

Seventh Regional 3R Forum in Asia and the Pacific *(Advancing 3R and Resource Efficiency for the 2030 Agenda for Sustainable Development)*

MAJOR POINTS & HIGHLIGHTS

Policy and institutional transformation

- *Need for policy transformation towards resource-efficient and circular economic development in Asia and the Pacific;*
- *Need for scientific and technological advancements in support of whole-of-value-chain approach as a critical means to circular economic development;*
- *Need to harness multiple benefits of circular economic development approach in achieving the SDGs under the 2030 Agenda for Sustainable Development;*

Resilience of cities and communities

- *The critical nexus between waste management and the resilience of cities and communities needs to be understood at policy level;*
- *3R and resource efficiency measures can provide many complementary benefits in making cities and societies resilient;*
- *Need for policy and institutional shifts for integrating 3R and resource efficiency with climate mitigation and disaster reduction strategies and measures;*

Biomass waste in rural economy

- *3R programmes and practices can provide an important basis for rural development and waste management under the 2030 Agenda for Sustainable Development;*
- *3R programmes and practices can provide circular economy opportunities in rural areas of Asia and the Pacific;*
- *Asia-Pacific countries need to strengthen policies, programmes and institutions to enhance the circular economy of rural and biomass waste;*

Private sector and sustainable business opportunities

- *3R technologies are key enablers for creating sustainable business opportunities towards economic success of the Asia and the Pacific;*
- *Government policies and programmes should provide a favourable regulatory framework and environment that ensures full recovery of costs invested by private and industry sectors on 3R technologies;*

Collaborative research and development

- *International joint ventures, public-private partnerships (PPPs), and international collaborative research programmes are crucial for promoting 3R technology research and development;*
- *Countries need to recognize the importance of triangular cooperation (government-private sector-scientific and research organizations) in advancing 3R research and development (R&D), technology transfer and technology evaluation;*
- *Conducive policies, regulations and guiding frameworks are key to encouraging private banks, domestic and foreign investment funds in 3R technology development;*

Greening SMEs for resource efficiency

- *Greening SMEs is critical for circular economic development under the 2030 Agenda for Sustainable Development;*
- *Governments need to assist SMEs to integrate resource efficiency into their entire supply chain through appropriate policy, institutional and financial measures and partnership mechanisms;*
- *Governments can facilitate various information-based instruments (e.g. product labels) in raising awareness of both consumers and SMEs on the needs and benefits of greening the supply chain;*

Multilayer and inter-municipal cooperation

- *Government-to-business, business-to-business, and industry-to-industry cooperation are crucial to increase the role of business and trade associations towards greening the entire operations and supply chain;*
- *Inter-municipal cooperation can enhance opportunities towards circular economic development;*
- *Inter-municipal networking and cooperation are crucial for increasing resource recovery, recycling, remanufacturing and industrial symbiosis;*
- *Inter-municipal cooperation can offer significant solutions to manage disaster waste;*

Emerging science and technologies

- *Emerging science and technologies such as green chemistry in 3Rs can provide social, economic and environmental benefits;*
- *Governments can advance green chemistry in their policy and development agenda to create sustainable urban business opportunities by reducing chemicals and waste;*
- *International collaborative research, financing, knowledge and technology transfer are crucial to promote green chemistry;*
- *The Regional 3R Forum in Asia and Pacific should address emerging technologies such as green chemistry and nano-technology, etc., in advancing 3R and resource efficiency in the region.*

Chair's Summary

Seventh Regional 3R Forum in Asia and the Pacific (*Advancing 3R and Resource Efficiency for the 2030 Agenda for Sustainable Development*)

2–4 November 2016

Venue: Adelaide Convention Centre, Adelaide, South Australia, Australia

Forum Chair

Ian Hunter, MLC

**Minister for Sustainability, Environment and Conservation
Government of South Australia**

I. Introduction

1. The post-2015 development agenda – *Transforming our world: the 2030 Agenda for Sustainable Development* – and the underlying Sustainable Development Goals (SDGs) adopted by the Member States of the United Nations, represent a plan of action for people, the planet and prosperity and reflect the commitment of the countries to shift the world onto a sustainable and resilient path. Through adoption of the Agenda, the Member States called for, among others, a world in which consumption and production patterns and use of all natural resources are sustainable.

2. Asia and the Pacific has been the most dynamic region globally and most growth in resource use has been triggered by rapid urbanization and industrial transformation. The policy and scientific community in Asia and the Pacific has recognized the large challenges of resource supply security, increasing waste and pollution, and climate change as critical constraints to future growth and rising material standards of living in the region. The 2030 Agenda for Sustainable Development and the SDGs not only call for equitable economic growth, but also provide an important political and implementation framework to implement 3R and resource efficiency measures to achieve circular economic development.

3. The Seventh Regional 3R Forum in Asia and the Pacific, 2–4 November 2016, Adelaide, SA, Australia, was co-organized by the Australian Government, the Office of Green Industries South Australia on behalf of the Government of South Australia, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Ministry of the Environment of the Government of Japan (MOEJ), and the United Nations Centre for Regional Development (UNCRD), under the overall theme of “*Advancing 3R and Resource Efficiency for the 2030 Agenda for Sustainable Development*” and under the Chairmanship of Mr. Ian Hunter, Minister for Sustainability, Environment and Conservation of the Government of South Australia.

4. The objective of the Forum was to gain policy and scientific insights into how resource efficiency and 3R could be advanced in achieving the SDGs, including discussions on the roles of 3R and resource efficiency in realizing smart, resilient, inclusive and liveable cities. The Forum also sought to actively engage the private and business sectors not only to demonstrate their expertise, technical know-how and range of services through the exhibitions, but also to explore various collaborative models and partnership options towards effective implementation of the Ha Noi 3R Declaration (2013–2023) as well as advancing 3Rs and resource efficiency towards circular economic development in Asia and the Pacific.
5. The Forum was supported by various international organizations and donor agencies, including the United Nations Environment Programme International Environmental Technology Centre (UNEP-IETC), the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP), the Secretariat of the Pacific Regional Environment Programme (SPREP), the Institute for Global Environment Strategies (IGES), and the Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries (JICA J-PRISM).
6. The Forum was attended by more than 340 participants, comprising high-level government representatives (both national and local), international experts and resource persons, representatives from various United Nations and international organizations, scientific and research organizations, non-governmental organizations (NGOs), and the private and business sectors, and other stakeholders from forty-one countries including Australia, Afghanistan, Bangladesh, Bhutan, Cambodia, the People's Republic of China (hereinafter, China), Germany, India, Indonesia, Iran, Japan, Kazakhstan, Kiribati, Kyrgyzstan, Republic of Korea (hereinafter, Korea), Lao PDR, Malaysia, Maldives, Marshall Islands, Mauritius, Mongolia, Myanmar, Niue, Nepal, Pakistan, Palau, the Philippines, Qatar, the Russian Federation, Samoa, Singapore, the Solomon Islands, Sri Lanka, Sweden, Thailand, Timor-Leste, Tonga, Tuvalu, the United Kingdom, Vanuatu and Viet Nam.
7. As a pre-event to the Forum, a meeting of the drafting committee on the State of 3R in Asia-Pacific was co-organized by UNCRD and IGES with the support of MOEJ. Within the framework of the Australia 3R Forum, a few other parallel and side events were organized such as: Asia 3R Citizens Network, co-organized by KESAB and the Asia 3R Citizens Network with the support of MOEJ; and the 2016 Adelaide Workshop on Multilayer 3R Partnerships and Cooperation among Asia-Pacific Cities, organized by MOEJ. An International 3R Exhibition was also co-organized through the joint efforts of the Office of Green Industries SA and MOEJ with the participation of a number of private and business sector representatives to showcase and demonstrate state-of-the-art technologies and equipment in 3R and resource efficiency areas.
8. OECD's Working Party for Resource Productivity and Waste (WPRPW) organized a Networking Lunch Session on 3 November 2016 to introduce OECD's Extended Producer Responsibility – Updated Guidance for Efficient Waste Management 2016. The session was

facilitated by Dr. Cecilia Mattsson of the Swedish EPA. OECD provides a platform for countries to exchange experience and, in 2001, produced a Guidance Manual to support the development of EPR systems. Among other recommendations, the Guidance Manual urges for better internalization of end-of-life costs and stricter enforcement, which would strengthen incentives for improving the eco-design of products and packaging. The report also recommends that EPR systems need to find ways for informal operators to work with, rather than against, formal waste management systems, unless there is a risk that they will be undermined by them.

9. Recognizing the multiple benefits of pursuing a circular economic development approach through effective 3R policies, programmes and institutions, the Forum discussed and adopted the goodwill, voluntary and legally non-binding *Adelaide 3R Declaration towards the Promotion of Circular Economy in Achieving Resource Efficient Societies in Asia and the Pacific under the 2030 Agenda for Sustainable Development* (See Annex 1).

II. Opening Session

10. Acknowledging that the Seventh Regional 3R Forum in Asia and the Pacific was held on the traditional land of the Kaurna people and thanking Mr. Jack Buckskin for his gracious Welcome to Country, Premier Jay Weatherill, welcomed the Forum participants on behalf of the South Australian Government. As the host of the Forum, he expressed confidence in South Australia's leadership in the 3Rs – reduce, reuse and recycle – and, more broadly, in the vital field of climate change policy. Our ultimate goal is to contribute to global efforts to better look after our planet – especially by striving to reach the United Nations Sustainable Development Goals. South Australia has a fine record when it comes to waste management and resource recovery. The container-deposit system has been in place for almost 40 years. There have been actions to cut the use of supermarket check-out plastic bags along with a complete ban on the practice of sending certain forms of waste to landfill. For example, 59 per cent of household waste, 76 per cent of commercial and industrial waste, and 85 per cent of construction and demolition waste are diverted from landfill. In 2016, the waste management sector of South Australia has become a billion dollar industry employing almost 5,000 people. The State of South Australia has also fostered international cooperation with countries like Egypt, India and Japan. They recognize the important role of the new State Government agency, Office of Green Industries SA, in helping South Australia move into the next phase of waste management promoting economic aspects of 3R. The State Government and the City of Adelaide have maintained a unique partnership to make Adelaide a carbon-neutral city, and to this end, various efforts are being made to foster renewable energy and combat the effects of climate change. About 40 per cent of South Australia's energy generation today comes from renewables. The State shares about 35 per cent of the country's installed wind farm capacity.

11. Delivering the opening remarks, Mr. Tadahiko Ito, State Minister of the Environment of Japan, outlined various 3R initiatives by the Government of Japan. He expressed his deep appreciation to the host Government of South Australia as well as the co-organizers – Government of Australia, CSIRO and UNCRD. Recognizing the importance of the theme of the Seventh Forum in the context of the 2030 Agenda for Sustainable Development and the SDGs, he said that along with rapid economic growth, it was important to build effective systems to promote sustainable consumption and production and proper management of waste. He referred to the “APEC High Level Meeting on Overcoming Barriers to Financing Waste Management Systems to Prevent Marine Litter”, co-organized by the USA and Japan in September 2016, which recommended improving funds mobilization opportunities for waste management facilities. He also emphasized the importance of strengthening funding for waste-to-energy activities as a contribution to the Paris Agreement on Climate Change. Finally, he appealed to national governments, local governments, private corporations, research entities and non-governmental organizations as well as a wide range of other actors for better international cooperation towards further strengthening the Regional 3R Forum in Asia and the Pacific in the context of the SDGs.

12. In her opening remarks, Ms. Chikako Takase, Director of UNCRD, noted that this year’s theme, Advancing 3R and Resource Efficiency for the 2030 Agenda for Sustainable Development, is especially relevant as the world is facing a serious challenge in achieving sustainable development with growing global population coupled with unsustainable trends in resource use and waste generation. She pointed out, however, that efforts to realize resource-efficient societies and economies through effective 3R policies and programmes will have multiple benefits on the way, starting with poverty eradication, creation of green jobs, and improved quality of life, then greening supply chains, ensuring the supply of natural resources, and reduction of greenhouse gases, among others. On the Regional 3R Forum, she noted that starting with fourteen countries in 2009, the Forum has successfully expanded to cover more than thirty-five member countries and the 2016 Forum in Adelaide is represented by government representatives from thirty-seven countries. She pointed out that the Adelaide 3R Forum provides a very good opportunity to discuss and gain policy and scientific insights to advance circular economic opportunities in the region and she hoped that the Forum will pave the way for further strengthening international cooperation and partnerships towards achieving the SDGs.

13. Paying due respects to the Kurna people, the traditional custodians of the land on which the Seventh Regional 3R Forum in Asia and the Pacific was held and with due acknowledgement to their deep spiritual attachment and relationship to the country, Mr. Ian Hunter, MLC, Minister for Sustainability, Environment and Conservation, South Australian Government, welcomed all the participants. South Australia has achieved significant recycling rates with South Australians currently diverting almost 80 per cent of all waste generated. The percentage of waste diverted from landfill has increased dramatically in recent years. Keeping in mind the steady growth in population, the South Australian Government

has focused on long-term sustainability. He made specific reference to the celebration of the 50th anniversary of Keep South Australia Beautiful (KESAB). KESAB has been at the forefront of Adelaide's reputation as one of the world's most liveable cities. Just over 40 years ago, KESAB led the charge for the nation's first container-deposit scheme. In 2009, South Australia led the nation by phasing out lightweight, checkout-style plastic bags. Due to changes in community attitudes towards the importance of protecting the environment and ecosystem, plastic bags have been diverted from landfill. He emphasized the triangular cooperation between the Government, business and the community to achieve long-term outcomes in waste reduction. This creates green jobs and increased economic activity while delivering positive outcomes to the natural environment. Opportunities exist in relatively new waste sectors, such as electronic waste, mixed plastics, photovoltaic cells, and new building products. South Australia's waste sector employs around 5000 people, has an annual turnover of about \$1 billion, and contributes \$500 million to Gross State Product directly and indirectly. The South Australian Government has helped expand the sector, investing in financial incentives for infrastructure, market development and research and innovation. All these have made significant contributions towards transitioning to a cleaner and greener economy. Aiming towards Carbon Neutral Adelaide, South Australia has made significant investments in energy-efficient technology and renewable energy, enabling South Australian entrepreneurs and investors to create new green jobs and opportunities. There is also a strong acknowledgement from government and industry that waste management will form a key component of Carbon Neutral Adelaide. At the government level, this will be driven by Green Industries SA (GISA). All these activities and initiatives are geared towards contributing to the United Nations 2030 Agenda for Sustainable Development as well as international actions towards mitigating climate change.

14. Dr. Alex Wonhas, CSIRO Executive Director for Environment, Energy and Resources welcomed participants and said that the Regional 3R Forum for Asia and the Pacific is the most important science-policy dialogue in the domain of sustainable resource management and waste management in our region. The Forum has enabled the exchange of knowledge between researchers and policymakers for many years. Dr. Wonhas referred to the new SDGs, which show the commitment of countries to alleviate poverty and provide millions of people with healthy and educated lives based on access to quality housing, mobility, food and water to engage in a satisfying and fulfilling life. Dr. Wonhas pointed out that such improvements in well-being will, however, lead to increased resource use, waste and emissions and we need to decouple human well-being from resource use and emissions. The policy and science communities in Asia and the Pacific need to continue to work together to design policies and technical solutions that reduce the environmental cost of human well-being. Dr. Wonhas said that CSIRO is Australia's national research institute and a keystone of Australia's innovation system. He mentioned that CSIRO's science covers many areas but sustainability science is key. This includes research in the resources and energy domain to provide knowledge and information for developing a "circular economy" in Australia and in the Asia-Pacific region. CSIRO works on solutions for harvesting resources and wealth from waste, to stem the tide

of unsustainable disposal. The CSIRO wealth from waste research cluster with universities developed new business opportunities, identified cost savings and developed new technologies for recycling, remanufacturing and the reuse of valuable components of the waste stream. Dr. Wonhas referred to the ongoing collaboration with United Nations agencies, UNCRD and UNEP, which supports sustainable consumption and production and the 3Rs in Asia and the Pacific. CSIRO aims to be a trusted adviser to the business and policy communities to contribute to resource efficiency and waste minimization.

15. Paying his respects to the Kaurna people of the Adelaide Plains, their Elders past and present, the traditional custodians of the land on which the Seventh Regional 3R Forum in Asia and the Pacific was held, and further recognizing the continuing culture and contribution they make to the life of the city and region, Mr. Dean Knudson, Deputy Secretary, Environment Protection Group, Department of the Environment and Energy, Government of Australia, extended a warm welcome to all the participants on behalf of Mr. Josh Frydenberg, MP, Minister for the Environment and Energy. He thanked all the co-organizers – the South Australian Government, CSIRO, MOEJ and UNCRD. The Paris Climate Change Agreement, SDGs and the forthcoming Conference of Parties (COP 22) in Marrakesh have encouraged us to think beyond linear economic models of “take, make and dispose” and towards the circular economy. He extended his sincere appreciation to the ground breaking and influential work of the Ellen MacArthur Foundation in outlining the importance of the circular economy in delivering environmental, social and economic outcomes. In circular economy, productivity is a central theme. Our collective challenge is both to create conditions under which we can achieve greater resource productivity and smarter supply chains, and to ensure that these improvements deliver the desired environmental and social outcomes. He acknowledged the important contribution the national science body, the CSIRO, had been making to the 3R Forum over the years as well as in improving understanding of the flow of materials through the region. He highlighted the important role played by the SMaRT Centre at the University of New South Wales in bringing together researchers in science, engineering and the built environment to develop novel research for sustainable materials and manufacturing processes. He also highlighted how STEM subjects – science, technology, engineering and mathematics – have become the foundation for future innovation by Australian research institutions. Collaboration between governments and industry will ensure policy settings provide the right incentives for industry to lead the way in mitigating the impacts their products have on the environment, while creating new economic opportunities for those industries. Collaboration between industries will also help to rethink the ways in which products are mined, designed, delivered, packaged and recovered for maximum productivity for shareholders and the community. Shifting our focus and the way in which we do business towards a circular economy model will enable greater collaboration throughout the Asia-Pacific region.

Delivering the keynote address, Mr. Andrew Morlet, CEO and Trustees, The Ellen MacArthur Foundation, defined a circular economy as being restorative and regenerative by

design, keeping products, components and materials at their highest utility and value at all times, and ultimately eliminating the concept of waste, with materials re-entering the economy at end of use as defined, valuable technical or biological nutrients. He cautioned with several examples that today's linear economy is massively wasteful. Firstly an end-of-pipe example: in the Fast Moving Consumer Goods sector globally, the total annual material input value is estimated at USD 3.2 trillion dollars, of which over USD 2.4 trillion, or 80 per cent of this is lost to landfill or incineration within just one year. The circular economy presents an inspiring innovation opportunity for new forms of profitable and better economic activity. Economic activity that preserves finite material stocks – which enhances natural capital – and which has multiple direct, positive consequential benefits that will, with adoption at scale, contribute substantially to both reduction of greenhouse gases and achievement of several of the Sustainable Development Goals. The idea of a circular economy that the Foundation promotes draws on several schools of thought and the pioneering concepts and examples of resource efficiency, industrial ecology, industrial symbiosis, and the zero waste to landfill initiatives that have become evident over recent years in China, Japan and in some European countries. The Foundation presented results from its research in Europe showing that the benefits of this approach, leveraging digital technologies for increasing utility, reuse, repair, remanufacturing and higher level recycling, would realize €1.8 trillion by 2050 and have direct impact on GHGs, reducing them by as much as 48 per cent by 2030 and 83 per cent by 2050, compared with 2012 levels. The Foundation also stressed the need for collaboration for systems solutions as an essential way of working in order to catalyse change, and to better inform policymaking – and that without this type of open collaboration approach, realizing the opportunities, and the SDG goals, will be extremely difficult to achieve.

III. Contribution of 3R policy and science towards SDGs under the 2030 Sustainable Development Agenda

Need for policy transformation needed towards resource-efficient and circular economic development in Asia and the Pacific

16. Dr. Heinz Schandl of CSIRO, Australia, reflected upon the contribution of the 3Rs to achieving the sustainable development goals (SDGs). The SDGs reflect the level of ambition and commitment of the global policy community. He argued that while the 3Rs are important to the SDGs in many ways it would be beneficial to focus on the core contribution of the 3Rs to sustainable materials management and waste management as represented in SDG 12 and resource efficiency (SDG 8). He argued that sustainable consumption and production (SCP) is the most efficient strategy to avoid trade-offs and create synergies to resolve the development and environmental challenges articulated in the SDGs. In his presentation he showed that it is possible for economic growth to continue while reducing natural resource use and environmental impacts in relative or absolute terms. In the short term there are many

cost-effective opportunities for greater resource efficiency that will wholly or partially offset any costs incurred in this decoupling; in the medium to long-term decoupling will generate higher economic growth than would occur based on current trends of inefficient resource use, environmental destruction and climate change. The 3Rs directly support SCP and enable decoupling across the whole supply chain.

17. Dr. Schandl presented recent CSIRO modelling showing that there is substantial potential to achieve economically attractive resource efficiency, providing win-win outcomes that reduce environmental pressure while improving income and boosting economic growth in the Asia-Pacific region. There are significant co-benefits for climate mitigation. The level and mix of economic and environmental benefits achieved will, however, depend on the detail of the policies and approaches implemented. Attention will be required to develop and test a smart and practical package of resource efficiency measures. He closed by showing how the 3Rs can contribute to regional development through capital development and new markets, networks and intermediaries, capital investment and capacity-building.

18. Professor Jinhui Li, of Tsinghua University, PR China, described the Chinese experience of implementing a circular economic development approach. China adopted circular economy in response to fast-growing natural resource use and related environmental damage. The Cleaner Production Promotion Law and the Circular Economy Promotion Law have been issued, providing legal guidelines to increase resource efficiency and reduce pollution. Policies and regulations have also been issued to promote the implementation of circular economy at enterprise, industrial park and social levels. Resource efficiency has increased and pollutant emissions have been declining gradually. Professor Li showed that there is additional potential for implementing 3R policies and programmes. He discussed that economic incentives are important; that government inputs are required for science and technology; and that there is a need to establish an assessment system and strengthen cooperation.

Need for scientific and technological advancements in support of whole-of-value-chain approach as a critical means to circular economic development

19. The panel discussion covered wide-ranging issues around the 3Rs in Asia and the Pacific. A critical part of government strategy in promoting a whole-of-value-chain approach vis-à-vis the circular economic development approach is to support necessary technological developments, build institutional capacity, and promote international collaborative research projects for strengthening basic statistics, material flow and waste accounting. The representative from Singapore stated that while Singapore is “resource deficient” the nation is using policy interventions such as economic instruments to conserve resources and promote energy efficiency. The 3Rs are still in their infancy in the Asia-Pacific region, therefore there is significant potential for resource efficiency gains and opportunities to “co-optimize” energy flows, material flows and people flows. There is much potential to use technology to support and enhance 3R efforts. For example, the burgeoning sharing economy illustrates

how technology can be used to make resource use more efficient. Technology can increase the optimization of resource utilization. Demographic shifts mean there is increasing willingness to share or rent rather than purchase new products. Technology can have both positive and negative impacts. Much innovation is occurring in “silos”; technology needs to be applied horizontally and cooperatively. Scientific input is required to enable complex recycling as hybrid materials are harder to separate. Design processes need to plan for eventual disassembly.

20. Dr. Nguyen Trung Thang of Viet Nam shared the ongoing work on the assessment of the “State of 3Rs in Asia and Pacific”. The objective of the assessment is to provide a knowledge base to assist member countries of the Regional 3R Forum in monitoring the status of implementation of 3R policies and programmes in response to the goals of the Ha Noi 3R Declaration (2013–2023). The assessment exercise aims to produce country reports (currently covering eleven countries) and a synthesis report as technical inputs to policy consultations at the Regional 3R Forums. Some participating countries have expressed interest in making voluntary contributions towards the State of the 3Rs reporting process by becoming members of the drafting committee. To this regard, countries were asked to submit their formal expressions of interest to the Secretariat of the Regional 3R Forum in Asia and the Pacific at UNCRD.

Need to harness multiple benefits of circular economic development approach in achieving the SDGs under the 2030 Agenda for Sustainable Development

21. The Forum noted that the cost of not harnessing the full potential of the circular economy could be vast, leading to supply constraints and economic problems. There is a close linkage between circular economy and achieving the SDGs; the loss of embedded energy and materials is astounding and information available on these issues is poor. The economics of recycling are not good as externalities are not generally accounted for. It is important to consider demand-side interventions as well as supply-side ones. Some countries and cities (e.g. Denmark and London) have put circular economy policies in place and are seeing economic development opportunities as a result. Switzerland is encouraging dwellings to be built to last 100 years; they have high upfront costs but achieve better sustainability. One delegate suggested that circular economy success stories be gathered together and made into a compendium to be shared with governments. Information gaps were also noted to be one of the challenges in this region. While there is still a paucity of data on waste flows, we already know enough to act in recommending policy solutions. It is important to include manufacturers in discussions of circularity. By integrating whole material cycles it is possible to model waste reduction strategies and reach policy solutions. The final remarks for the session noted that the fundamental issue at stake is that resources are finite. Past generations lived more sustainably. We need to come back to the ancient mindset of sustainable living. All of us are actors in this.

IV.3R and resource efficiency towards building resilient cities and societies under the 2030 Agenda for Sustainable Development

The critical nexus between waste management and the resilience of cities and communities needs to be understood at policy level

22. The background paper presented by Professor C. Visvanathan of the Asian Institute of Technology, Thailand, argued that long-term 3R and resource efficiency vision and policy are essential success factors for enhancing the resilience of cities. Preparedness and appropriate selection of policy that aligns to local scenarios greatly raises the resiliency of cities, as well as the effectiveness of long-term planning. Several comparative cases including Cambridge, Singapore and Gothenburg have showed effective resilient city transformations using such aligned local scenarios. Professor Visvanathan introduced four essential elements of a resilient city, constituting networks that lead to long-term planning, resilient thinking and technological integration, 3R and resource efficiency integration, and institutionalization and adoption of technology.

23. Mr. Shigemoto Kajihara, of MOEJ, stated that one of the most important achievements of the Toyama Framework on Material Cycles adopted in 2016 by the G7 countries is a recognition of the potential of the 3Rs and resource efficiency to achieve the common goal of realizing a society which uses resources efficiently and sustainably across the whole life cycle so as to remain within the boundaries of the planet. Three goals of the Framework on Material Cycles, namely domestic policies for resource efficiency and the 3Rs, global resource efficiency and the 3Rs, and transparent follow-up processes, which will lead to improved resiliency of cities, were outlined. Implementation of the Toyama Framework will help to realize a resilient society. For instance, Japan facilitates environmentally sound disaster waste management to respond to the frequent occurrence and aggravation of natural disasters, by appropriate treatment and recycling of large amounts of disaster waste, by developing waste treatment facilities resilient to disasters, and by facilitating the utilization of the facilities as energy supply hubs.

24. Mr. Ananda Ram Bhaskar, Director-General of the National Environment Agency of Singapore, showed that the Singapore has instituted the Sustainable Singapore Blueprint 2015, which aims for a zero waste nation and a vibrant and sustainable city. Singapore's activities in the 3R domain include solid waste management, 3R and resource efficiency covering minimizing land-use, curbing waste growth towards zero waste, prioritizing approaches that improve solid waste management, and maximizing resource efficiency.

25. The Forum discussed that continuity and sustainability of 3R and resource efficiency policies and programmes is important, therefore, the political leadership and political will of changing leaders have great influence on such sustainability. The Forum recognized that the city is where actions are happening, where most resources are consumed, where partnerships among different stakeholders are occurring, and where communications from government

(local) to the community are most effective (more so than from than central government). Resilient and healthy urban policies will be more concrete, helpful, and effective as these stakeholders can share knowledge and policy experience among networks of cities.

26. The Forum recognized that while developed economies focus on efficiency, there is a lack of resources to achieve full 3R, resource efficiency, and sustainable waste management implementation in some developing economies. There is a need for capacity-building and programme prioritization to best use limited financial resources. Governments can incentivize many quantifiable benefits of 3R and resource efficiency and align them to private sector investment targets; thus, putting in place public-private partnership schemes.

3R and resource efficiency measures can provide many complementary benefits in making the cities and societies resilient

27. The Forum notes that substantial co-benefits in saving resources, avoiding waste and enhancing resilience can be achieved in cities through the application of 3R policies in an urban context. Promoting 3R policies and practices in urban areas can create co-benefits for environmental outcomes and regional economic development, creating employment opportunities and reducing inequality. Through improving economic development, 3R policies indirectly contribute to achieving the SDG outcomes of poverty reduction, creating access to important services and provisions and raising the material standard of living of urban dwellers.

28. The Forum emphasized the importance of multi-stakeholder collaboration and participation at the local level to enable 3R opportunities and local economy revitalization. Increased waste generation and land scarcity, such as in the case of Singapore and many Japanese cities or in small island states, require strong 3R and resource-efficient strategies. 3R policy efforts in Singapore highlight that feedback loop analysis, solving problems at source, and providing the right incentives are key approaches to reap further resilient city benefits. It was acknowledged that in Southeast Asian economies, many 3R and resource efficiency initiatives such as fly ash symbiosis and organic residue composting have provided significant monetary benefits to the community, and to city residents in general.

29. The Forum also looked at the special situation of the vast amounts of additional waste that are generated by natural disasters such as earthquakes, heavy winds, flooding, coastal storm surges and fire. These unexpected additional waste flows overwhelm existing waste management capacity. This has been an increasing problem in Japanese cities and many other cities in the region. Risk management plans and disaster clean-up strategies need to include planning for waste management and waste recovery strategies in the event of natural disaster.

Need for policy and institutional shifts for integrating 3R and resource efficiency with climate mitigation and disaster reduction strategies and measures

30. The Forum recognized that in order to align strategies, policies and programmes for resource efficiency and waste minimization, climate mitigation and disaster risk reduction, new institutional arrangements and inter-agency collaboration are needed in cities. This can be enabled through horizontal collaboration between different agencies. In this context it is important for cities to be able to rely on a national strategy that regulates how national and urban policies and plans interact to achieve optimal outcomes with regard to the different issues cities face. As an example, resource recovery from waste streams can reduce reliance on virgin resources, which often entail large energy and carbon emission footprints. Every waste stream provides opportunities for resource recovery to create new business opportunities and employment, allowing for reduced energy requirements and contributing to greenhouse gas abatement. Urban governments that actively align the simultaneous goals of resource conservation, climate mitigation and disaster risk reduction will yield a double benefit in economic and environmental terms.

31. The Forum emphasized the relevance of urban planning in the context of disaster waste management. Disaster waste requires skilled management to support post disaster clean-up and to avoid environmental and health risks. The experience of Japan, with advanced 3R infrastructure and preparation in place, showed large improvements in disaster waste management. City to city collaboration should not be limited to economic cooperation but also include resource efficiency and waste management. In case of SIDS, the private sector could look into the feasibility of using scarce land resources to facilitate the recovery of valuable recyclable waste streams, and governments should encourage community awareness for 3R and resource efficiency and resource recovery at source.

32. The Forum recognized that cities are a key element of the SDGs and a key element of the global conversation around resource efficiency and resilience. Cities are the point at which many of the issues discussed in the domain of the 3Rs, resource efficiency and the SDGs intersect and interact. Cities receive the bulk of production and are the primary point of consumption and waste generation. In cities population pressure intersects with economic interests and societal expectations. There has also been unprecedented growth in investment in cities of Asia and the Pacific, building new infrastructure that will have a lasting effect on economies and competitiveness, liveability, well-being and the environment. Cities should be the focus of multiple, complex planning exercises across economic, social and environmental dimensions to enhance their efficiency and resilience.

33. Cities also contain many elements that may generate a way forward for the 3Rs, resource efficiency and the SDGs. Cities are where many of the key actors reside, reaching critical mass, facilitating and brokering new linkages. They are places where knowledge and the potential for innovation is greatest, generated by academia, public and private sectors. Capital and other resources exist at scale. Cities are big complex systems. Every city can be viewed as a laboratory of innovation and experimentation and cities can collaborate and learn from each other. It is essential to gather these experiences and apply the learnings in the future.

34. New knowledge is required to better understand how multiple and interrelated planning processes – strategic planning, transport planning, climate adaptation and mitigation, resource efficiency and waste minimization strategies – most effectively work together to create competitive, liveable, environmentally friendly and resilient cities. Policy approaches, incentives and strategies that show the greatest promise need be identified and shared. Networks and linkages need be established and utilized to further the 3Rs, resource efficiency and waste minimization. The Forum recognized that political bipartisanship is important for maintaining long-term strategic focus for strategically important urban development projects.

V. 3R as the basis for Rural Resource and Waste Management for Regional Development

3R programmes and practices can provide an important basis for rural development and waste management under the 2030 Agenda for Sustainable Development

35. Although the contribution of the biomass-based rural economy is significant for the regional economy in many developing countries in Asia and the Pacific (contributing 7 to 30 per cent of GDP), most development opportunities and provision of public services tend to concentrate on rapidly growing urban areas. At the same time, rural areas and agricultural regions are linked with urban areas as resource and food suppliers or sometimes as waste sinks. Specific challenges include the costs of logistics and a lack of available resources for remote areas such as mountainous areas and remote island countries. Increasing agricultural waste and municipal solid waste are significant threats to sanitation and the health of the residents of rural and remote areas, often through surface water contamination or illegal and uncontrolled dumping of waste. Improving lives in rural and remote communities is vital to achieving the Sustainable Development Goals (SDGs).

36. The Forum recognized that the promotion of environmentally sound utilization of biomass resources available in rural areas is significant for sustainable regional development in many ways: as a source of energy, to create job opportunities, to ensure the competitiveness of farming by providing additional income, and in protecting the rural natural environment. Thus, the Forum recommends that rural and regional development policies need to incorporate the concepts of resource efficiency and low-carbon development. Considering the importance of biomass resources for rural areas, as a source of energy as well as for income-generation, the sustainable, efficient and environmentally sound management of such resources should be ensured. Thus, policy development and international technical assistance is needed to promote the circular use of available biomass, contributing to sustainable rural development.

3R programmes and practices can provide circular economy opportunities in rural areas of Asia and the Pacific

37. The Forum acknowledges that in the context of rural and remote areas, a decentralized approach to the reuse and recycling of biomass resources provides a significant opportunity. The Waste to Energy (WtE) market is expected to reach 38 billion US\$ by 2020. Considering the fast-rising energy demand in rural areas, there is high potential for a WtE market. Biomass resources are a stored source of solar energy and can be converted to useful bioenergy. Traditional biomass is sometimes neglected as a source of renewable energy compared to more advanced technologies such as photovoltaics. Agricultural residue such as rice straw has a large potential as a source of bioenergy using modern low-emission conversion technologies. The example of India shows that 70 per cent of the rural population depends on traditional biomass for its energy needs. Power generation using biomass feedstock is a large industrial sector in rural areas of India, with more than 10 million man-days employment. The Forum acknowledges that there are various ways to overcome barriers to promote environmentally sound biomass utilization, such as national action plans, economic incentives such as preferential tariffs for biomass utilization, cooperative initiatives, technology standards for biofuels, and investment into R&D. The economic utilization of biomass waste has positive implications for SDG outcomes including GHG reduction and rural development.

38. In addition, the high proportion of organic content in municipal solid waste (MSW) provides opportunities for composting and nutrient recovery and can be an effective means of implementation of the 3Rs for MSW in developing countries. Composting has various benefits including waste to resources, waste reduction for final treatment, revenue generation from selling the compost, job creation, improving soil quality through nutrient recycling, and awareness-raising for pursuing a clean and green environment. Composting can be promoted through both decentralized small-scale approaches and centralized approaches. A decentralized small-scale approach is labour-intensive and needs community participation but is applicable in both urban and rural conditions. For example, Surabaya in Indonesia could reduce the amount of waste for final treatment of MSW by 30 per cent in 5 years by promoting composting. The Forum recognizes that the involvement of the community and political leadership are key factors for the success of composting as one of the means of the 3Rs.

39. The Forum stressed the importance of reaching a good balance of biomass waste utilization for energy security, food security, and natural environment conservation to achieve the best outcomes for economy and the environment.

Asia-Pacific countries need to strengthen policies, programmes and institutions to enhance the circular economy of rural and biomass waste

40. The Forum concluded that for biomass waste utilization, country-specific solutions are required. At the same time, it was found that there are several useful policy approaches to enhance circular economic utilization of rural and biomass waste. Firstly, the establishment of policy frameworks for the 3Rs will help countries to respond to increasing pressures from different and emerging waste streams. Secondly, it is important to select appropriate, simple

and affordable technologies and to employ a decentralized approach for biomass utilization. Life cycle analysis (LCA) can help to improve decision-making. Waste segregation can also help to ensure the effective implementation of such technologies. Thirdly, based on the nature of different waste streams, an appropriate geographical scale of material circulation can be examined and promoted. Fourthly, it is important to have the right mix of policy incentives. For example, to ensure composting as the right way to treat organic waste streams, it is important to promote organic farming and to collaborate with businesses and, at the same time, to ensure the elimination of subsidies for chemical fertilizers. Finally, encouraging business investment is key. Innovative financial policy approaches, such as a Corporate Social Responsibility (CSR) fund to use 2 per cent of total income of large companies to reinvest in sustainable rural development, could be useful.

VI. Evolution of 3R technologies and practices through private sector initiatives

3R technologies are key enablers for creating sustainable business opportunities towards economic success of the Asia and the Pacific

41. Asian and Pacific countries have achieved economic growth fuelled by massive extraction amounts of natural resources, mass production, mass consumption and mass generation of waste. As a result the region is facing numerous difficulties such as local resource scarcities, land scarcity, limitations for waste disposal and climate change. 3R technologies are key enablers not only for sustainable development, but also for creating sustainable business opportunities to further the economic success of the Asia and the Pacific. It was also shared that a 3R based economy is not following a pure market-based approach, but requires additional legislative frameworks and rule sets to operate properly. The experience of South Australia's recycling, remanufacturing and waste sector shows that it created 4,800 new jobs in recycling, remanufacturing and waste management and has a \$1 billion turnover per annum and this value is expected to double over the next decade.

42. Another example of best practice for creating 3R business opportunities is how a Japanese private company, Kaiho Sangyo, enabled innovation in reuse of automobile engines to create a profitable business. To avoid complications of reusing old automobile engines and create a sustainable business, the recycling company came up with an easy to understand certification system called Japan Reuse Standard (JRS) and PAS 777. This standardization increased the rate of used automobile engines and diverted old engines from being disposed of in landfill. Dowa Eco-System, another Japanese private company, demonstrated how a polluting mining company could transform itself into a green business and make profits in doing so. Instead of mining black ore, they are now recycling e-waste and have developed a new furnace which can process secondary metals effectively.

Government policies and programmes should provide a favourable regulatory framework and environment that ensures full recovery of costs invested by private and industry sectors on 3R technologies

43. Governments can create a business environment for 3R businesses by providing policies and programmes which are favourable to investment in 3R technologies. The South Australian experience has suggested that focus should be placed on six factors supporting the 3Rs. These factors include policy (strategy), governance (which includes legislation and compliance), economic factors (financial levers), a systems approach, technologies that fit the purpose, and education and awareness initiatives (to support behavioural change). Some countries such as Japan and the Republic of Korea have introduced EPR-based regulation, which ensures the full recovery of costs invested by the private and industry sectors for developing recycling technologies.

International joint ventures, public-private partnerships (PPPs), and international collaborative research programmes are crucial for promoting 3R technology research and development

44. A critical part of government strategy is to promote research and development, mobilize greater investments and build institutional capacity in adapting new technologies towards resource efficiency. Information sharing at regional and international levels is crucial to bridge gaps between countries in 3R-related capacity and technical know-how. Similarly, the private sector and companies could benefit from international joint ventures in terms of technology transfer and transfer of business models.

45. The Forum noted that policies for promoting proper waste treatment and recycling in developing countries could attract foreign direct investment to developing countries. For instance, Kaiho Sangyo and Dowa Eco-System Co. Ltd. presented their experiences about investing in foreign countries.

46. The Forum also took note of the 3R award system established by the Government of Maldives and how it has helped the private tourist resorts in introducing various 3R technologies. In response to the Malé 3R Declaration (2015), private tourist resorts have introduced various 3R initiatives for protecting the fragile marine environment and ecosystems. The initiatives include upgrading environmental management systems, replacement of conventional lighting with energy-efficient lighting, waste segregation, improved and temporary safe storage, introduction of a plastic reduction policy in the resort management system, and composting activities, among others.

Countries need to recognize the importance of triangular cooperation (government-private sector-scientific and research organizations) in advancing 3R research and development (R&D), technology transfer and technology evaluation

47. To advance 3R technologies, triangular cooperation is key. Well-designed legislation, sound investments, standards and accreditation systems are essential ingredients to create markets for environmentally friendly products. Similarly, national standards, which generate consumers' trust in recycled products, could drive the economic success of recycling technologies and businesses. A number of governments have supported 3R promotion by developing product standards for easy recycling and reuse. For instance, an Australian experience, where private companies in partnership with research partners promoted tyre recycling, showed that with proper partnerships and a quality product in place, a recycling business can make profits and create new jobs.

Conducive policies, regulations and guiding frameworks are key to encouraging private banks, domestic and foreign investment funds in 3R technology development

48. The Forum noted that appropriate regulatory frameworks and government incentives are key to facilitating 3R technology development by attracting investors, entrepreneurs and innovators. The South Korean experience shows that with a clear target of recycling set by the government and supporting measures in place private investors can be attracted to 3R business.

49. The Forum stressed the importance of a potential pathway to work towards developing an ideal framework for implementing 3R technologies which encompasses policy, governance, finance and R & D. Another important aspect which was discussed was the need for the involvement of local communities to make various private and government sector sustainability initiatives a success.

50. An update on the ELV (end-of-life vehicle) sector in Japan was provided and several sustainable technologies being implemented by local industries for processing ASR were highlighted by the panellists. In addition, the possibility of implementing such technologies in regional and remote areas and developing countries through the micro-factory approach being developed by the SMaRT centre, UNSW (University of New South Wales) was shared by the panel.

VII. Greening SMEs towards resource efficiency and circular economic development

Greening SMEs is critical for circular economic development under the 2030 Agenda for Sustainable Development

51. The Forum noted that in many countries in Asia and the Pacific SMEs covered around 90 to 95 per cent of business activity, making a very large contribution to economic development. For example, SMEs in India contribute 38 per cent of GDP, 40 per cent of exports and 45 per cent of manufacturing outputs. However, resource efficiency in most SMEs is low. Typically, in many circumstances 50 per cent of waste from SMEs is directly sent to landfill. In addition,

SMEs also dominate the recycling sector and because of technologies employed pollution problems are often greater than they would be if 3R principles were to be implemented in SMEs.

52. The 2030 Agenda for Sustainable Development attaches importance to circular economy, which will require a substantial contribution from, and cannot be achieved without, SMEs. The Forum recognized greening of SMEs as critical for circular economic development. It would also enhance the eco-competitiveness of SMEs, creating green jobs and helping to promote inclusive social-economic development.

Governments need to assist SMEs to integrate resource efficiency into their entire supply chain through appropriate policy, institutional and financial measures and partnership mechanisms

53. SMEs operate in large parts of the supply chain in various industrial sectors and often lack technical know-how, infrastructure, human and financial capital. Governments' policies and programmes need to be designed to enhance capacity of SMEs to integrate resource efficiency and waste minimization principles and practices into their entire supply chain, enabled by appropriate policy, institutional and financial measures and partnership mechanisms.

54. The Forum took note of the fact that many SMEs face difficulties in adopting cleaner production technologies and finding markets for green products. Government leadership and support is crucial in order to share information on technologies for SMEs and set up centres to facilitate the demonstration, dissemination and adoption of technologies. Such facilitation centres could provide technical advisory services to assist SMEs in choosing green technologies and implementing 3R practices.

55. Governments can also play a role in creating recycling facilities for different industrial clusters. These recycling facilities could provide training to SMEs to enhance the knowledge base for recycling. A green technology fund, which could be set up by the governments to finance green technologies and to lower investment risks of new technologies, could be a means to drive a transition towards the 3Rs in SMEs.

56. The Forum noted that there were already many SME support programmes in the Asia and the Pacific region. The Republic of Korea, for instance, has enacted recycling regulations and established collection and transportation infrastructure systems for recyclable waste. Japanese local governments carry out awareness programmes for citizens and business to enhance collection of recyclable wastes for private recyclers. The National Manufacturing Competitiveness Programme for MSMEs in India supports the adoption of cleaner and energy-efficient technologies for SMEs. Cleaner production centres have been established with support from UNIDO, UNEP and other donors in various countries such as Viet Nam, Indonesia and China, among others. Financial support for the greening of SMEs exists in Thailand, Indonesia and other countries, often supported by international donors.

Governments can facilitate various information-based instruments (e.g. product labels) in raising awareness of both consumers and SMEs on the needs and benefits of greening the supply chain

57. The rise of information and communication technologies provides large scope for digital media in raising awareness of all stakeholders including consumers, suppliers and SMEs on the need for, and potential benefits of, greening the supply chain. The Forum noted examples such as eco-labelling programmes and green public procurement programmes in Japan, South Korea, Thailand, Singapore and other countries. These programmes have created opportunities for SMEs to find demand for recycled goods. The Global Ecolabelling Network (GEN) encourages countries to create national eco-labelling programmes in line with international standards.

58. New initiatives that align digital technology with social networks such as the Australian Advisory System for Processing, Innovation and Resource Efficiency (ASPIRE) are good examples for innovation in sharing information and exchanging waste. The ASPIRE programme is supported by local governments. Similar digital platforms for online waste information exchange programmes could offer a viable opportunity for other countries of the region to maximize the utilization of waste in line with 3R principles at a low cost.

Government-to-business, business-to-business, and industry-to-industry cooperation are crucial to increase the role of business and trade associations towards greening entire operations and supply chains

59. To green supply chains, collaboration between government and businesses, business and business, and industry-to-industry are key. This will synergize various efforts made by government agencies, businesses and industry. Creation of a best practice manual for collaborative frameworks was recommended by the panel members. Collaborations may include international organizations to harness technical and financial support for SMEs. The Forum also recognized the importance of dialogues between the private sector, government agencies and citizens in shaping up government policies and programmes, strategizing investments by the private sector, and in raising public awareness

60. Examples of industry-industry cooperation in India were shared. The Waste Minimization Circles programme provides opportunities for SMEs to share their experiences to improve pollution control and resource efficiency. One hundred and fifty-eight waste minimization circles have been established in India with the aim of reducing water and energy consumption, improving resource efficiency and reducing waste generation.

VIII. Major Achievements and Initiatives by Countries on the Implementation of Ha Noi 3R Declaration (2013–2023)

61. The progress so far reported by the participating countries shows the following lessons. Firstly, the Regional 3R Forum in Asia and the Pacific helps to mainstream 3R policy in member countries. Secondly, there is a steady progress in legislation and policy development and its implementation based on different priorities of countries such as source separation, disaster waste management, waste-to-energy technologies, packaging recycling, and medical waste management. Setting clearer vision, strategy and policy objectives, and planning follow-up are key to achieving steady progress in 3R policy development and implementation. Countries face several major challenges for effective 3R policy implementation. Often there is a challenge caused by lack in coordination among different ministries and local governments. Although 3R policy should be linked with development of appropriate infrastructure, countries often lack financial resources to invest in such infrastructure. However, gradual preparation and investment into appropriate facilities are observed in the region. Collaboration among stakeholders, especially participation of citizens and awareness-raising, is still to be strengthened. For 3R policy promotion, the establishment of stable recycling markets and industries is necessary, either within domestic markets or for the possible export of recyclables in an environmentally sound manner.

62. **Afghanistan**: Afghanistan has introduced a Solid Waste Management Plan (SWMP) for municipalities, developed with the support of USAID and other donor organizations. The country still requires additional support to strengthen existing capacity for 3R implementation and to fill existing capacity gaps. New projects to improve waste management and sanitation are going to be implemented in 12 major cities of Afghanistan. The selection and design of landfill sites has been achieved for 20 municipalities. The National Comprehensive Agricultural Development Program 2016–2021 aims to reduce food losses and target recoverable waste streams in the overall food supply chain. There are decentralized composting plants located in three cities (Kabul, Balkh, Herat). Challenges such as low public awareness, low institutional and governance capacity, and a lack of funding and engagement of private investors for 3R activities remain and need to be tackled in the future.

63. **Australia**: In Australia, waste management is primarily the responsibility of state and territory governments, while the national government's primary role is to ensure that Australia is able to meet its international obligations on waste. A key national approach has been through extended producer responsibility and in particular the Product Stewardship Act 2011. A number of products are managed by industry through EPR including used oil, televisions and computers, used paint and used tyres, with a number of other products and materials under active consideration such as micro-beads, PV panels, oil bottles, and batteries. Major challenges include reaching agreement on priorities and desired outcomes, and system design issues such as data measurement, participation, responsibilities, funding and monitoring and reporting.

64. **Bangladesh**: The National 3R Strategy for Waste Management was launched in 2010 and aimed to achieve the complete elimination of waste disposal in open dumps, rivers and flood plains by 2015. The strategy promotes recycling of waste through mandatory collection and

segregation of waste at source, to create a market for recycled products and to provide incentives for recycling of waste. Pilot initiatives in line with 3R strategies in different programmes and projects have also been implemented. The Seventh Five Year Plan (2015–2020) includes 3R/4R strategies and programmes for waste management and low-carbon sustainable development. Challenges in Bangladesh include the lack of proper collection, transportation, and treatment capacity for waste, a lack of legal arrangements and rules for solid waste management, lacking public awareness and lack of involvement by the private sector. Enhanced research and development as well as capacity-building is also needed. This needs to include a business case for recycling of waste streams to enable the engagement of the business community to create businesses in the recycling and waste management sectors.

65. **Bhutan**: The Waste Prevention and Management Act and Regulation of 2012 stipulates the promotion of 3R principles. Economic incentives such as a green tax and community initiatives for 3R have also been introduced. Critical challenges in Bhutan include weak enforcement, limited financial resources, lack of waste management infrastructure, and weak coordination among institutions and government agencies. Public participation in Bhutan is inadequate and market-based policies are needed to encourage 3R initiatives. A few districts and towns are implementing public-private partnerships for integrated solid waste management where segregation of waste is carried out. High levels of organic content of municipal solid waste indicated opportunity for recycling organic waste and therefore a few compost plants have been installed. Making roads out of plastic and making egg trays out of waste paper are two examples of initiatives. Bhutan will amend its waste prevention and management regulations and invest in a Zero Waste Project, and create new incentives for private business engagement in the waste sector.

66. **Cambodia**: Has developed a set of policies and legislation including the Government National Green Development Policy, the National Industrial Development Policy, the National Housing Policy, a Sub-Decree on municipal waste management, a Sub-Decree on e-waste and a Coastal Development Policy, as well as provincial and municipal master plans in the areas of waste management and recycling. Cambodia has expressed the need for improved technology, human capacity strengthening, and knowledge and financial resources to promote and manage 3R-related initiatives. The future plan includes drafting a sub-decree on plastic waste management, encouraging foreign investors to work on waste-to-energy projects, and developing a master plan on national waste management.

67. **PR China**: China has made great achievements since the law promoting circular economy was issued in 2008; the circular economy has already transformed from concept to practice. In the 12th five year period resource productivity increased 15 per cent, about 160 circular economy implementation models have been explored in different enterprises, sectors and industrial parks, energy consumption per unit of GDP decreased 36 per cent, water consumption per unit of industry added value decreased 60 per cent, and an integrated policy supporting system has been established. China plans to implement circular reform in 600 industrial parks in 2016–2020, including creation of a common energy supply centre, and

shutting down high pollution, low efficiency furnaces, establishment of common pollution treatment facilities, and optimizing the organization of material and energy flows. A differential pricing policy will require industries with high rates of pollution and consumption to pay more if they exceed certain quotas.

68. **India:** The Government of India has launched an ambitious programme called Swachh Bharat mission (clean India mission) with a general philosophy around 5R (Reduce, Reuse, Recycle, Recover and Remanufacture). The objectives under solid waste management includes conversion of over 65 per cent of waste to wealth, 20 to 25 per cent to the recycling industry and less than 10 per cent to landfill. Under this programme, the Government of India provides up to 35 per cent grants for setting up waste processing plants. Also solid waste management rules have been notified, mandating segregation of waste into three streams – biodegradable, dry waste, and domestic waste. The Government of India has notified rules regarding the management and handling of plastic waste e-waste, construction and demolition waste, and hazardous waste. For full-scale recovery of resources from waste and to encourage private sector participation in the waste management sector, the Government provides market development assistance of US\$25 per MT on the sale of compost to scale-up setting up of compost plants. Moreover, the Government has notified a generic tariff for waste to energy of US\$0.12 per unit of power for MSW and US\$0.14 per unit for RDF based plants. As per the tariff policy, all state power distribution companies have to compulsorily purchase the power generated from waste-to-energy plants. In the recycling sector, under new rules brand owners who sale/market products which are non-biodegradable should put in place a system for collecting the packaging waste generated. Moreover for promoting the recycling of construction and demolition waste, the Bureau of Indian Standards has notified standards for use of recycled concrete aggregate derived from C & D waste for use in the construction sector. Challenges in this sector include the rapid development of waste processing facilities in the country, as well as ensuring behavioural change among the public to adopt lifestyles based on 3R concepts. The Indian Government is committed to the philosophy of 3R.

69. **Indonesia:** Has promoted and implemented 3R programmes through the Bank Sampah mechanism, EPR Policy and community-based composting, as well as building and operating recycling centre facilities. The Presidential Regulation on National Policy and Strategy on Solid Waste Management 2016–2025, and implementing the 10-yearly road map for EPR Policy promotion and implementation 2013–2022, are also important towards waste reduction. Challenges faced include the need for more financial support and information on best available technologies, and the lack of law enforcement and participation of public-private partnerships in recycling programmes.

70. **Japan:** Japan announced that the G7 environmental ministers adopted the Toyama Framework on Material Cycles in May 2016 to establish a common vision and to mainstream resource efficiency and the 3Rs as a global agenda. Japan recently updated its “basic policy” on target setting for municipal and industrial waste management and improving policy on disaster waste management under its waste management law. Also, Japan recently developed

guidelines for PV recycling, responding to increasing installation of solar energy facilities, as well as updating three basic indicators for a sound material cycle society.

71. **Kazakhstan**: Kazakhstan presented its first ever country report at the Regional 3R Forum. Through a Presidential Decree, Kazakhstan has commenced its transition to a green economy with an Ecological Code in place by law. A “road map” is being developed including separation of municipal waste, packaging, hazardous waste, food waste. An Extended Producer Responsibility scheme is in place as a pilot for end-of-life vehicles. Challenges include lack of waste management infrastructure and the absence of products for secondary markets. Future efforts will focus on developing national standards for small to medium enterprises that operate in the waste management sector, establishing infrastructure and waste sorting technologies, and expanding the EPR scheme. Kazakhstan adopted a policy for transitioning to a green economy on 13 May 2013. Along with the implementation of separate collections, re-cultivation of old landfills and extended implementation of EPR, government standards have been developed for waste management including paper waste, oil waste, and electrical equipment and batteries, which are sent to the market for recycling. One challenge faced by Kazakhstan is the lack of available recycling and processing technology.

72. **Kiribati**: The National Waste Management Strategy developed by Kiribati in 2008 is still in the process of endorsement, but uses the 3Rs concept as the strategy’s guideline. Revision of the draft is needed to consider other emerging waste issues such as health care waste and e-waste. The Kiribati Integrated Environment Policy (KIEP) identifies waste and chemical management as key thematic areas that require national attention for implementation. Challenges faced include a lack of funds for sustainable financing of solid waste collection and disposal, limited government budget, the lack of national capacity and absence of proper solid waste management technologies at a national level.

73. **Kyrgyzstan**: Kyrgyzstan attended the Forum for the first time.

74. **The Republic of Korea**: 3R policies are at very mature stage in the Republic of Korea. Only 16 per cent of wastes are now landfilled, 59 per cent MSW is recycled and 25 per cent is incinerated whereas 96 per cent of MSW went to landfill in 1982. Out of total waste generation about 85 per cent is now recycled in the Republic of Korea. The country has changed its waste management system to a resource circulation society. The country has an ambitious plan of zero land filling by 2020 and the framework of resource circulation will apply from January 2018. For its waste reduction policy, the Republic of Korea has implemented a “Volume-based waste fee system”, a unique nationwide “Pay as You Throw system”, which has an important role in encouraging households to reduce waste discharge, and the Industrial Waste Reduction Program to encourage businesses. The Deposit-Refund System is under its reuse policy, and EPR, Eco-Assurance and Collection and Treatment of Agricultural Waste systems are recycle policies with take-back obligations on producers. The framework act on Resource Recirculation enacted on 19 May 2016 will be enforced on 1 January 2018. The Republic of Korea aims for zero landfill of recyclable resources, will

reinforce policies to support recycling businesses and create recycling markets, and provide policy instruments which support recirculation.

75. **Lao PDR:** Plans for 3R implementation fall under the Environmental Sustainable City Guideline, but face major challenges such as a lack of policy and legislation for 3Rs promotion, and a lack of technology for recycling. National policy frameworks need to be strengthened and expanded to shift the emphasis from an end-of-pipe approach to an integrated resource management approach. At the local level, the 3Rs need to be integrated into waste management strategies and action plans for municipalities; these need to be developed and implemented especially in Vientiane and other big cities. A sound solid waste management system is to be established in harmony with city government and development by 2030.

76. **Malaysia:** Malaysia revised its National Solid Waste Management Policies in 2016, clearly stating that solid waste management in Malaysia must be managed according to a waste hierarchy. The goal of the National Solid Waste Management Policies is to achieve a 40 per cent reduction in waste going into landfill. The policies reduce the burden on landfills, as well as greenhouse gas emissions from landfills in Malaysia. Moreover, the policies aim to achieve a 38 per cent reduction in greenhouse gas emissions from solid waste disposal by 2020. Also, source separation has been introduced as a mandatory policy under enforcement since June 2016. Various challenges still exist, such as interministerial coordination, high waste management cost, inadequate facilities, and low public awareness, for effective implementation of 3R policy.

77. **Maldives:** Has launched a national initiative under the title “Saafu Raajje” in order to implement the national waste management policy with specific considerations put on 3R implementation. Achievements include a national waste management policy and the establishment of the Malé 3R Declaration of private resorts (a declaration targeted to the Maldives tourism industry). Initiatives have been taken on awareness campaigns, training and educational programmes, partnerships created between various organizations and MEE. One major objective is the introduction and application of the 3R concept throughout the country. A regional waste management system has been created that includes community-based systems to manage waste at islands level and a regional system for treatment and final disposal as well as a transport network for the transfer of residual waste. Challenges that have been detected include insufficient funds, geographical situation and islands sizes, lack of or limited technical capacity and lack of awareness on waste management in general, both among the public and within the government. Projects under implementation include waste management systems, a waste transport network and a hazardous and chemical treatment system. Projects in the pipeline are clean environment management, the largest waste management system ever to be created in Maldives, starting a recycling facility and strengthening the legislative framework. There will also be a master plan about community-based waste management systems, training and capacity-building at the EPA, establishment

of a proper collection service and a national awareness campaign for good practices, as well as introducing a 3R Award for resorts.

78. **Marshall Islands**: Some achievements in solid waste management have been made, including starting green waste composting and making paper into briquettes. Activities today include pick up from landfill, compacting, purchasing from collectors and storage in containers. There are problems with land scarcity, closeness to residential areas, potential threats to the marine environment, high costs to build and to operate, and that the current landfill is non-compliant. Therefore they have created a new landfill.

79. **Mauritius**: Mauritius currently has one engineered landfill, where landfill gas is recovered and compost is produced, as well as five transfer stations, which the country aims to develop into resource recovery centres. E-waste is a growing concern, growing in volume, but currently there are only two dismantlers. The Government has cooperated with the EU to develop a national EPR system for e-waste management and they have identified a Producer Responsibility Organization. Mauritius is also currently developing a national waste recycling and resource recovery strategy. An interim storage facility for hazardous waste has been constructed, before it gets exported. Mauritius is also looking at opportunities to promote industrial symbiosis and has lodged an expression of interest for used tyres. Challenges mentioned included difficulties in raising financing and in the proper allocation of risk between the public and private sectors.

80. **Mongolia**: For effective implementation of 3R policy, Mongolia faces various challenges such as a lack of financial resources, lack of specific 3R policies and legislation, and the significant role played by the informal sector. Recycling in Mongolia is mainly operated by the informal sector and recyclables are usually exported. Therefore, there is strong awareness of the need to update 3R-related and waste management policies to meet emerging waste challenges.

81. **Myanmar**: Myanmar has developed the National Comprehensive Development Plan and one of its strategic aims is to safeguard the environment and resource base. Under waste management, reducing plastic use and greening are encouraged through government advertising and raising awareness. Specific policies and regulations have not been made in some areas, but a programme for the formulation of a Green Economy Policy and strategic framework have been started with the assistance of the World Wide Fund for Nature. The challenges faced by Myanmar include low levels of technology and public awareness, the lack of financial mechanisms and the need for coordination and cooperation among stakeholders.

82. **Nepal**: The achievements include pilot projects on WM strategic plans in more than 25 municipalities. Examples are inter-municipal cooperation in areas for effective waste management such as strengthening municipal capacity in 3R, establish basic infrastructure for recycling, promotion of 3R activities at the local level, behaviour change of people for 3R

and efforts to improve financial sustainability in SWM. Universities have integrated solid waste management in their academic curricula. There has been various training for communities regarding waste handling, reuse, recycling of organic and inorganic waste including composting and other recycling options of different waste material. The critical challenges are matters of implementation such as weak institutional capacity, rare use of innovative technology, financial sustainability, community bargaining in and around landfill sites, lack of technical human resources for better management of solid waste, lack of awareness and self-ownership and a low level of research and development.

83. **Niue:** 3R policies are at very basic stage in Niue, despite the country having a population of only 1,600 it has endeavoured to implement 3R policies. Niue has established the Niue National Strategic Plan 2016–2026 to provide a basis for economic development of the country for the next 10 years – waste is a sub-component in one of the seven national development pillars – and established a Project Management and Coordination Unit to facilitate incoming projects (waste management included). The challenges faced include human resource limitations and building capacity in-country, implementation of policies and workplans on-ground and lack of equipment, machinery and technology to successfully carry out the activities proposed. Niue has planned continuous collaboration and maintain consistency at national, regional and global level on 3R (including ongoing negotiations with donors/potential donors) for improvement, possible scale-up of current projects and establishment of a waste recovery centre for a more central and consistent approach in this sector, therefore making management, sorting, collection, storage and packaging of waste on the island more efficient.

84. **Pakistan:** Achievements include the establishment of many waste management companies that are responsible for collection, transportation and disposal. Pakistan gave examples of resource efficiency/clean technology projects such as energy efficiency, cleaner technology, composting sites, and establishment of waste management companies. There are initiatives including green jobs promotion programmes for the construction, tourism and energy sectors. The Green Office aims to green office and business practices including green and socially responsible procurement. Critical challenges for Pakistan are a lack of awareness of policies, implementation mechanisms, massive population growth, industrial development, lack of technical know-how and illegal e-waste trafficking. Waste agricultural biomass management capacities need to be built, primarily within the agricultural sector. Many farmers are illiterate and environmental education is non-existent. Pakistan's vision for 2025 includes a Five Year Plan 2013–18. This contains elements such as projects on energy from waste, urban wastewater treatment plants, and establishment of provincial cleaner production centres. Other activities include installation of composting plants and scientific landfill sites, bio-remedial measures to be adopted for wastewater treatment, and sustainable monitoring and implementation of hospital hazardous waste management. Government aims to develop more waste-to-energy projects such as establishment of waste recycling facilities, PET

recycling, generation of biogas and the identification of informal waste pickers to engage them to raise their living standards.

85. **Palau:** Has endorsed central government policies to utilize or reduce organic waste, such as composting, energy recovery and improving efficiency in food processing, under the National Solid Waste Management Plan. Challenges faced by Palau include the lack of laws and regulations and difficulty in promoting waste segregation practices. To overcome its shortage in landfill capacity, Palau promotes various recycling initiatives including scrap metal recycling, beverage container recycling, composting, and waste-tyre shredding in strong collaboration with communities.

86. **The Philippines:** The Philippines introduced the Ecological Solid Waste Management Act in the year 2000 (RA 9003), which incorporates the waste hierarchy approach to waste management with segregation of waste mandated to municipalities. Since 2007 by law all final disposal sites have needed to be sanitary landfills although the high cost of investment is a barrier in many areas. In response to this, the Government is now looking into clustering local government units and developing joint infrastructure. Challenges include lack of “political” will at the municipal level to segregate waste and a lack of technical and financial capacity of the recycling industries. There is also a lack of recycling facilities and a strong dependence on commodity markets (and prices) for sale of recyclables. The government of the Philippines has introduced an Eco-labelling programme and a Green Procurement Programme.

87. **The Russian Federation:** In the Russian Federation various layers of government have responsibilities on waste management, including the federal government, federal authorities, regional authorities and local authorities. Russia currently recycles 54 per cent of its industrial waste, but recycling rates for municipal waste are still low. The country operates 4,500 authorized landfills but a large number of open dumps also exist, which continue to operate due to a lack of alternatives. The Government has introduced a number of legislative measures aimed at promoting recycling, including a ban on landfilling of valuable components, and a licensing system for dealing with waste. The Ministry of Industry and Trade is promoting the establishment of eco-industrial parks to promote new technologies and secondary raw materials. 2017 has been declared as the “Year of Ecology”, focusing on environmental protection, with over 200 activities planned at federal level, including recycling and the promotion of 3R. Russia also plans to host the IPLA Global Forum for the second time.

88. **Samoa:** Has implemented a number of projects in 3R areas through partnerships between the government and private sectors. Under the second phase of J-PRISM Project-JICA, the main focus for Samoa is on the development of the National Solid Waste Management Strategy in line with the Regional Solid Waste and Pollution Control Strategy 2016–2026. The National Strategy will highlight 3R or 5R concepts. The Pacific Regional Waste Strategy “Cleaner Pacific 2025” will also be implemented, starting in 2017. Samoa is also in the final

year of the Shibushi City Model Project-JICA on Waste Minimization without Incineration, which focuses on composting organic wastes as part of 3R and waste minimization. Challenges include the absence of national waste minimization policies, recycling policies, strategies and regulations, limited institutional capacity, capability and inadequate government funds as well as isolation from overseas markets.

89. **Solomon Islands:** Has introduced and implemented several policies related to 3Rs such as the National Development Strategy (NDS) 2016–2035, the National Adaptation Programme of Action (NAPA), the National Biodiversity Strategic Action Plan (NBSAP), the National Climate Change Policy (NCCP), the Solomon Islands National Plan of Action (CTI) as well as reviewing strategies such as the National Solid Waste Management Strategy 2009–2014. The new policy document, National Waste Management and Pollution Control Strategy 2017–2026, has broadened its scope to encompass other waste streams such as Healthcare Waste, Hazardous Waste, Liquid Waste, Solid Waste and E-Waste. Major challenges include the availability of land for proper landfills, limited financial and human resources and the lack of technical capacity and appropriate basic infrastructure.

90. **Singapore:** Under the Sustainable Singapore Blueprint 2015 (SSB), Singapore’s national blueprint for sustainable development, Singapore is working towards becoming a zero waste nation and has set a target of a 70 per cent recycling rate to be met by 2030. Major new 3R initiatives and plans include the introduction of mandatory requirements for more sustainable packaging waste management within the next few years, and Singapore is now conducting a study to develop feasible system designs for the effective collection, recycling and management of e-waste. Singapore is also improving waste management infrastructure. Examples include: i) Integrated waste management facility – As part of the long-term plan to meet Singapore’s future waste disposal needs, an integrated waste management facility (or IWMF) is being developed. The IWMF will be equipped with several state-of-the-art solid waste treatment technologies that will enable it to effectively process various waste streams, while maximizing energy and resource recovery and minimizing environmental and land-use footprint. ii) Metals recovery facility – Singapore has also recently set up a metals recovery facility which uses magnetic and eddy current separators to recover ferrous and non-ferrous metals from the incineration bottom ash generated by Singapore’s waste-to-energy incineration plants. iii) Centralized recycling chutes in new flats – starting from 2014, all new public high-rise residential developments have been fitted with Centralized Chutes for Recyclables.

91. **Sri Lanka:** In Sri Lanka solid waste management is a responsibility of local government, which are responsible also for raising funds for this purpose, but the national and provincial governments also have certain roles and responsibilities. It is increasingly difficult to find new land for landfills, and local communities object to new landfill projects, prompting the Government to try to divert as much waste from landfill as possible. Composting has been widely promoted but there have been difficulties in marketing the compost to farmers due to quality problems. Now home composting is also being promoted, along with biogas

production. The Government has been conducting several awareness-raising activities, including education programmes and waste separation in schools, door-to-door communication campaigns and the use of street drama. Considering the difficulties in changing behaviours, the Government is also making 3R mandatory by law and as of 1 Nov 2016 it introduced a new “no separation, no collection” policy that allows local governments not to collect waste unless it is properly separated. It has also established eco-kiosks in Colombo, to be able to capture recyclable materials from households.

92. **Thailand**: The National Waste Management Master Plan (2016–2021) was approved by the Cabinet on 3 May 2016 to support Integrated Waste Management. The Master Plan applies 3R to waste management and collection systems, applies integrated technologies into waste recovery and disposal, amends and develops regulations, and facilitates public involvement. The Zero Waste Project, Government Green Procurement, and Clean and Green City Projects are ongoing pilot projects. The challenges faced by Thailand include inadequate financial and technical support, multi-stakeholder cooperation and difficulties in obtaining consistent segregated waste. Thailand is currently cooperating with UNEP to address the issue of food waste.

93. **Timor-Leste**: Timor-Leste has a 4R-Programme. In recycling there has been work on plastics, rubber and broken tyre recycling initiatives. Reuse has focused on bio-briquette production and collection of cardboard. In reduce they promote the use of biodegradable bags in reducing plastic waste. The fourth R is about returning, such as composting, returning fertilizer to the soil (nature) and collecting metals, then re-exporting them to countries of origin. There has been work on education and public awareness where “Every Friday is cleaning day” and healthy village competitions, as two examples of activities. Problems include lack of detailed site development plans, operator training, leachate collection/disposal system, storm water run-off diversion and litter control. Some profiling and compaction, small soil cover and inadequate recycling facilities. Challenges in the future are lack of expertise, and appropriate technology for waste collection, transportation and processing. Public participation and awareness has to grow and the state needs to prioritize differently. Coordination and task distribution (different institutional responsibilities) also have to be developed. Timor-Leste has already started environmental education, implementation of green school pilot projects, composting systems, and energy production. In the future they would like to promote public participation and awareness and promote foreign investment such as the development of a furnace waste melting system. Improvements need to be done on waste collection, segregation and management systems, waste stations, landfill and waste industrial systems. Applying the polluter pays principle is also a wish.

94. **Tonga**: Environmental protection is embedded in Tonga’s strategic framework and the country has introduced a number of laws and regulations for environmental protection that provide guidance to waste management and 3R initiatives, including the Waste Management Act (2005), Hazardous Wastes and Chemicals Act (2010) and the Litter Control Act (2016). Tonga has a draft waste management strategy and has adopted a number of initiatives,

including awareness campaigns (such as “Clean, Green Tonga” and the Clean Schools Initiative), PacWaste (an initiative dealing with e-waste, health care waste and asbestos), a National Implementation Plan on Persistent Organic Pollutants (POPs), renewable energy generation through biomass, and a capacity-building initiative under the J-PRISM programme. Most programmes are, however, donor-funded, and limited human and financial resources, along with limited institutional capacities and no recycling facilities, are persistent challenges.

95. **Tuvalu:** 3R policies are at a very basic stage in Tuvalu. Tuvalu has integrated waste management as a priority into the National Strategy for Sustainable Development 2016–2020 (Te Kakeega III), endorsement of the Tuvalu Integrated Waste Policy and Action Plan 2017–2026, enforcement of the Waste Operations and Services Act 2009 and drafting of the Waste Operations and Services Regulation. Awareness programmes (communities, schools and businesses) on waste management and 3R. Work closely with households on waste segregation. It has a pilot project for pig waste management and composts. Implement the Tuvalu Integrated Waste Policy and Action Plan. The country has vision and mission statements with a commitment to develop a cleaner and healthier Tuvalu for today and future generations and to develop, implement and strengthen appropriate waste strategies through concerted efforts of the Government, stakeholders and communities in order to improve the environment and the health of the people of Tuvalu.

96. **Vanuatu:** 3R policies are at a very basic stage in Vanuatu. The government of Vanuatu Developed the National Waste Management and Pollution Control Strategy (2011–2016). It has various challenges such as low levels of capacity and inadequate governance mechanisms to facilitate effective and sustainable integrated waste management, and lack of implementation of policy and legal frameworks. The future plan is to upgrade and revise the National Waste Management and Pollution Control Strategy (2016–2020).

97. **Viet Nam:** Viet Nam plans to extend the ratification of the National Strategy for Integrated Management of Solid Waste that was until 2015 to 2050, and the National Strategy on Environmental Protection from 2020 until 2030. The priorities of waste reduction, reuse and recycling are emphasized in these policies. Recent achievements have also been made through adopting legal documents on hazardous waste and medical waste management and the increased construction of new MSW treatment facilities, from 2 in 2000 to 35 in 2015. Several legal documents were recently revised to support waste-to-energy technologies, and to start a take-back scheme based on the principle of extended producer responsibility (EPR). Legislation on construction and demolition wastes is under preparation. The country also experienced a severe marine pollution incident due to inappropriate waste management by a private sector company. Challenges include obsolete treatment technologies, lack of research on waste-related issues, lack of detailed policies, and limited financial resources.

IX. Inter-municipal Network and Cooperation for 3R

Inter-municipal cooperation can enhance opportunities towards circular economic development

98. The promotion of recycling businesses within a municipality to a large extent depends on potential risks including uncertainties in the waste supply and its characteristics, price fluctuations in the purchase of waste as well as the market for recycled materials, difficulties associated with waste segregation, high costs of transportation, environmental and safety issues with the recycling industry, integration of the information sector into the formalized recycling business sector, and a lack of availability of land for construction or expansion of recycling centres. These risks can be mitigated when municipal agencies operate in the context of a national framework to promote urban recycling business. Further support can be provided by cooperation among municipalities, sharing good practice and strategies to mitigate risks.

99. Inter-municipal cooperation can further facilitate achieving economies of scale among recycling businesses, and also increases potential for creating regional recycling facilities. Achieving economies of scale not only helps in cutting upfront investment and cost of operation per unit of waste, but allows for the application of resource-efficient and climate friendly technologies, and also creates safer working environments.

Inter-municipal networking and cooperation are crucial for increasing resource recovery, recycling, remanufacturing and industrial symbiosis

100. The concept of industrial symbiosis applied in the urban context needs to be developed with an “industry mix” approach. Waste transportation is one of the major hurdles for developing regional recycling facilities. Establishing Material Recovery Facilities (MRF) in an existing industrial estate can be an attractive alternative to developing the industrial symbiosis precinct on a green field. The MRF approach helps by containing waste in the estate itself as a resource and minimizing the transportation of waste outside of the industrial estate. The promotion of the urban industrial symbiosis concept could lead to the development of joint solutions to handle diverse waste streams arising from cities and industries. For example, urban waste streams of paper and packaging wastes from industry can be handled together, enabling economies of scale. This urban- industrial symbiosis may provide a breeding ground for technological innovations and enable new business models. The adaptation of the “urban mining” concept can add feedstock for materials recovery to industrial waste flows.

Inter-municipal cooperation can offer significant solutions to manage disaster waste

101. Many municipalities do not have any basic guidelines related to disaster waste management. Because of this lack of preparedness many urban centres in the Asia-Pacific region are faced with the unmitigated impacts of frequent extreme climatic events or natural

disasters. It is important that municipalities develop comprehensive disaster waste management plans. In order not to duplicate effort, such plans should not be developed by individual municipalities but result from coordination and cooperation of municipalities that face similar problems or vulnerabilities. Such cooperation could be supported by central government initiatives to establish “Disaster Waste Management” frameworks providing clear guidelines, funding mechanisms and technical advice to cope with various forms of natural disaster events. In the case of any disaster event, this network could directly work in coordination with the municipality, and assist the affected municipality to manage the damage. In such a way inter-municipal cooperation could lead to the development of economically viable and technically feasible solutions to be adopted to manage disaster waste problems and to provide basic infrastructure for waste removal, sanitation and to improve health and safety.

X. Role of Green Chemistry in Minimization of Toxic Chemicals and Wastes

Emerging science and technologies such as green chemistry in 3Rs can provide social, economic and environmental benefits

102. Dr. Oliver Hutt of the CSIRO stressed the strategic importance of the chemical industry delivering services to many other industries and suggested that improvements in chemical processing are yielding large environmental benefits while also creating economic opportunities through saving costs and creating innovation. He presented the value of continuous flow chemistry for improving resource efficiency and reducing waste by reducing process inputs and waste and requiring less energy. He discussed important factors to facilitate 3R innovations in the chemical industry, including enhanced collaboration, changing existing business incentives, providing funding sources and risk management, all based on cultural change in the chemical industry. Harmonization of regulation across the region, changing curricula to enable new qualifications and operating across academic silos to build the next generation of scientists to contribute to green chemistry and the 3Rs, all within policy frameworks that encourage low inputs, low waste, and pollution chemistry.

103. Karin Rumar from the Swedish Chemical Agency talked about the need to enforce chemicals in products and presented the Chemicals in Products (CiP) project. Information on chemicals in products is key to sustainability but this is often not achieved and information gaps prevail. The CiP project focuses on toys, textiles, electrical appliances and building materials. Information for chemicals in products is required to restrict substances of concern, and improve registration and labelling. New standards have been adopted for certain substances, such as a standard for phthalates in China; important progress for reducing the environmental and human health impact of chemical substances in products.

104. The potential environmental, social and economic impacts from chemicals and hazardous waste are ever present. With projected population growth in the Asia-Pacific

region, goods and services that rely upon the chemicals and plastic sectors will increase significantly. In order to ensure the safe treatment and disposal of chemical waste, countries need to create policy frameworks and businesses need to employ sustainable chemical manufacturing technologies to prevent such waste.

105. Green chemistry is defined as the “design of chemical products and processes to reduce or eliminate the use and generation of hazardous substances”. Waste and pollution prevention is one of the key components of the internationally adopted “Twelve Principles of Green Chemistry”. Green chemistry focuses on the economic and environmental co-benefits of the chemical industry.

Governments can advance green chemistry in their policy and development agenda to create sustainable urban business opportunities by reducing chemicals and waste

106. The Forum noted that many countries in the Asia and the Pacific region are signatories to the Basel Convention, the Rotterdam Convention, the Stockholm Convention, and the Minamata Convention, which are all related to managing chemicals and waste and supporting green chemistry. However, the critical question of how to implement green chemical approaches in an economically feasible manner still remains to be explored. Sweden, and many other European countries, have addressed the issue of toxic chemicals and waste by restricting some hazardous substances in products. The RoHS-Directive (Restriction of Hazardous Substances) and Toy Safety Directive are good examples of such restrictions. Institutions and governance mechanisms, as well as legislative frameworks, implementation rules and enforcement mechanisms, need to be strengthened in many countries in Asia and the Pacific.

International collaborative research, financing, knowledge and technology transfer are crucial to promote green chemistry

107. Flow chemistry, i.e. creating chemical processes where chemical reactions run in a continuous flow stream rather than in batch production, has the potential to contribute to a number of SDG targets by dramatically improving a range of processing parameters including better process efficiency and reduced waste generation.

108. The Forum noted that significant knowledge gaps exist concerning which hazardous substances are found in products and therefore also in end-of-life products. “Chemicals in Products” (CiP) is a global programme developed within the framework of a United Nations Strategic Approach for International Chemicals Management (SAICM) to address this gap.

The Regional 3R Forum in Asia and Pacific should address emerging technologies such as green chemistry and nano-technology, etc., in advancing 3R and resource efficiency in the region

109. Technological improvements and innovations that allow a step change in achieving the 3Rs depend on many factors including R&D investment, research funding, information sharing, accreditation and intellectual property rights and patenting mechanisms and depend on establishing a national innovation architecture. Achievement in innovation also depends on creating a climate and culture of innovation in a country's science and business communities, and the ability to facilitate collaboration between scientists and business leaders. Innovation will not only improve environmental outcomes but will also allow for benefits of sustainable green chemical manufacturing to flow to society as a whole through improved health and safety protection. However, such benefits may not necessarily flow to manufacturing companies, which may result in a lack of investment for research and development. It will require leadership of the policy community to enhance investment incentives through well-designed policies and regulations that encourage such investment and make it economically viable and profitable. The Forum acknowledged the need to address the challenge of how to take green chemistry and its contributions from the research sector to market and adoption by industry.

XI. Public-Private-Partnerships in advancing 3Rs in Asia and the Pacific

110. A round-table between government and the private sector was organized, for the first time in the context of the 3R Forum, to promote Public-Private-Partnerships (PPPs), which may provide win-win solutions for public utilities and the private sector if properly enabled by appropriate policy frameworks. There are many examples where such partnerships have led to savings in municipal budgets, where waste management usually is a significant cost factor. The private sector, on the other hand, may use this as an incentive for creating new business opportunities by converting waste into environmentally friendly products and harnessing energy by heat recovery.

111. Such partnerships combine advantages of the private sector such as dynamism, access to financial resources and application of novel technologies, managerial efficiency, and entrepreneurial spirit, with important and legitimate social concerns and responsibilities that are held by the public sector and may include public health, environmental concerns, harnessing local knowledge and supporting job creation.

112. The Forum noted that the objectives of the round-table were well aligned with the objective of International Partnership for Expanding Waste Management Services of Local Authorities (IPLA) – a SDG partnership – as well as SDG 17, which calls for strengthening the means of implementation and effective public, public-private and civil society partnerships to achieve all Sustainable Development Goals in all countries under the 2030 Agenda for Sustainable Development.

113. The Seventh Regional 3R Forum in Asia and the Pacific provided a unique opportunity to have a productive dialogue on PPPs to advance 3R in the region. An interactive

session between government representatives and the private sector explored various partnerships and sustainable business opportunities in 3R areas. Representatives of 41 countries and 21 private companies participated in the round-table. Government representatives had the opportunity to share their specific concerns, needs and requirements, including possible investment and PPP opportunities. Private sector representatives showcased their experience, expertise and technical know-how in various areas of 3R and waste management. Participants noted the importance of including community interests and concerns when designing, implementing, and monitoring and evaluating PPPs. A case has been made for involvement of the science community to inform the design of PPPs through knowledge-based contributions.

114. Based on the success of the round-table dialogue, the Forum recommends that future 3R Forums adopt similar mechanisms to advance the dialogue and collaboration between governments, the private sector, the scientific community and the community at large.

XII. The Way Forward

115. The adoption of the Sustainable Development Goals (SDGs) by the international community and the level of ambition and commitment expressed in the 2030 Agenda for Sustainable Development provides an important reference point and framework for the future of 3R policy efforts in Asia and the Pacific.

116. In a similar vein, the Paris climate agreement and countries' commitment to greenhouse gas abatement efforts have created opportunities to harness the co-benefits of resource efficiency and climate mitigation. The 3Rs allow countries, through well-designed policies, to harness overarching synergies and avoid trade-offs in several areas of environmental and health impacts including resource depletion, climate change, water and soil quality, waste and pollution, among others.

117. Many of the objectives and targets of the SDGs are directly or indirectly supported by 3R policies that improve resource efficiency and waste management, making the 3Rs one of the most important policy instruments to achieve decoupling between economic growth, human well-being and environmental pressures and impacts. Achieving decoupling is instrumental for ensuring the integrity of the natural resource base, to enhance the supply security of strategic resources, and to operate within the absorptive capacity of ecosystems. Decoupling is hence vital for well-functioning economic systems and communities.

118. Sustainable resource management and waste management were identified by the Forum as instrumental for achieving the SDGs in the region. There are many important co-benefits for health, enhancing life expectancy and avoiding pollution-related diseases when

waste is managed well and the contamination of water bodies, air and soil, which is a problem prevalent in many countries in Asia and the Pacific, is prevented.

119. While the 3Rs contribute across many SDGs, the core contributions of 3R policies and initiatives are expected in the area of material cycles and waste and emissions, which are addressed by SDG 11 and SDG 12, and decoupling of economic growth and resource use addressed by SDG 8. In addition, the Forum identified many co-benefits of 3R policies and initiatives for regional economic development. Investing in the 3Rs helps to create competitive, liveable and prosperous urban and rural communities. The 3Rs create and contribute to new economic opportunities, and also create new employment opportunities in many regions through the distributed and localized nature of 3R activities. Investing in the 3Rs also helps increase equal opportunity and reduce inequality.

120. 3R policies that focus on material cycles, waste and emissions (the industrial and urban metabolism) contribute to enabling countries to establish circular economy opportunities across the whole economy. A focus on the circular economy requires a stronger recognition of the “whole-of-value-chain” approach, extending the waste management perspective to the whole life cycle of resources including the upstream resource requirements of traded products and services. While many countries have adopted a policy approach that simultaneously addresses resource efficiency, waste minimization and low-carbon development, other countries are encouraged to invest in such a synergistic approach. This will also allow countries to address the important issue of the resource nexus to ensure policies capture synergies and avoid trade-offs in the national and global resource circulation system.

121. The Adelaide 3R Declaration provides guidance for the implementation of circular economy principles into countries’ development and policy planning. Adopting and pursuing the policy agenda for a circular economy outlined in the Adelaide Declaration will enable countries to create national innovation systems based on 3R principles and practices. This will allow countries to harness economic opportunities that will drive the next wave of economic growth in decades to come.

122. The Forum has earned a reputation as the most important science-policy dialogue in Asia and the Pacific for the environmental and economic policy domains of resource efficiency and waste minimization. This science-policy partnership needs to be extended to other important stakeholders, including business and community leaders, to further enhance the reach and impact of the regional dialogue. This tripartite arrangement including the policy, business and research communities will create new opportunities and new relationships at national, regional and community levels for 3R implementation.

123. The Forum acknowledges the important contribution of the Expert Group to the Regional 3R Forum in Asia and the Pacific. The Forum participants recommended that the service the Expert Group provides to the regional forum, the UNCRD and countries be

enhanced by organizing a yearly meeting of the Expert Group back-to-back with the Forum and by establishing co-chairs to provide leadership and facilitate interaction among Expert Group members and with the UNCRD and government representatives.

124. While some countries have made progress in advancing institutions and governance mechanisms for the implementation of 3R policies and programmes, a conventional style of governance prevails. While the responsibility for the 3Rs often resides within environmental agencies, the responsibility and commitment of other government agencies is not always at its full potential. Countries may need to establish novel institutional arrangements to fully harness the multifaceted benefits in resource and waste management, climate and water by creating institutional arrangements that foster coordination and collaboration among government agencies.

125. Furthering the 3Rs and circular economy in Asia and the Pacific requires new knowledge based on policy research, collaboration and mutual learning among research partners based in different countries in the region. Funding for such collaborative research activities in the domain of the 3Rs and circular economy is not yet available and efforts should be made to establish an Asia and the Pacific research fund that allows such collaboration between the regional academic community to occur.

126. Another important aspect recognized by the Forum concerns information sharing among countries to provide technical assistance and policy guidance, to learn from best practice and to avoid duplication of effort. The Forum recommends the development of a compendium on circular economy bringing together knowledge, expertise, case studies and best practices from various parts of the world.

127. In order to effectively advance 3R and resource efficiency in the region, monitoring and evaluation of 3R policy implementation in the region needs to be conducted. A regular assessment of the State of the 3Rs in Asia and the Pacific, as proposed at the Fifth Forum in Surabaya, Indonesia (2014) needs to be undertaken. The State of the 3Rs report could be a collaborative and complementary initiative among member countries, the 3R Forum Secretariat and members of the Expert Group. It should aim to provide the required knowledge base to assist member countries in improved policymaking in areas of 3R and resource efficiency. This collaborative process should aim to publish synthesis reports providing assessment of progress towards the implementation of the Ha Noi 3R Goals (2013–2023).

XIII. Closing Session

128. After expressing her gratitude to the hosts, the co-organizers and the supporting organizers, Ms. Chikako Takase, Director of UNCRD, pointed out that the expanded number of participating countries indicated that the Forum was providing a valuable platform for

policy dialogue and exchange of information among all the participating stakeholders. She congratulated the efforts of the South Australian Government in promoting green industries supporting a zero waste society, which were evident everywhere in the city, and expressed her gratification that the Adelaide Declaration was adopted unanimously. She noted that the Declaration was the expression of the determination of the participating countries to move towards circular economy with the aim of achieving resource-efficient societies, and thought that it was a fitting tribute to the host city, Adelaide, and the Government of South Australia. She also noted that the Chair's Summary just adopted reflected the focused discussion held during the Forum and a clear sign of the efforts to implement the Ha Noi 3R Declaration (2013–2023) by the participating countries. She added that at the next Forum, the midterm assessment of the progress in implementation will be published as the State of 3Rs and she hoped that the Forum will continue to serve as the catalytic platform to promote 3R and resource efficiency policies and programmes.

129. Japanese Vice Minister of the Environment, Mr. Shigemoto Kajihara, expressing his deep gratitude to the hosts, the South Australian Government, and the Australian Government, CSIRO and UNCRD, congratulated the member countries of the Forum for adopting the Adelaide 3R Declaration. He highlighted the timely and significant step made by this Forum towards the implementation of the 2030 Agenda for Sustainable Development in Asia and the Pacific, with multi-stakeholders' participation. He also stressed the importance of the Adelaide 3R Declaration, noting that promotion of the 3Rs and resource efficiency is a vital factor in pursuing sustainable development, and contributes to the implementation of the Paris Agreement through Sustainable Consumption and Production, particularly in this rapidly growing region. In line with the objectives of the Declaration, he assured Japan's continuous contribution to sustainable development in the region by utilizing its state-of-the-art technologies and expertise in environmental fields.

130. Delivering the closing remarks the Hon. Ian Hunter, Minister for Sustainability, Environment and Conservation, Government of South Australia, noted the successful conclusion of the Seventh Regional 3R Forum and expressed appreciation to all the participants, while highlighting the importance of waste management and the 3Rs in meeting international climate targets. He extended special thanks to the Hon. Jay Weatherill, Premier of South Australia, the United Nations, the Australian Government, Green Industries South Australia, and the 41 participating countries for their dedication to the success of the Forum. As India will host the 2017 Forum, Minister Hunter congratulated the Government of India on their steps towards sustainable development and emphasized India's commitment towards solar technology and other renewable energies. Minister Hunter expressed that Australia's strong relationship with India is an example of how important international collaboration is in fostering a healthier and cleaner environment for future generations as we look forward to the opportunity to learn from India at the 2017 Forum.

131. On behalf of the Government of India, Mr. Saurabh Jain, IAS, Director, Ministry of Urban Development, Dr. Rama Kant, Deputy Director, Ministry of Urban Development

and Mr, Khanendra Kumar Dulichand Bhardwaj, Director, National Productivity Council officially announced that India would host the Eighth Regional 3R Forum in Asia and the Pacific in 2017. In this regard, the participants of the Seventh Regional 3R Forum witnessed a handing over from the host, Government of South Australia, Australia, to the next host, the Government of India.

132. Technical field visits were made to four different areas: (a) Tour of South Australia's resource recovery and recycling industry, (b) Tour of Barossa Valley, (c) Tour of Cleland Wildlife Park, and (d) Self-guided tour of Adelaide's clean beaches.

Annex 1
Adelaide 3R Declaration¹
towards
the Promotion of Circular Economy in Achieving Resource Efficient Societies
in Asia and the Pacific
under
the 2030 Agenda for Sustainable Development

Preamble

Asia and the Pacific is the most rapidly urbanizing and industrializing region in the world. The unprecedented scale and speed of the urban industrial transformation coupled with increased production and consumption has lifted millions of people out of poverty. However, this presents challenges for Asia-Pacific countries in the sustainable environmental management of their natural and ecological resources. At the same time, the growing volume and diversification of various waste streams has compounded these challenges. Waste management in many Asia-Pacific countries has to deal with increasingly complex waste streams including industrial waste, electronic waste, plastics in coastal and marine environments, construction and demolition waste, and chemicals that add critical dimensions to the region's sustainability. The sustainability and resilience of the region's cities, rural communities, natural environment and ecological assets has become a top priority of many policies. Future economic growth and human well-being need to be more resilient and regenerative, to phase out negative environmental, economic and social externalities towards natural resource shortages, increasing waste problems, pollution, natural disasters and the increasing frequency and magnitude of climate change impacts such as typhoons, cyclones, wild fires, heat waves, floods, landslides, and droughts, flash floods in mountainous and hilly regions, Glacier Lake Outburst Flood (GLOF), and natural fires due to thunderstorms, lightning, etc.

The Heads of State and Government and High Level Representatives of the 193 Member States of the United Nations adopted the post-2015 development agenda – *Transforming our world: the 2030 Agenda for Sustainable Development*, with 17 Sustainable Development Goals (SDGs) at its core, at the United Nations Sustainable Development Summit held in New York from 25 to 27 September 2015. The post-2015 development agenda represents a plan of action for people, the planet and prosperity and reflects the commitment of all countries to guide the world economy to a socially just and environmentally sustainable and resilient path. Through the adoption of the Agenda, the Member States call for a world in which consumption and production patterns and the use of all natural resources are sustainable. The 2030 Agenda for Sustainable Development, together with the SDGs and the Paris Agreement on Climate Change, provides an important political platform to integrate 3R and resource efficiency plans, programmes and policies into overall policy, planning and development practices at local, provincial and national levels. It is noteworthy that resource efficiency, waste minimization and low-carbon societies are becoming important drivers of economic success in a world where natural resources and landfill capacity are scarce and finite. There is an opportunity to help drive the next economic growth cycle by taking advantage of new industries, business opportunities and innovation in resource efficiency, waste minimization and preserving the value of materials circulating in the economy.

The policy, scientific and business communities in Asia and the Pacific are increasingly recognizing the large challenges of resource supply security, increasing waste and pollution, and climate change which may become impediments to future growth, prosperity and rising material standards of living in the region. There is a growing commitment, reflected in the Paris Agreement

¹ *Adelaide 3R Declaration is a good-will, voluntary and legally non-binding declaration.*

on Climate Change, that the region needs to embark on an alternative model of economic growth that is decoupled from increasing resource use, waste and emissions. This will not happen spontaneously but requires well-designed policies, multi-stakeholder collaboration, and well-functioning institutions and governance mechanisms that enable technological, social and design innovations towards sustainable use of natural resources and the prevention of the unsustainable generation of waste and pollution.

Governments, businesses and households in Asia and the Pacific have a significant potential for increasing resource efficiency and minimizing waste and emissions by devising and implementing 3R policies and programmes as well as strengthening institutions and investing in green infrastructure. The opportunities for decoupling of economic growth and resource use in the region are very large. In the short term there are many cost-effective opportunities for greater resource efficiency and waste minimization that will provide substantial net materials and energy saving opportunities. In the medium to long term, decoupling will generate higher economic growth than would occur under current trends of inefficient resource use, environmental destruction and climate change. The future prosperity of economies in Asia and the Pacific and the ability to achieve the ambitious 2030 Agenda for Sustainable Development will rely on more effective and efficient use and management of natural resources, reduction of emissions and the minimization of waste, in other words, achieving the principles of 3R.

The concepts of circular economy and resource efficiency are gaining momentum worldwide because of the large benefits that can be achieved. Studies show that up to 80% savings in materials, energy use and emissions could be achievable in the energy, building, transport and food sectors as well as in heavy industry and manufacturing². Governments also recognize that their development targets would be hard to achieve unless alternative models of economic development are identified and implemented, noting that commitments on this issue such as the Toyama Framework on Material Cycles have been declared. At the heart of the circular economic development approach is a systemic shift that integrates economic, environmental and social strategies to achieve high resource efficiency, increased employment opportunities, quality of life, economic competitiveness of products, increased use of renewable energy and materials, lower carbon emissions, lower production costs, innovation favouring regenerative industrial processes and business models that maximize asset utilization. Recognizing the importance of entrepreneurship, circular economy strategies include supporting mechanisms for SMEs.

In a 3R (reduce, reuse, recycle) context, the circular economic principles encourage countries to pursue a whole-of-value-chain approach, and upstream strategies to move away from strictly consumptive resource use and rising waste, and to aim for a higher level of circularity at the business and whole economy level. By reducing dependence on finite resources, businesses and economies can capture an added benefit of lower costs and enhance their social licence. Governments and businesses in Asia and the Pacific are encouraged to take note of the relevant international experience, knowledge and technical know-how in areas of circular economy, extended producer responsibility (EPR), environmentally friendly design and eco-products, eco-industrial parks, and green energy, which will be beneficial for creating sustainable business opportunities for both domestic and foreign enterprises.

Declaration

We, the representatives of Asia-Pacific countries (Afghanistan, Australia, Bangladesh, Bhutan, Cambodia, the People's Republic of China, India, Indonesia, Japan, Kazakhstan, Kiribati, Kyrgyzstan, the Republic of Korea, Lao People's Democratic Republic, Malaysia, Maldives, Marshall Islands, Mongolia, Myanmar, Nepal, Niue, Pakistan, Palau, the Russian Federation,

² Von Weizsäcker, E, K Hargroves, MH Smith, C Desha and P Stasinopoulos (2009). *Factor 5. Transforming the Global Economy through 80% Improvements in Resource Productivity*. Earthscan, London.

Samoa, Singapore, Solomon Island, Sri Lanka, Thailand, the Philippines, Timor-Leste, Tonga, Tuvalu, Vanuatu and Viet Nam), city government representatives, international organizations, non-government organizations, private sector and industry groups, and professionals in the field of 3Rs and waste management and other stakeholders, having met at the Seventh Regional 3R Forum in Asia and the Pacific, held in Adelaide, South Australia, Australia, from 2 to 4 November 2016,

Reaffirming the importance of careful planning and coordinated execution of various 3R policies and programme instruments (such as regulatory, economic and financial, information-based, voluntary initiatives, partnerships and technology transfer) to achieve the Sustainable 3R Goals of the Ha Noi 3R Declaration (2013–2023) adopted at the Fourth Regional 3R Forum in Asia and the Pacific, held in Ha Noi, Viet Nam from 18 to 20 March 2013,

Noting the fact that the Asia and the Pacific region has become a net importer of primary materials and natural resources, and that there is a need to explore sustainable business opportunities based on 3R principles to reduce import dependency and pursue sustainable development; sustainable business opportunities exist, among others, in resource recovery, remanufacturing using waste as a resource, green buildings and infrastructure, green chemistry, sustainable transportation, energy and water efficiency, sustainable farming, bio-economy (bio-products, bio-energy, bio-engineering), and wastewater reuse for urban green spaces and urban agriculture,

Recognizing the importance of multi-sector partnerships such as public-private-people partnerships and triangular cooperation as critical to realizing sustainable business opportunities which enable countries, cities and businesses to move from a linear throughput economy to a resource-efficient, closed-loop and circular economy in which economic benefits can take various forms such as savings in waste disposal costs, revenue from the reuse, recycling and energy recovery of previously wasted materials, saving foreign currency by reducing imports of materials, job and livelihood creation, and creating opportunities for carbon credits,

Reaffirming our commitments to the 2030 Agenda for Sustainable Development and the underlying Sustainable Development Goals (SDGs), and thereby **recognizing** the important complementary benefits of 3R policy implementation in achieving the SDGs, in particular SDG 11, SDG 12 and SDG 8 and related targets,

Building on the success of the Paris Agreement on Climate Change and further **recognizing** the need to limit global warming to less than 2 degrees Celsius and transition our economies to net zero emissions, as well as the potential contribution the improved resource efficiency will play in achieving sustainable economic growth, meeting intended nationally determined contributions (INDCs) and decoupling growth and emissions,

Recognizing the important role of the Technology Facilitation Mechanism (TFM), established by the Addis Ababa Action Agenda and subsequently launched at the United Nations Sustainable Development Summit held in New York in 2015, as facilitating access to information, knowledge, experience, best practices and lessons learned as well as in promoting science, technology and innovation cooperation around areas important to the implementation of the SDGs, and thereby **underscoring** its relevance in the areas of 3R science, technology and innovation in support of circular economic development,

Noting the outcome of the Maldives 3R Forum that 3R as an economic industry offers competitive solutions to many urban environment and development issues, provided 3Rs and resource efficiency are integrated into macroeconomic and development policies,

Express our commitments to:

1. **Strengthen** coordination among countries and within countries to progressively adopt and implement circular economy plans, a whole-of-value chain approach, strategies and tools to reduce,

reuse, and recycle natural resources in production, consumption and other life cycle stages, enabled by extended producer responsibility (EPR), environmentally friendly design, low emissions technology, ecological budgeting, financial incentives and investments, taking into account the prevailing economic conditions;

2. *Promote* policies, programmes and institutions that will help integrate and forge collaboration among industrial firms, including SMEs, eco-industrial parks and regional infrastructure to support resource optimization and efficiency;

3. *Promote* sustainable urban planning and practices which can lead to highly profitable and employment generating business opportunities; create enabling policies, institutions, multi-stakeholder partnerships and an investment atmosphere to expand markets for environmental goods (equipment, technologies, eco-products, green energy, rainwater harvesting, green city development, green construction materials etc.) and services;

4. *Discourage* all forms of end-of-pipe waste disposal which is a sunk cost with no financial return; encourage diversion of waste from landfill to recycling and recovery facilities; encourage energy recovery and sound management when such diversion is impossible with the current technology available and situation;

5. *Support* science and evidence-based policymaking to improve economic prosperity and human well-being enabled by resource efficiency, waste minimization and sustainable natural resource management; promote networks of innovation and national innovation centres for resource efficiency, waste and emission minimization in order to drive a science, innovation and technology based culture in overall policy-setting and development agendas;

6. *Take* full benefit of the Technology Facilitation Mechanism (TFM)³ led by the United Nations system to tap relevant information, knowledge, experience and best practices in the areas of 3R science, technology and innovation in support of circular economic development;

7. *Develop* institutional capacity as well as promoting government and international collaborative research projects in the areas of strengthening basic statistics, material flow and waste accounting and analysis, and material and waste footprint analysis and resource productivity analysis with a broad objective to reduce wastage of natural resources, promote optimal use of resources, to preserve natural capital and encourage renewable resource flows towards circular economic development, and disseminate results of such projects widely;

8. *Promote* research and development (R&D) oriented industrial structures to address resource efficiency related problems in the industry sector as the basis for scaling up new and innovative business models and circular economy activities and opportunities, including low emissions technology and renewable energy;

9. *Promote* 3Rs-related science, technology and infrastructure, industry-industry cooperation (so that by-products circulate fully in local production systems), encourage green products and green consumerism, renewable energy programmes, including residual waste-to-energy, and enabling conditions for multi-stakeholder partnerships to enhance resilience of industrial systems, cities and the overall economy in support of the 2030 Agenda for Sustainable Development and its SDGs;

10. *Promote* inter-municipal or city-city cooperation to integrate different production and consumption systems in the region so that resources or by-products circulate among the industries

³ The TFM is an initiative to widen access to science, technology and innovation to advance progress towards the Sustainable Development Goals (SDGs), and comprises:

- i) a UN inter-agency task team on science, technology and innovation (STI) for the SDGs;
- ii) a collaborative annual multi-stakeholder forum on STI for the SDGs; and
- iii) an online platform as a gateway for information on existing STI initiatives, mechanisms and programmes.

and urban systems within the same region creating circular economic opportunities, entrepreneurial spirit and new employment opportunities, ultimately contributing to the well-being of local communities;

11. *Facilitate* environmentally sound management of disaster waste in order to better respond to the increasing frequency and magnitude of natural disasters and the resulting large amounts of disaster waste through setting up appropriate treatment facilities, reuse of demolished waste materials from earthquake-devastated areas, and putting recycling programmes and infrastructure in place;

12. Call upon multilateral development banks, bilateral and multilateral donors, development agencies and partners and United Nations organizations to provide necessary capacity-building and support (human resource development, financing, knowledge and technical know-how) for instituting circular economic development approaches in overall policy, planning and development to achieve significant benefits for the 2030 Agenda for Sustainable Development; and also note the commitment of G7 Environmental Ministers in assisting developing countries to build the capacity needed for effective resource efficiency and resource circulation policies.