and their next lifecycle in mind, with used products gaining value by 3R approaches, upcycling, upgrades and repairs;
  - industries such as manufacturing and agriculture can work in closed loops and no longer produce unnecessary by-products; and
  - global value-chains can go through the Fourth Industrial Revolution, optimized with digital technologies and automation; waste can become a thing of the past.
- **Transportation and services:** Vehicles keep roads congested as they mostly carry one person; autonomous electric vehicles remain luxury products; and public transport remains expensive and are in a state of decay. A circular economy approach can enable:
  - on-demand services with non-polluting innovative vehicles, providing easy access and convenience;
  - high-speed connectivity and digital communication can enable effective access to services without the need for ownership of assets; and
  - new materials and biochemicals can enable production of resource-efficient vehicles, fuels and infrastructure.
- **Food and living:** The burning of fossil fuels to provide energy for living continues to accelerate global warming; the attempt to increase production of food to meet the demands of the global population combined with uneven weather cycles, has led to severe soil erosion and diminishing crop returns, with poorer nations experiencing unprecedented famine; and construction wastes natural resources. A circular economy approach can enable:
  - citizen participation in the production, conservation and consumption of their own renewable energy, with communal living becoming the new normal;
  - local and plentiful food for all with efficient urban and rural biocycles and innovative production, and natural maintenance of soil fertility; and
  - regionally abundant renewable materials used for modular construction alongside reusable concrete, aluminum and steel produced in low-carbon closed loops.
- **Plastics:** The growth of plastics demand is met by an increased use of non-renewable fossil resources; plastics-based products continue to be designed for single-use, while oceans have become full of plastics and increasingly free of life; landfills continue to grow, spoiling land areas. A circular economy approach can enable:
  - wider acceptance of reuse as a major part of consumption behavior, with plastics upcycled and production based on recycled raw materials instead of virgin fossil fuels;
  - a shift to the use of sustainable alternatives such as bio-based plastics; and
  - oceans and land areas to become naturally clean environments free of plastic waste.
- **Capabilities:** Societies face broad unemployment and a loss of human capital due to redundant skills and knowledge; education has become mainly a privilege of the wealthy and produces mostly disciplines that have limited capabilities to challenge existing structures of value creation; and those experiencing poverty and the under-educated are considered unproductive for society while facing increasing discrimination by the wealthy and educated. A circular economy approach can enable:
  - education as a life-long journey of learning and re-education, in societies that fully recognize the value of human skills and capabilities, providing jobs with a deeper purpose beyond access to a personal income;
  - schools and other educational institutions focused on creating and amplifying a diverse range of knowledge and sense of value such as "Mottainai mind" for all people in all professions; and
  - peer-to-peer cross-disciplinary learning methods become common, recognized and supported by public and private sectors, with stronger financing and support for innovation and R&D.

Upcoming Meetings

EU Raw Materials Week 2018: Organized by the European Commission through its European Innovation Partnership on Raw Materials, the third EU Raw Materials Week will have the theme "Raw materials for low carbon and circular economy." The Week's main event will be the 6th High Level Conference of the European Innovation Partnership on Raw Materials on 14 November, which will address battery value chains, cascading woody biomass, and secondary raw materials for energy-

intensive industries. **dates:** 12-16 November 2018 **location:** Brussels, Belgium **email:** info@eurawmaterialsweek.eu **www:** http://eurawmaterialsweek.eu/index.html

Second Meeting of the Conference of the Parties to the Minamata Convention on Mercury: Among other things, COP2 is expected to adopt revised guidelines on interim storage and consider a report on waste thresholds. **dates:** 19-23 November 2018 **location:** Geneva, Switzerland **contact:** Minamata Convention Secretariat **fax:** +41-22-797-3460 **email:** MEA-MinamataSecretariat@un.org **www:** http://www.mercuryconvention.org/

Circular Economy Forum of the Americas 2018 (CEFA 2018): CEFA2018 is a two-day high-level event that offers interactive sessions, workshops, and other opportunities to gather insights on what is available in the field of circular economy throughout the Americas. CEFA expected outcomes include: the Declaration of Santiago for regional cooperation on circular economy, a report capturing the principle outcomes and recommendations, and an announcement of new circular economy programmes and initiatives. **dates:** 27-28 November 2018 **location:** Santiago, Chile **contact:** Circular Economy Platform of the Americas (CEP-Americas) **email:** info@cep-americas.com **www:** https://www.cefa2018.com/

World Resources Forum 2019 (WRF 2019): Organized and hosted by the Public Waste Agency of Flanders (OVAM), WRF 2019 will have the theme "Closing Loops - Transitions at Work." Thematic sessions will focus on such issues as: circular cities and regions; the contribution of ports to a low-carbon circular economy; the global metals flow; digital transformation as a driver for circular economy; sustainable materials and waste management; bioeconomy; soil and land as valuable resources to close loops; circular economy as an enabler for climate policy; upscaling sustainable lifestyles; and financing the circular transition. **dates:** 24-27 February 2019 **location:** Antwerp, Belgium **contact:** OVAM phone: + 32 15 284 148 **email:** woordvoerder@ovam.be **www:** https://www.wrf-antwerp2019.be/

Ninth Regional 3R Forum in Asia and the Pacific: The event, co-organized by the Ministry of Natural Resources and Environment, Thailand, MOEJ, and UNCRD under the overall theme of "3R as a way for moving towards sufficiency economy - Implications for SDGs." **dates:** 4-6 March 2019 **location:** Bangkok, Thailand **contact:** UNCRD Secretariat **phone:** +81 52 561 9377 **www:** http://www.uncrd.or.jp/Home?page=view&nr=1174&type=13&menu=198

Fourth Session of the UN Environment Assembly (UNEA-4): UNEA-4 will focus on the theme, "Innovative solutions for environmental challenges and sustainable consumption and production (SCP)," particularly: better global environmental data and partnerships; sustainable and efficient resource management; and robust engagement of civil society, citizens and academia in promoting innovative approaches. **dates:** 11-15 March 2019 **location:** Nairobi, Kenya **contact:** UN Environnent Programme **www:** http://web.unep.org/environmentassembly/

Third Meeting of the Open-Ended Working Group (OEWG3) of the Strategic Approach to International Chemicals Management (SAICM): The OEWG is to consider the results of the first two meetings of the intersessional process addressing the possible post-2020 platform for addressing chemicals and waste, and prepare for the Fifth International Conference on Chemicals Management (ICCM5). **dates:** 2-4 April 2019 **location:** Montevideo, Uruguay **contact:** SAICM Secretariat **phone:** +41-22-917-8273 **fax:** +41-22-797-3460 **email:** saicm.chemicals@unep.org **www:** http://www.saicm.org

Basel Convention COP14, Rotterdam Convention COP9 and Stockholm Convention COP9: The 14th meeting of the COP to the Basel Convention, the ninth meeting of the COP to the Rotterdam Convention and the ninth meeting of the COP to the Stockholm Convention will convene back-to-back. **dates:** 29 April - 9 May 2019 **location:** Geneva, Switzerland **contact:** BRS Secretariat **phone:** +41-22-917-8271 **fax:** +41-22-917-8098 **email:** brs@brsmeas.org **www:** http://www.brsmeas.org/

WCEF 2019: The third WCEF will be held in Finland. **dates:** 3-5 June 2019 **location:** Helsinki, Finland **contact:** Sitra **phone:** +358 294 618 991 **fax:** +358 9 645 072 **www:** http://www.wcef2019.com

Glossary

CO_2	Carbon Dioxide
EU	European Union
EV	Electric Vehicle
G20	Group of 20 Countries
GEF	Global Environment Facility
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
MOEJ	Ministry of the Environment of Japan
OECD	Organisation for Economic Co-operation and Development
PACE	Platform for Accelerating the Circular Economy
SCP	Sustainable Consumption and Production
Sitra	Finnish Innovation Fund Sitra
SDGs	Sustainable Development Goals
UNCRD	UN Centre for Regional Development
UNEA	United Nations Environment Assembly
UNEP	UN Environment Program
UNEP-IRP	International Resource Panel
UNGA	United Nations General Assembly
UNIDO	UN Industrial Development Organization
UNFCCC	United Nations Framework Convention on Climate Change
WCEF	World Circular Economy Forum
WEF	World Economic Forum