

GREEN PRODUCTIVITY FOR SDGs

REVIEW OF EMERGING AND PRIORITY NEEDS



The Asian Productivity Organization (APO) is an intergovernmental organization committed to improving productivity in the Asia-Pacific region. Established in 1961, the APO contributes to the sustainable socioeconomic development of the region through policy advisory services, acting as a think tank, and undertaking smart initiatives in the industry, agriculture, service, and public sectors. The APO is shaping the future of the region by assisting member economies in formulating national strategies for enhanced productivity and through a range of institutional capacity-building efforts, including research and centers of excellence in member countries.

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GREEN PRODUCTIVITY FOR THE SDGS

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Green Productivity for the SDGs: Review of Emerging and Priority Needs

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First edition published in Japan
by the Asian Productivity Organization
1-24-1 Hongo, Bunkyo-ku
Tokyo 113-0033, Japan
www.apo-tokyo.org

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FOREWORD

Among efforts to achieve economic progress while tackling environmental issues to ensure a better quality of life, Green Productivity (GP) stands out as a holistic strategy. The APO launched its GP Program in the Asia-Pacific region in 1994 as a response to the first Rio Earth Summit held in 1992, based on the belief that a healthy environment and robust, competitive economies are mutually dependent.

More than 20 years after the term GP was coined, and with the establishment of the APO Center of Excellence (COE) on GP within the China Productivity Center of the ROC in 2013, environmentally sound manufacturing and management practices are now widely accepted as effective tools. GP has also been positioned as part of global initiatives in pursuing sustainability. In recent years, the global sustainability focus has been continuously updated by international organizations, governments, and enterprises with evolving concepts and philosophies such as the circular economy, the UN Sustainable Development Goals (SDGs), etc. Therefore, while exploring activities for the COE on GP to undertake in the future, the APO acknowledges that global concepts, ideas, and goals should be incorporated.

Given recent developments and the emerging needs of APO member countries, this research project on Green Productivity for SDGs: Review of Emerging and Priority Needs attempted to outline appropriate new topics and forms of activities of the COE on GP. This approach resulted in the reidentification and reprioritization of areas, sectors, and institutions requiring support from the COE on GP. The efforts of the two authors of this study, K.D. Bhardwaj and Dr. Chun-hsu Lin, are very much appreciated. The APO expects that this publication of their research results will serve as an informative guide for readers in member countries and other economies when updating development priorities and planning the next steps in the journey of promoting GP, putting circular economy concepts into practice, and making sustainability the foundation of efforts to meet the SDGs.

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EXECUTIVE SUMMARY

In the past five years, global sustainability concepts have been continuously updated with different focuses and philosophies. This study attempts to outline the appropriate topics and formats of activities to be implemented in 2021 and 2022 under the APO Center of Excellence on Green Productivity (COE on GP) to better meet the needs and expectations of member countries.

Based on the results of a survey conducted in January and February 2020 among GP experts in APO member countries, as well as surveys conducted of participants and experts in COE on GP activities from 2016 to 2019, the following GP promotion needs were identified. In terms of topics, most APO members expressed interest in: 1) GP certification programs and frameworks, public awareness, and green supply chain management; 2) energy management, audits, and efficiency; 3) waste management and recycling; and 4) material flow cost accounting. In addition, ISO standards related to the SDGs, intelligent industry, clean production, financial mechanisms, and corporate social responsibility were topics suggested by experts and participants in COE on GP activities.

In terms of the format of COE on GP activities, most suggestions were on increasing the use of onsite demonstrations and hands-on workshops. Longer periods of training, extension of training through the Internet, and follow-up projects were suggested to strengthen the effectiveness of GP-related training and meet the specific needs of member countries.

Continuous consultation services were another type of instrument suggested for promoting GP among APO members, including the establishment of online portals, setting up micro COE for special needs and purposes, and preparation of manuals or toolkits for technical reference.

The research report is structured as follows. First, the introduction provides an overview of the GP concept and the need to conduct this study. Recent global developments in sustainability initiatives covering climate change, the low-carbon economy/green growth, the SDGs, and the circular economy are explained in the next section. Updates on how 15 member countries are pursuing sustainability are given in the following section. The needs of APO member economies to meet the SDGs are then outlined. Finally, additional support services to be provided by the APO are suggested.

Introduction: Green Productivity in the APO

Green Productivity

Productivity is an umbrella concept covering a hierarchy of improvement opportunities for businesses to meet or exceed the needs and expectations of the marketplace. These ever-changing expectations are now embracing good environmental management as a customer demand alongside quality, supply, delivery, technology, health and safety, and cost. When environmental needs and expectations are incorporated into productivity, it is then termed “Green Productivity” (GP).

The APO has been promoting GP in the Asia-Pacific region since 1994. The GP concept aims for socioeconomic development with the ultimate objective of sustained improvement in the quality of human life. It also emphasizes environmental improvement combined with productivity enhancement and profitability. GP efforts have included numerous demonstration projects, international and regional forums, workshops, and seminars held in member countries over the past decades. As a result, GP is now widely accepted as a holistic approach to tackle environmental issues and problems while simultaneously enhancing productivity, the foundation of business competitiveness. The APO has introduced various GP tools such as pollution prevention, environmental management systems, ecodesign, green procurement, etc., to assist SMEs in improving their productivity in a green, sustainable manner.

GP also attempts to answer society’s needs for a better quality of life by increasing productivity through environmentally sound manufacturing practices and management activities. GP was conceived on the understanding that a healthy environment and a robust, competitive economy are mutually dependent. GP fosters “smart growth” by releasing the collective creative ingenuity of the people. This is a move away from “mandate, regulate, and litigate” toward encouraging people to act responsibly and take control of their actions to improve the quality of their own lives and to profit from it.

Summary of GP Need Assessment Study in 2014

In May 2013, the 55th APO Governing Body Meeting approved the establishment of the COE on GP in Taipei, Republic of China (ROC), to promote and implement GP-related activities. To facilitate and better design the programs of the COE on GP, later in 2013, the APO conducted a study with 13 experts to assess the GP needs of member countries in the agriculture, industry, and service sectors. The conclusions from the previous study were that the following were required:

1. Capacity building by developing GP training manuals and case studies.
2. Awareness building and promoting GP adoption by developing demonstration/pilot projects and model organizations in member countries.
3. Developing a network of GP knowledge and capacity using existing successful experiences in member countries.
4. Conducting training courses, workshops, and seminars [1].

Following the study, the COE on GP prepared a short-term (2014–2018) proposal including the following:

1. Continued operation of the Asian Green Productivity Exchange Platform that consists of the COE on GP Advisory Committee, COE on GP Office, and technical group meetings.

2. Establishment of the Asian Green Productivity Team in the four focused technology areas of resource recycling, green energy, green factories, and ecoagriculture.
3. Promoting Asian GP Excellence Benchmarking and Green Leadership by organizing annual International GP conferences and benchmarking workshops/seminars.
4. Enhancing stakeholders' GP awareness by holding Green Excellence Enterprise Awards, setting up an APO GP website, and producing additional promotional materials such as press releases, journal articles, and promotional features highlighting project events.

Need for This New Study

In the past five years, global sustainability concepts have been continuously updated with different focuses and philosophies. Based on the experiences of previous COE on GP activities, this new study attempts to outline the appropriate topics and formats of its projects to be implemented in 2020 and 2021 to better meet the needs and expectations of APO member countries.

Research Methodology for Need Assessment

The research was carried out based on questionnaire surveys circulated to all National Productivity Organizations (NPOs) and past participants and resource speakers in APO GP projects. The questionnaire survey was supplemented with desk assessment and online information available in the public domain. In addition, the summarized results of surveys of participants and resource persons/experts in COE on GP events and activities held during 2016–2019 were used. Those surveys were provided by the COE on GP Secretariat in Taipei. Several Skype calls and online meetings were held among the two authors and APO Secretariat in order to develop the questionnaire and outline of the research framework.

Recent Global Developments in Sustainability Initiatives

In the past decades, sustainability has become the ultimate goal for international society. Especially during the past five years, new concepts and focuses have been proposed, updated, discussed, and set as targets for governments and enterprises. Therefore, while we are looking at what should be pursued in COE on GP activities in the near future, those global concepts, ideas, or targets should also be incorporated in initiatives.

Climate Change Initiatives and Frameworks

Climate change has been the most concerning environmental issue during the past decades and has generated many dialogues, regulations, policies, and instruments. In June 1992, the United Nations passed the United Nations Framework Convention on Climate Change (UNFCCC) to reduce and regulate the global emission of anthropogenic greenhouse gases (GHGs). Following the framework, in December 1997, the 38 participants in the third Convention of Parties (COP) signed an agreement in Kyoto, Japan, promising to reduce the emission of GHGs by 5.2% compared with the 1990 level during the period from 2008 to 2012. The Kyoto Protocol was finally put in action in February 2005 after Russia's parliament passed the target requirement. The goals of the Kyoto Protocol were intended to be achieved through targets imposed on the Annex I countries via the approaches of joint implementation, the clean development mechanism, and emission trading.

However, the protocol with different emission reduction obligations on developed countries was not successful in controlling the emission of GHGs. Another solution approach from the COP 21

in 2015 was proposed and activated in 2016, known as the “Paris Agreement.” The body for obligations of emission reduction was expanded in the Paris Agreement to developing countries such as PR China and India. Each country was to determine its Intended Nationally Determined Contribution (INDC) to control the rise of temperature within 2 degrees Celsius, but with 1.5 degrees as the target to pursue [2]. In addition, according to the agreement, developed countries should provide a green climate change fund to assist developing countries with the strategies of climate change mitigation and adaption. Obviously, the agreement has had huge impacts on industries such as transportation and power generation. Brand-name enterprises promised to cut the GHG emissions of their products by requiring their supply chains to comply with the targets.

Low-carbon Economy/Green Growth/Green New Deals

The low-carbon economy is another trend in sustainability policy but specifically focused on energy efficiency and emission control of GHGs to counteract climate change. Low-carbon issues have been addressed in response to the obligations on countries set by the UNFCCC. A low-carbon society can be achieved through technical and nontechnical approaches. The technical approaches include technology improvement, energy management systems, and changes in lifestyles. The nontechnical approaches, on the other hand, are economic instruments, e.g., taxes and subsidies, to reduce the need for or inefficient uses of fossil fuels.

Evolved from the concepts of the low-carbon society and environmental protection in general, the term “green growth,” known as “green New Deals” in Europe, was coined in the ROK in 2008 when then-President Lee Ming-Buk tried to stimulate economic growth while facing the ongoing global economic downturn as well as to cope with the Kyoto Protocol principles. An intergovernmental and also physical agency, the Green Growth Committee, directly supervised by President Lee, was then created to achieve the green growth targets in all sectors [3].

Sustainable Development Goals

The UN Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all UN members in 2015 as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030. The 17 SDGs from the 2030 Agenda for Sustainability thus have become the most comprehensive goals for sustainability [4]. SDGs 7, 11, 12, and 13 are closely associated with GP.

- **SDG 7:** Affordable and clean energy
Ensure access to affordable, reliable, sustainable, and modern energy for all.
- **SDG 11:** Sustainable cities and communities
Make cities and human settlements inclusive, safe, resilient, and sustainable.
- **SDG 12:** Responsible consumption and production
Ensure sustainable consumption and production patterns.
- **SDG 13:** Climate action
Take urgent action to combat climate change and its impacts.

Since 2015, the SDGs have become the most followed direction by countries pursuing national sustainability. Unlike the UNFCCC, the framework of the SDGs does not rely on negotiations among all countries for emission obligation agreements but provides a principle for national

development. The APO COE on GP activities also reflect and help achieve SDGs 7, 11, 12, and 13 in member countries.

The Circular Economy

The process of growth and development on a worldwide scale has continued to intensify environmental challenges, including the need to address climate change issues and impacts on one hand, and the problems of land and water pollution, waste disposal, and other related concerns including the impact on the health of the entire ecosystem on the other hand as we rework the prevalent linear economy model into a greater circularity of products and material resource flows. According to the emerging understanding of the path ahead, a European Environment Agency report in 2017 stated that: “Circularity shall involve transforming production and consumption systems and is likely to entail several aspects such as the following and more: (a) complex product design and functionality, (b) increasing use of modular design, (c) local production on demand by additive manufacturing, (d) building services around products, (e) home delivery systems, (f) changing product lifespan, (f) collaborative consumption, (g) market for recycling, (h) enhanced markets for IOT, etc. These shall require enabling measures to be put into place across all countries, including via policies, programmes, collaborative initiatives, citizen and industry/business engagements and their reworked models, and much more” [5].

What Is the Circular Economy?

Transforming the linear economy, which has remained the dominant model of “take, make, and dispose,” since the onset of the Industrial Revolution, into a circular one is by no means an easy task and entails a radical change in current production and consumption patterns that can lead to sustainable development.

The circular economy is a new way of creating value and ultimately prosperity in which products are designed for durability, reuse, and recyclability. Waste across the product life cycle is minimized and materials for new products come from old ones as much as possible. The emphasis is increasingly on restorative and regenerative design, in which attempts are made to supply products, components, and materials at their highest utility and value at all times. A circular economy is a continuous cycle that preserves and enhances natural capital, optimizes resource yields, and minimizes system risks by managing finite stocks and renewable flows.

According to the definition of the Ellen MacArthur Foundation, the circular economy is an “industrial system that is regenerative and restorative by design, rethinks products and services to design out waste and negative impacts, and builds economic, social, and natural capital.” Moreover, a circular economy is seen as a third pillar of international climate policies and serves both mitigation and adaptation efforts. It supports mitigation actions by emphasizing the maximum use of already circulating resources, use of regenerative resources (as opposed to nonrenewables), and better design of products for easier repair and recycling, thus allowing a reduction in GHG emissions from both natural resource extraction and from industrial transformation processes. Additionally, a circular economy can be a climate change adaptation approach in that it ensures interventions are not so resource intensive that they cannot be sustained into the future.

The circular economy is not a new idea or term for achieving a sustainable society by enhancing the efficiency of resource utilization. However, it has been used with different interpretations in various aspects. For example, the circular economy is the status of a recycling-oriented society. It

can also be an environmental principle of production and consumption for economic development. Furthermore, the circular economy can be an evolution of business models to replace the traditional ownership concept of appliances. After several decades of discussion, in December 2015, the European Commission proposed an action plan called the “Circular Economy Package” [6]. The package has attracted tremendous attention and discussion in many countries. Compared with the SDGs, the circular economy is more focused on the maximization of resource utilization and therefore has more specific principles or methods coming from think tanks, governments, and business sectors.

Principles of the Circular Economy

Principle 1: Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows.

A circular economy enhances natural capital by encouraging flows of nutrients within the system and creating the conditions for regeneration of soil and other living systems. Whenever possible, utility is provided virtually or as a service rather than as a physical product. When resources are needed, the circular system favors technologies and processes that use renewable or better-performing resources.

The circular economy seeks to address several challenges to natural capital:

1. Threatened stock and variable quality of fresh water;
2. Soil degradation;
3. Loss of biodiversity; and
4. Depletion of fish stocks and degradation of marine ecosystems.

Principle 2: Optimize resource yields by circulating products, components, and materials at their highest utility at all times, in both technical and biological cycles.

This entails designing for refurbishing, remanufacturing, and recycling to keep products, components, and materials circulating and contributing to the economy. As in a linear system, increasing yields is useful and requires ongoing system improvements. However, unlike a linear system, a circular system does not compromise on effectiveness, which requires a fine balance between efficiency and long-term resilience. The circular economy seeks to address several resource challenges, including:

1. Material consumption: If countries like India maintain their rapid economic development pace of the past few decades, they stand to more than triple their demand for resources by 2030. This could be effectively contained by adopting circular economy principles.
2. Nutrient loss: The deterioration of soil due to the loss of nutrients is a significant trend in India and this could be reduced for effective gains.

Principle 3: Foster system effectiveness by revealing and designing out negative externalities.

The negative externalities of economic activity include land degradation; air, water, and noise pollution; release of toxic substances; and GHG emissions. A circular economy would reveal the cost of these externalities, in other words, outline their risks and potential economic impact.

In addition to the above are five principles and schools of thought [7] reflected as a collation that emphasizes: 1) design out waste; 2) build resilience through diversity (balance efficiency with adaptability); 3) shift to renewable energy sources; 4) think in systems; and 5) think in cascades.

Sustainability may conjure up images of recycled teabags and homegrown vegetables, but what does it mean when it comes to multibillion dollar global industries? The circular economy is the way forward. The UN defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The world's most sustainable companies do the most to minimize their negative impacts on the environment, society, and economy while maximizing their positive impacts by adoption of the circular economy [8].

Priority Sectors for Promotion of the Circular Economy

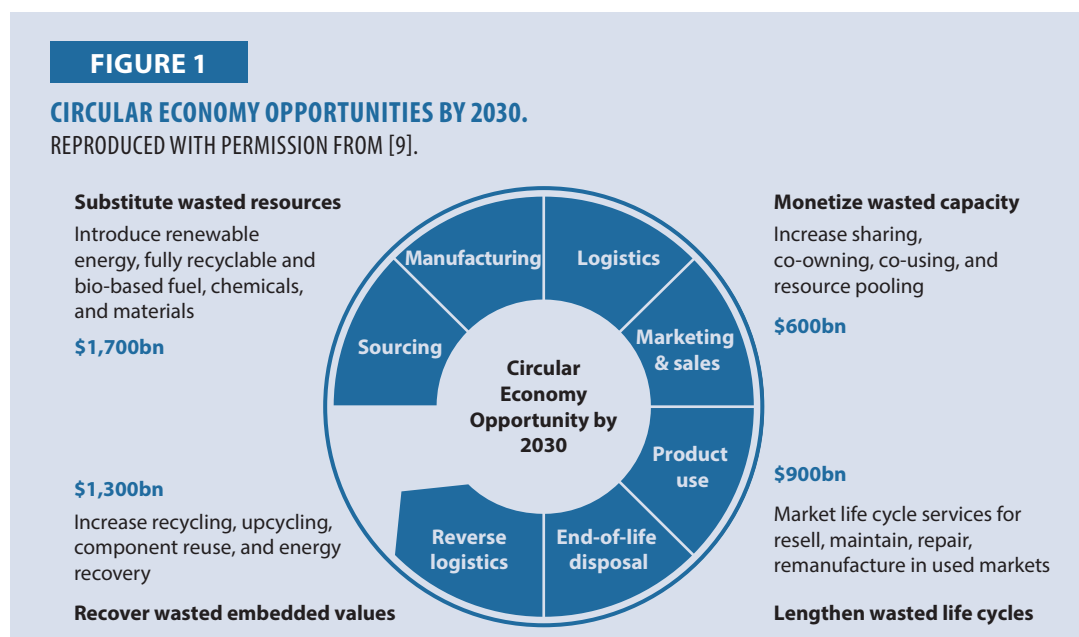
The circular economy seeks to eliminate any kind of waste in the market. When viewed from the lens of the circular economy, waste does not refer to the usual connotation of “junk,” but to any kind of underutilization of resources or assets. There are four distinct types of waste that circular models seek to eliminate:

1. Wasted resources, i.e., material and energy that cannot effectively be regenerated over time;
2. Wasted capacities, i.e., products and assets that are not utilized fully;
3. Wasted life cycles, i.e., products reaching the end of life prematurely due to planned obsolescence or lack of second-life options; and
4. Wasted embedded values, i.e., components, material, and energy not recovered from waste streams.

The following are the priority sectors from the perspective of the circular economy:

1. Metals and mining;
2. Electronics;
3. Agriculture, food, and beverages;
4. Plastics;
5. Manufacturing;
6. Construction and demolition; and
7. Garments and leather.

USD4.5 trillion could be saved globally by adopting the circular economy. This would entail eliminating the concept of waste altogether (i.e., eliminating waste not in the traditional sense of rubbish, but any underutilization of natural resources, products, and assets).



The Circular Economy and SDGs

The transition from the 8 Millennium Development Goals (MDGs) pursued until 2015 to the 17 SDGs (with a range of indicators to adopt and achieve results on by 2030) has become a driving framework. When pursued systematically and in earnest by all countries, the SDGs can provide the elements and the dynamics for a circular economy ideology. Circular economy applications are deeply linked to the SDGs in terms of responsible production and consumption frameworks and activities, health, agriculture, business and social issues, employment aspects, water and sanitation, affordable clean energy, industry innovation and infrastructure, sustainable cities and communities, climate issues, life below water and above land, etc.

In the context of the scope for circular economy-related initiatives, the linkages could be to the chain of material flows and in reverse logistics processes in material recovery and urban mining, besides applying a hierarchy of waste management processes and attending to product development, design, and provisioning via manufacturing-to-consumption systems. It is important to note that estimates of global material consumption are approximately 70 billion tons/annum and growing [10]. Material consumption and its categories are shown in Table 1.

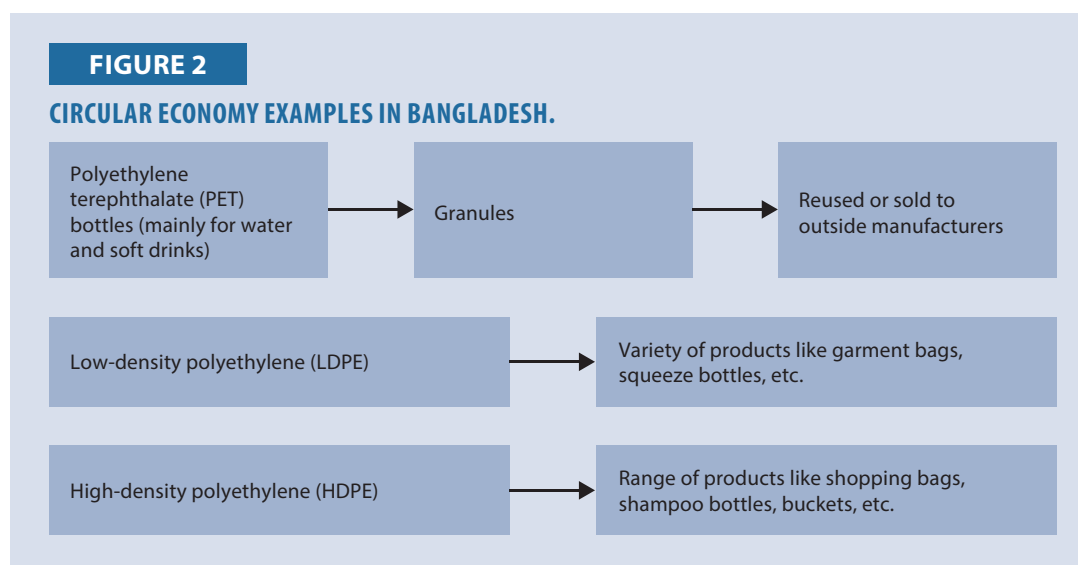
TABLE 1
INCREASE IN ANNUAL GLOBAL MATERIAL USE.
REPRODUCED WITH PERMISSION FROM [11].

Material	2011 (Gt)	2060 (Gt)
Metals	8	20
Fossil fuels	14	24
Biomass	20	37
Nonmetallic minerals	37	86
Total	79	167

Updates on Pursuing Sustainability in APO Members

Bangladesh

Bangladesh has taken some notable initiatives to follow circular economy principles, with some prominent examples shown in Figure 2.



Ella Pad is an innovative example of making sanitary napkins in Bangladesh from leftover cloth in garment factories. These napkins are reasonably priced and are affordable for the poor, helping many women who could develop health problems even leading to death. These sustainable sanitary pads are symbolic in terms of demonstrating how circular economy practices can change ways of life while minimizing waste generation. Hygienic sanitary products made from waste cloth from garment factories prove that low-cost solutions can provide high-end services. The same concept can be expanded to making women's undergarments from leftover fabric in garment factories.

The Government of Bangladesh (GoB) needs to take initiatives and launch nationwide dissemination campaigns to inform business owners including of MSMEs, entrepreneurs including startups, consumers/customers, and other stakeholders of the importance and larger benefits of adopting the circular economy. According to the Ellen MacArthur Foundation, it is mainly the lack of knowledge/awareness that has been identified as the biggest bottleneck in making a transition to the circular economy. Industries, enterprises, and businesses are concerned that the financial costs of developing reusable/recyclable materials would be high and that these practices may decrease the efficiency of their businesses, eventually leading to losses. This is a misplaced concern. Therefore, the GoB needs to kick off circular economy awareness programs. It could consider introducing a cocktail of policy measures, such as fiscal incentives and technical and financial support, which may provide the boost for a change of mindset. A market-driven approach to low-carbon growth in Bangladesh incorporating products with low-carbon footprints or carbon-neutral products, services, and produce would propagate resource-efficient technologies/techniques among the industry, service, and agriculture sectors and promote the circular economy doctrine in the country.

Policy initiatives such as the development of product/process standards, ecolabeling, green finance, performance standards, ecoprocurement, sustainable procurement, standards for recycled products, etc. could be catalyzed to generate green business opportunities and jobs while creating new markets for resource-efficient, refurbished, recycled, and reused products and technologies. The

GoB needs to extend technical and financial support to various stakeholders which could be instrumental in the transformation to the circular economy by changing production, consumption, and supply management.

Although the GoB has evolved a congenial policy/regulatory setup that could be instrumental in promoting the circular economy, there is a need to create an incentive mechanism. The policy and regulatory package includes the National Environmental Policy (2018), Solid Waste Management Rules (2010), National 3R Strategy for Waste Management (2010), Draft Solid Waste Management Rules (2018), Draft E-Waste Management Rules (2018), Draft SRO on Plastic Waste Management (2019), Renewable Energy Policy (2008), National Sustainable Development Strategy (2008), Bangladesh Industrial Policy (2016), Compulsory Use of Jute Package Act (2010) and its subsequent Rules (2013), City Corporation Act (2009), Bangladesh Environment Conservation Act 1995 (with amendments), Bangladesh Environment Conservation Rules 1997 (with amendments), etc. [12].

A lot of work still needs to be done and comprehensive efforts are required to realize the circular economy with full potential. The circular economy is in the nascent stage in Bangladesh and there is enormous scope for harvesting its benefits. Research on product supply chains, product life cycle analysis, the resource-efficient economy, waste to energy, and valuation of natural assets are required to make the circular economy a reality in Bangladesh and other APO member countries [13].

Cambodia

Cambodia has been facing challenges in achieving sustainable natural resource management. Owing to its focus on improving living standards by encouraging urbanization and industrialization, its forest cover gradually declined from 57% to 47% between 2010 and 2014 under the national REDD+ strategy 2017, culminating in enormous natural wealth loss. According to the Ministry of Environment, urbanization resulted in increased solid waste disposal in landfills from 318,000 tons to 1.5 million tons per annum between 2004 and 2017. This has caused land contamination apart from groundwater pollution. On the other hand, more than 90% of all waste consists of recyclable materials (e.g., organic 55%, plastic 21%, and textile 13%). For example, Environment Ministry data showed that waste generated daily in Phnom Penh amounted to 1,800 tons to 2,000 tons, comprising almost 90% recyclables including organic waste that can be utilized for composting/ biogas; plastic that can be recycled; and leather, textile, paper, stone, ceramic, and glass waste that can be segregated at source and sent for recycling. This indicates that there is huge potential for the circular economy in Cambodia based on the amount of recyclable materials being disposed of instead of being placed back in economic value chains.

In terms of sustainable energy in line with the SDGs, Cambodia has also been facing challenges in ensuring access to reliable energy for sustaining economic growth. Although the government is committed to ensuring that household access rates to grid-quality power reach 90% by 2030, this still indicates that 10% of households will not have that access.

Recent Policy Initiatives in Cambodia

Some recent policy initiatives relevant to GP and the SDGs taken in Cambodia are:

1. Industry Policy Development 2015–2025 by the Cambodian government;
2. Programme for Country Partnership prepared by the UN International Development Organization (UNIDO) and line ministries;

3. UNIDO Projects hosted by the Ministry of Industry and Handicraft and UNIDO Cambodia Office;
4. Draft Energy Efficiency Strategy and Workplan by the Ministry of Mines and Energy;
5. Cambodia National Strategic Plan on Green Growth 2013–2030 by the Ministry of Environment; and
6. National Green Growth Roadmap by the Ministry of Environment.

Republic of China

Even though the ROC is not a member of the UN, it still actively engages in international affairs and related efforts of the UN, including the SDGs. The ROC has adopted the SDGs and customized some of the goals to adjust to its domestic characteristics and needs, including the formulation of Goal 18, a nuclear-free homeland. During the 1950s to 1960s, the ROC experienced rapid economic growth and development contributing to the success of its current economy. However, little effort was made to protect the environment throughout the rapid development era, causing the rivers and air to become heavily polluted. Learning from the mistakes of the past, the ROC now focuses on the protection of the environment and has implemented various schemes and regulations to sustain the environment for future generations.

In regard to sustainable consumption and production (SCP), the ROC has made notable progress. Currently, there is a 96% waste collection rate and a 60% recycling rate. In addition, the daily waste generation rate decreased from 1.13 kg/day per person in 1998 to 0.41 kg/day per person in 2018, a 36% reduction from the historical peak in 1998. Such recycling achievements are made possible by national regulations and advances in innovative recycling technologies developed in the ROC.

Over 20 years ago, the Environmental Protection Administration implemented the four-in-one recycling program and a stringent extended producer responsibility system in order to promote waste reduction and recycling by the public as well as to increase resource efficiency and sustainability. The ROC's extended producer responsibility system currently regulates over 60 products in 13 categories, including PET and glass bottles, lightbulbs, motorized vehicles, and electronic waste such as TVs and refrigerators, and requires the mandatory recycling of these products. The success of the ROC's recycling has attracted the notice of the international community and been reported by the *Wall Street Journal* and *The Economist* in recent years. The *Wall Street Journal* even called the ROC “the world's genius of garbage disposal” in a 2016 article.

Several innovative recycling technologies have been developed to contribute to recycling management. Precious metals such as gold, silver, copper, and tin are commonly used in everyday electronic products but their availability is finite. An innovative stripping method was developed in the ROC to recover precious metals from electronic products in a nonharmful, ecofriendly process. After sorting, the recovered metals can then be used in production. The ROC's textile industry converts PET bottles into recycled fiber, which can be used in production. In the 2018 FIFA World Cup, half of the teams wore uniforms made in the ROC from recycled PET bottles. Ultimately, the goal of the ROC's circular economy is to increase resource productivity from NTD66.1/kg in 2016 to NTD76.11/kg in 2030, an increase of 15%.

To promote public awareness of the circular economy from the private side, the Center for Green Economy of the Chung-Hua Institution for Economic Research initiated the Taiwan Circular Economy Award to recognize business and enterprise efforts. The award showcases innovative circular economy achievements.

As part of efforts to combat climate change, the ROC has committed to increasing renewable energy generation to 20% of the total and reduce GHG emissions by 50% compared with the baseline 2005 level by 2050. It aims to achieve 20% renewable energy through the expansion of solar and wind power generation. So far, 2,990 MW of solar power generation and 706 MW of onshore wind power generation have been developed. Great effort is now being made in offshore wind generation in the Taiwan Strait, between the ROC and PR China. To show its commitment to reducing GHG emissions, the National Climate Change Action Guidelines were passed in 2017 and the Greenhouse Gas Reduction Action Plan in 2018. These are the central government's first steps in addressing GHG and carbon reduction. The first stage of the program is to reduce 2% of GHG emissions by 2020, and ultimately by 50% by 2050, compared with the 2005 baseline level.

Fiji

Fiji has a combined Five-Year/20-Year National Development Plan (NDP). The NDP, with the vision of “Transforming Fiji,” maps the way to realize full national potential. The 20-Year Development Plan (2017–2036) and comprehensive Five-Year Development Plan (2017–2021) work together. The Five-Year Development Plan provides a detailed action agenda with specific targets and policies aligned with the long-term transformational 20-Year Development Plan. This forward-looking NDP is the outcome of a nationwide consultation process that involved the private sector, civil society, community groups, government, and the general public. Inclusive socioeconomic development is at the heart of this NDP, and the strategies within are ultimately designed to empower every Fijian and widen the reach of programs, services, and networks of infrastructure to transform the country.

The NDP is aligned with global commitments including the 2030 Agenda for Sustainable Development and Paris Agreement on Climate Change. Consistent with the goal of the Paris Agreement to achieve climate neutrality and a low-emission world, Fiji will develop a 2050 Pathway to decarbonize its economy. The integrated nature of development and the need for multisectoral solutions are recognized and addressed. Critical cross-cutting issues such as climate change, green growth, the environment, gender equality, disability inclusiveness, and governance are mainstreamed in the NDP.

The economy and ecology go hand in hand in island nations such as Fiji, and they need to prioritize sustainable development in a way that sets an example for all. Fiji and similar island states are fragile and vulnerable, yet they have a great opportunity to demonstrate sustainable practices by adopting sustainable waste management through the 3Rs (reduce, reuse, and recycle). There is huge scope for harnessing renewable energy and reducing/eliminating dependence on diesel- or gasoline-powered generators for local energy needs. Fiji's Turtle Island Resort has been a torch bearer in sustainable tourism and strives to become 100% self-sufficient with regard to its energy needs by going solar. The island is also preserving its natural habitats through an intensive reforestation program [14, 15].

India

India consumes about 7.2% of globally extracted raw materials each year but supports 17% of the global population. India was the third-largest consumer of material (5 billion tons) after PR China

(21.5 billion tons) and the USA (6.1 billion tons) in 2010. The resource extraction per unit area in India is one of the highest in the world (1,579 tons/acre) compared with the global average of 454 tons/acre (Table 2).

TABLE 2

MATERIAL CONSUMPTION AND PRODUCTIVITY IN INDIA AND SELECTED COUNTRIES.

REPRODUCED WITH PERMISSION FROM [16].

	PR China	Germany	India	Japan	USA	World
Total material consumption (billion tons)	35.19	1.21	7.42	1.44	6.58	91.88
Per capita consumption (tons/capita)	25.19	14.75	5.67	8.92	20.58	12.44
Material productivity (percentage improvement between 1970 and 2015)	311%	287%	256%	301%	276%	115%

India's significant import dependency for various metals, minerals, and raw materials means there is a need for enhancing resource efficiency and circular economy initiatives.

Future Trends

Under the assumption of continued economic growth of 8% by 2030 and possible slowing down to 5% thereafter by 2050, and medium growth in population as projected by the UN, it is estimated that India would require around 2.7 billion tons of biomass, 6.5 billion tons of minerals, 4.2 billion tons of fossil fuels, and 0.8 billion tons of metals in 2030. The per capita consumption would reach around 9.6 tons in that year, which is nearly the current global average.

The above estimates translate into a need for waste management policy(ies). In the context of India, while a series of environmental laws, acts, and legislation have been promulgated, attention has also been especially drawn to waste management via notification of The 6 Waste Management Rules, 2016, and further amendments such as the Solid Waste Management Rules, 2016; Plastic Waste Management Rules, 2016; E-Waste Management Rules, 2016; Biomedical Waste Management Rules, 2016; Construction and Demolition Waste Management Rules, 2016; Hazardous Waste Management and Handling Rules, 2016; etc., which set the status and context as well as roles, responsibilities, and guidelines to strengthen initiatives essential to facilitating the circular economy.

Policy Measures for the Circular Economy

The upcoming Industrial Policy envisages development of national goals for the circular economy covering resource productivity, recycling rate, waste reduction, ecoinnovation, share of renewable energy, and GHG emissions. Sectoral policies will incorporate measures to promote circularity. Fiscal measures for promoting reuse/repair will be considered for sustainable products.

Circular Economy: Economic Potential

A Federation of Indian Chambers of Commerce and Industry strategy paper indicated that around half-a-trillion US dollars' worth of India's GDP value could be protected through circular economy business models by 2030.

Indian Initiatives to Address Water, Land, and Air Pollution

India generates about 53 million tons of solid waste annually. However only 25–30% is collected and processed, causing serious environmental issues. The Swachh Bharat (Clean India) Mission launched by the government in 2014 has the objective of 100% scientific management of solid waste, which aligns well with Mission Zero Waste. The mission is expected to create momentum among cities, industries, and other stakeholders to look at waste as a resource. The Swachh Survekshan (Cleanliness Survey) has created a competition among cities and towns to be recognized as clean cities creating a circular economy.

In addition, there are several other interventions of the Government of India to address pollution issues complementing the circular economy perspective, including:

1. India's National Manufacturing Policy focuses on promotion and adoption of green technologies and green manufacturing among MSMEs.
2. The government has embarked upon an initiative of creating 100 smart cities across the country, and waste management and resource conservation are significant parts of this important initiative.
3. The government is in the process of finalizing national goals under the UN SDGs.
4. The government has promoted the concept of Zero Effect, Zero Defect Effect in order to achieve green economic growth.
5. The government has emphasized the development of MSMEs and making them competitive and sustainable to achieve increased economic growth in manufacturing.
6. Government policy interventions and formulations include the Notification of National Ambient Air Quality Standards, formulation of environmental regulations/statutes, setting up monitoring networks for assessment of ambient air quality, introduction of cleaner/alternate fuels like gaseous fuel (CNG, LPG, etc.), ethanol blends, etc., promotion of cleaner production processes, and launch of the National Air Quality Index by the Prime Minister in April 2015.
7. The Bharat Stage IV (BS-IV) norms were first applied in 63 selected cities and universalized by 2017; a decision was taken to leapfrog directly from BS-IV to BS-VI fuel standards by 1 April 2020.
8. Taxes are levied on polluting vehicles and incentives offered for hybrid and electric vehicle use.
9. Comprehensive amendments were made to various Waste Management Rules including Municipal Solid Waste, Plastic Waste, Hazardous Waste, Biomedical Waste, and Electronic Waste notifications.
10. The Notification of Construction and Demolition Waste Management Rules was enacted.
11. Bans were put in place on burning leaves, biomass, and municipal solid waste.

12. Public transport networks of metro rail, buses, e-rickshaws, and carpooling, along with the Pollution under Control campaign, lane discipline, and vehicle maintenance are promoted.
13. Revisions of existing environmental standards and formulation of new standards for prevention and control of pollution from industries were enacted.
14. Regular coordination meetings at official and ministerial levels are held with state governments.
15. Directions under Section 5 of the Environment (Protection) Act, 1986, and under Section 18(1)(b) of the Water (Prevention and Control of Pollution) Act, 1974, and Air (Prevention and Control of Pollution) Act, 1981, were issued.
16. Online continuous (24/7) monitoring devices were installed by major industries.
17. Action plans were prepared for sewage management and restoration of water quality in aquatic resources by state governments.
18. The National River Conservation Plan for abatement of pollution in identified stretches of various rivers was implemented and conservation activities undertaken including the interception and diversion of raw sewage, construction of sewage systems, setting up sewage treatment plants, constructing low-cost sanitation facilities, conducting education and awareness campaigns, encouraging community participation, utilizing electric/improved wood crematoria, and initiating riverfront development projects.

Physical trade balances may need to be prepared for material flows within and beyond geographic boundaries, which may also need to be extended within and beyond sectors. That would require standardization of products and by-products as part of material recycling efforts, which would in turn require appropriate labeling and market development by reworking the codes for various sectors with regard to production. There is a scope for and need to incorporate product composition declarations in mass terms to accelerate circular economy initiatives and to develop necessary economic instruments and incentives in circular economy structures.

Indonesia

In Indonesia, the implementation of the UN SDGs has been incorporated into its national development plan (Nawacita). Nawacita aims to address major development challenges such as the large population of the poor, gaps among income groups and regions, and environmental degradation. Therefore, the national plan incorporates the concept of the SDGs to improve people's lives and society, with special focus on respecting the carrying capacity of the environment and the balance of the ecosystem [17].

Since the implementation of the UN SDGs, Indonesia has poured efforts into achieving national development, as well as the SDGs, and produced remarkable results. Education, which is essential for productivity, has been widely promoted, resulting in increases in the net attendance rate in preprimary education from 79.4% to 83.3%, gross enrollment rate in junior secondary school from 91.17% to 91.52% and in senior secondary school from 78.02% to 80.68%, and in tertiary level from 25.25% to 30.19% during 2015–2018. In terms of climate change mitigation, GHG emissions were reduced by 22.5% from the baseline cumulative total of 13 billion tons of CO_{2e} and its intensity by 275% from the baseline of 560 tons of CO_{2e} per billion rupiah.

However, there are several issues that challenge the development of Indonesia, including electricity access coverage and SCP. Electricity access is near universal but there are still regions with electrification under 65%. Furthermore, Indonesia relies heavily on fossil fuel for power generation, with low utilization of renewable energy sources. According to data from the Ministry of Environment and Forestry, Indonesia produces approximately 64 million tons of waste each year, of which 15% is plastic consisting mainly of food and beverage packing and plastic bags. Unfortunately, Indonesia has made only low-level recycling efforts and the circular economy is nonexistent. In 2018, the National Development Planning Agency (Bappenas) reported that only roughly 36% of waste was collected and transported to final disposal sites, while more than 60% remained unmanaged. To combat waste issues, Bappenas has received funding from the UN Development Programme to develop a circular economy initiative and accelerate the achievement of SCP in Indonesia by 2024.

Japan

Because of its developmental success in the postwar era, many developing countries around the world often looked to Japan as a model for developmental guidance and technology export. Soon after the announcement of the UN SDGs, Japan quickly reacted to establish its action plan and implement corresponding measures. In 2018, Japan rolled out its first action plan (SDG Action Plan 2018) to demonstrate how it will meet the SDGs. The plan focuses on eight priority areas:

1. Empowerment of all people;
2. Achievement of good health and longevity;
3. Creating growth markets, revitalization of rural areas, and promoting science, technology, and innovation;
4. Sustainable and resilient land use, while promoting quality infrastructure;
5. Energy conservation, renewable energy, climate change countermeasures, and a sound material-cycle society;
6. Conservation of the environment, including biodiversity, forests, and the oceans;
7. Achieving peaceful, safe, and secure societies; and
8. Strengthening the means and frameworks for the implementation of the SDGs.

Each year, Japan updates the plan to reflect the latest status of SDG implementation and newly formulated measures.

In the priority area of energy conservation, renewable energy, climate change countermeasures, and a sound material-cycle society, Japan has coordinated several measures. The manufacturing industry is requested to set its own carbon reduction goals and initiate the plan by first improving its energy efficiency. The country will periodically evaluate the status of industry's carbon reduction and encourage innovative ideas to reduce emissions. In accordance with the Paris Agreement, Japan has set the goal of reducing GHG emissions by 25.4% by 2030 in comparison with the 2005 base level. Japan successfully reduced GHG emissions by 8% between 2014 and 2017 [18].

In regard to the circular economy, Japan plans to strengthen its recycling system to maximize resource efficiency, particularly through “urban mining.” For the first time in Olympic history, the gold, silver, and bronze medals of the games will be made of recycled materials collected from household appliances throughout the country. Working with the nation’s recyclers, approximately 18,000 collection points for household appliances were established across the country [19].

Republic of Korea

The ROK adopted “low-carbon green growth” as a national vision plan for the next 60 years to help address energy and resource issues resulting from global warming. In order to achieve the low-carbon vision, it devised the National Strategies for Green Growth and Five-Year Plan for Green Growth. The plan outlines three strategy areas and 10 policy objectives. Some of the objectives include efficient reduction of GHG emissions, oil alternatives/energy independence, development of a green technology industry, greening of all industries, and a highly developed industrial structure. On the other hand, the ROK is also actively promoting SCP as part of its national plan.

During its rapid economic development period, the ROK was heavily reliant on natural resources such as water and energy. In 2008, its domestic material consumption was 1.5-fold the global average. From 1981 to 2012, the primary energy supply rose by about six-fold. After shifting to a sustainable development paradigm, the ROK began to witness significant improvement in waste management. Waste generation decreased from 2.44 kg/day per person to 1.06 kg/day, and the recycling rate grew by 2.5-fold from 23.7% to 60.5% [20].

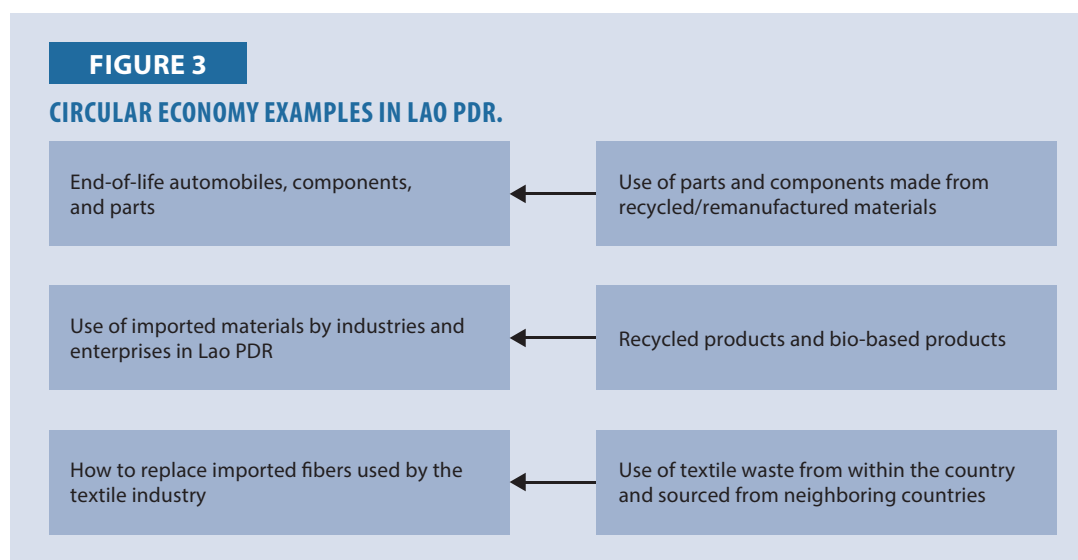
In accordance with the adoption of the Paris Agreement, the ROK pledged to reduce its GHG emissions to 37% less than the business-as-usual scheme by 2030. It aims to achieve carbon reductions through its energy sector. In 2017 and 2019, the country adopted the eighth Electricity Plan and third Energy Master Plan, respectively. The Energy Master Plan targets increasing renewable electricity generation to 20% by 2030 and to 30–35% by 2040. The Electricity Plan reflects the government’s determination to shift electricity generation from coal and nuclear to more renewables [21].

Lao PDR

Lao PDR is well positioned as a resource hub on the newly built transit railroads and the Mekong River. The country needs to focus on reuse, recycle, and remanufacture strategies to close material cycles, which will also help its neighboring countries.

Lao PDR’s textile enterprises have great potential to adopt the circular economy by using textile waste for sourcing fiber and locally available hemp to replace synthetic fiber wherever possible. There is also scope for algae farming in huge hydropower reservoirs. Algae can be a good source of bioproducts to be utilized as nutrients, biofertilizers, and biofuels as alternative sources of energy.

The use of locally sourced timber to replace imported concrete could pave the way for the construction industry in Lao PDR to inch toward the circular economy. That approach could first target areas promoting traditional tourism with minimal impact on the environment. Recycling of construction and demolition waste with the segregation of unwanted residual material such as plastic, wood, metal fragments, etc. would also be a viable option. Products made from recycled aggregates typically tend to have a cost advantage over conventional products since natural aggregates are transported over long distances [22]. Examples of circular economy measures in Lao PDR are given in Figure 3.



Malaysia

Prior to the setting of the SDGs, Malaysia had been addressing sustainable development through efforts to eradicate poverty and restructure societal imbalances in national development plans from the 1970s. It is currently in its 11th national plan period (11MP 2016–2020), which was formulated to align with the SDGs. The 11MP contains six strategic thrusts to address Malaysia’s challenges and the opportunities in the fast-changing global landscape and six “game-changers” to shift the growth trajectory to address future challenges. One strategic thrust related to GP is making green growth for sustainability and resilience a way of life leading to strengthened food, water, and energy security; lower environmental risks; and ultimately improved well-being and quality of life. In regard to GP, key successes worth noting include 98% coverage of 24-hour electricity supply at the national level, a 1.5-fold increase in renewable energy capacity, and 33% reduction of carbon intensity in the economy since 2009 [23].

Like many other nations, Malaysia is facing issues caused by plastics and currently does not have a unified approach to deal with the problem. Spearheaded by the Ministry of Energy, Science, Technology, Environment and Climate Change, it plans to roll out a circular economy roadmap for plastics by 2020 to ultimately phase out single-use plastics. Furthermore, to promote SCP, the 11MP also includes the following key initiatives:

1. The Ministry of Education has aligned the educational curriculum with the SCP agenda and developed a guidebook for educators on global sustainability.
2. Malaysia aims to increase the recycling rate to 22% by 2020, up from 17.5% in 2016.
3. A tool to quantify carbon emissions and sustainable impacts of the built environment has been developed.

Although Malaysia has recorded great achievements in regard to the SDGs, particularly on GP, the country still has other priority areas requiring attention such as incorporating the concept of sustainable development of infrastructure and industry in pursuit of green growth, strengthening human capital development for economic transformation, and promoting widespread SCP practices.

Mongolia

The Green Development Policy of Mongolia includes an action plan to ensure evolution into an environmentally sustainable developed nation to be inherited by future generations. It relies on participatory, inclusive economic growth based on green concepts. Six strategic objectives will ensure green development:

1. Promote an SCP pattern with efficient use of natural resources, low greenhouse gas emissions, and reduced waste.
2. Sustain the ecosystem's carrying capacity by enhancing environmental protection and restoration activities and reducing environmental pollution and degradation.
3. Increase investments in natural capital, human development, and clean technology by introducing financing, tax, lending, and other incentives to support a green economy.
4. Engrain a green lifestyle by reducing poverty and promoting green jobs.
5. Encourage education, science, and technology to serve as the catalyst for green development and develop cultural values and livelihoods in harmony with nature.
6. Implement a population settlement plan in accordance with climate change considering the availability of natural resources and regional resilience.

With its action plan, the Green Development Policy establishes a number of specific and measurable targets for each strategic objective.

Mongolia is committed to achieving the following through its Sustainable Development Vision 2030:

1. Increase GNI per capita to USD17,500 and become an upper middle-income country based on income per capita.
2. Ensure average annual economic growth of not less than 6.6% through 2016–2030.
3. End poverty in all its forms.
4. Reduce income inequality and have 80% of the population in the middle- and upper middle-income classes.
5. Increase enrollment rates in primary and vocational education to 100% and establish a lifelong learning system.
6. Improve the environment so that Mongolians lead long, healthy lives while increasing life expectancy at birth to 78 years.
7. Be placed among the first 70 in the ranking of countries by the Human Development Index.
8. Preserve ecological balance and be placed among the first 30 in the ranking of countries by the Green Economy Index.

9. Be ranked among the first 40 countries in the Doing Business Index and among the first 70 in the Global Competitiveness Index.
10. Create a professional, stable, participative governance system, free of corruption and adept at implementing development policies at all levels [24].

Philippines

The Philippines introduced the Ecological Solid Waste Management Act in 2000 (RA 9003), which incorporates the hierarchy approach to waste management with segregation mandated to municipalities. Since 2007, all final disposal sites have been legally required to be sanitary landfills, although the high cost of investment is a barrier in many areas. In response, the government is now looking into clustering local government units and developing joint infrastructure. Challenges include a lack of political will at the municipal level to segregate waste and a lack of technical and financial capacity of recycling industries. There are also too few recycling facilities and a strong dependence on commodity markets (and prices) for the sale of recyclables. The Government of the Philippines has introduced ecolabeling and green procurement programs.

Steps have also been taken to transition to a green economy with the passage of vital laws, including the Renewable Energy Act of 2008 aiming to accelerate the exploration and development of renewable energy resources, institutionalize national and local capabilities in the use of renewable energy systems, and promote efficient, cost-effective commercial applications by providing fiscal and other incentives.

The Green Jobs Act of the Philippines was signed into law to promote the creation of green jobs and provide incentives to firms generating them. The green jobs include areas such as renewable energy and scientific operation and management of waste disposal facilities.

There have been several success stories of innovative, sustainable projects pioneered by local governments including the Quezon City Integrated Solid Waste Management Facility that converts waste into renewable energy; Cagayan de Oro Septage Management; and Cebu City Solid Waste Management. The establishment of the Public-private Partnership (PPP) Center by the government was an exemplary step to evolve sustainable projects by joining hands with the private sector to enhance project sustainability. Those projects may include climate-resiliency components to address the threat of climate change and create infrastructure and systems paving the way for adopting circular economy practices. In December 2018, the PPP Center Governing Board issued a resolution titled Safeguards in PPP: Mainstreaming Environmental, Displacement, Social, and Gender Concerns with the aim of preventing negative impacts on people and the environment in the implementation of PPP projects [25].

The Enhanced National Greening Program focusing on the expansion of bamboo and mangrove plantations, the Biochar Program, Sustainable Coral Reef Ecosystems Management Program, Coastal and Marine Environment Program, and National Ecosavers Program are some key initiatives. Other program focuses include ecotourism, mining rehabilitation, pollution mitigation, and bioremediation as a natural waste management technique that utilizes organisms to remove pollutants from contaminated sites [26].

Singapore

As a small island city-state, Singapore relies heavily on external resources and commodities for its development. Therefore, the SDGs have significant meaning and impact. Energy is one of the

toughest challenges for Singapore. Since its independence in 1965, energy security has been a top priority. According to the Sustainable Development Report 2019 [27], 100% of the public has access to electricity. Currently, about 95% of Singapore's electricity is generated using natural gas imported from nearby countries like Malaysia and Indonesia. However, the country is aiming to diversify its resource supply to strengthen energy security. One method for this is the import of liquified natural gas (LNG). In May 2013, an LNG terminal was established comprising two storage tanks with an initial throughput capacity of 3.5 million tons/annum (Mtpa). In 2017, the capacity was increased to roughly 11 Mtpa with the completion of an additional facility.

To show its commitment to reducing GHG emissions and adhere to the Paris Agreement, Singapore has sought innovative methods to reduce its carbon footprint. Despite challenges such as land availability and intermittent sun coverage, solar photovoltaic (PV) generation has grown significantly from a 0.4 megawatt peak (MWp) in 2008 to approximately 143 MWp in 2017. Singapore plans to increase solar utilization to 350 MWp by 2020 and 1 GWp beyond that year.

Regardless of being a small city-state, Singapore also has its share of waste issues. In 2017, it generated approximately 7.7 million tons of waste but had only one offshore landfill. Therefore, it is committed to becoming a Zero Waste Nation through the circular economy. One key initiative is waste reduction and recycling. Singapore currently claims a 59% national recycling rate and aims to increase that to 70% by 2030 by focusing on priority areas like e-waste and plastic and packaging waste. Singapore produces approximately 60,000 tons of e-waste annually, but with rapid advances in technology and shorter product replacement times, the amount of e-waste is expected to rise. Currently, e-waste recycling is conducted through a PPP collection network. The e-waste collected is then channeled to recyclers for treatment. Singapore will be rolling out a mandatory e-waste recycling framework by 2021.

Singapore accounts for about 0.12% of global GHG emissions and is taking ambitious measures to reduce its carbon emissions. It has pledged to reduce emission intensity by 16% by 2020 and by 36% by 2030 from the 2005 level. Singapore plans to achieve its emission goals through its Carbon Action Plan with four mitigation strategies: 1) improving energy efficiency; 2) reducing carbon emissions from power generation; 3) developing and deploying cutting-edge low-carbon technologies; and 4) encouraging collective action among government agencies, individuals, businesses, and the community.

In 2018, Singapore became the first nation in Southeast Asia to introduce a carbon tax of SGD5 (approximately USD3.8) per ton of CO_{2e} for 2019–2023. The tax is applied to all sectors of industry without exemption, which covers 80% of emissions. As mentioned above, Singapore has set targets to increase its renewable energy supply, mainly through solar PV generation. But the nation is also conducting R&D on offshore wind generation. Its first wind turbine was installed at the offshore landfill in 2017, and there are plans to develop hybrid micro grids in the next few years.

Sri Lanka

Developing countries like Sri Lanka face major challenges such as increasing adverse impacts due to climate change, achieving energy efficiency, and maximizing the use of renewable energy to achieve energy security. A green growth approach combined with circular economy practices could address the majority of challenges and open up new avenues of low-carbon growth in line with the SDGs. There is a need to promote resource efficiency and sustainable energy management in all sectors to minimize or eliminate ecological degradation.

Sri Lanka took an exemplary step by introducing its Blue-Green Budget: the Launch of Enterprise Sri Lanka, which focused on MSMEs and creating green jobs leading to sustainable development. It also included ecotargets such as making all vehicles powered by alternative energy instead of fossil fuels by 2040. All government vehicles must be converted to electric or hybrid versions by 2025. This will transform the mindsets of citizens, encourage the use of renewable energy, green the Sri Lankan economy, and create numerous green business opportunities. Economic sectors like energy, fisheries, water supply and sanitation, agriculture and food processing, etc. could employ innovative green solutions on the path to the circular economy, eliminating social issues such as poverty and poor hygiene. The country has the resources, traditional wisdom, and inherent indigenous know-how to exploit advanced technologies and modern science to capitalize on locally available natural resources for expanded growth [28].

In Sri Lanka, it has become increasingly difficult to find new land for waste disposal. Local communities object to new landfill projects due to the “not in my backyard” syndrome. This has prompted the government to divert as much waste from landfills 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.

There are noteworthy initiatives by service-sector organizations. The Central Bank of Sri Lanka has been promoting green banking practices to manage environmental and social risks in projects financed to make businesses greener, sustainable, innovative, and socially inclusive. A roadmap has been developed on green, sustainable financing. In line with this, the Sri Lanka Bank Association plans to train banking-sector employees in how to scrutinize project financing from a sustainability perspective by minimizing support to polluting businesses and promoting ecofinancing. Technical and vocational training providers could upgrade their course curricula to focus on environmental aspects and sustainable development. Such courses could include how to engage in innovative practices for reducing production costs and minimizing material losses so that business could be competitive and sustainable in the long term [29].

The Government of Sri Lanka has taken several initiatives to mainstream efforts to meet the SDGs:

1. The establishment of a Parliamentary Select Committee on Sustainable Development;
2. Enactment of the Sustainable Development Act No. 19 of 2017, which lays the foundation for a well-organized institutional mechanism to implement the SDGs utilizing the existing system of public institutions;
3. Creation of the Ministry of Sustainable Development, Wildlife and Regional Development as the focal point for coordinating and facilitating the implementation of SDGs; and
4. Drafting a policy framework reflecting adherence to sustainable development principles.

The long-term Vision 2025 is the foundation for the transformation of Sri Lanka into a knowledge-based, competitive, social-market economy with environmental protection as a development priority under the theme of agriculture and sustainable development.

Vietnam

Vietnam faces huge challenges in areas such as industrial wastewater pollution; urban wastewater, which is one of the largest contributors to surface and groundwater contamination in the country; air

pollution due to industries, automobiles, and urban sources; growth of fossil fuel energy consumption by industry and coal-fired power plants in northern Vietnam; traffic congestion; sustainable land-use planning and management; adverse environmental impacts due to the disposal of solid waste consisting of recyclable materials resulting in resource losses; lost energy sources due to the burning of municipal and industrial solid waste without energy recovery practices; and socioeconomic challenges and health hazards in the nearly 3,000 villages that specialize in recycling discarded plastic and other waste materials like e-waste. Another important aspect is the informal sector comprising the people involved on a daily basis in picking, collecting, and segregating recyclable materials such as plastics, metal, glass, paper, etc. These people are important agents of the circular economy but are socially marginalized and live near dump sites, as is the case in almost all APO member countries.

The Government of Vietnam needs to start on the path toward the circular economy by initiating biomass resource mapping and biomass circular strategies; producing organic fertilizer locally using organic waste and biomass; adopting integrated pest management and scientifically evolved seed varieties to eliminate the excessive use of pesticides, herbicides, and fertilizers; investing in climate-smart technologies and services; promoting climate-controlled agriculture with greenhouse technologies; upgrading livestock-breeding technologies and services; expanding urban agriculture around Hanoi and Ho Chi Minh City; and promoting smart technologies for small-scale agriculture. All of these would provide enormous benefits in terms of efficiency and sustainability.

In Vietnam, opportunities lie in the following sectors with regard to the circular economy:

1. Agriculture;
2. Renewable energy;
3. Logistics;
4. Water management; and
5. Smart cities [30].

Initiatives by the Government of Vietnam

The following GP-related initiatives have been undertaken by the Government of Vietnam:

1. The National Action Plan on the implementation of the 2030 Agenda for Sustainable Development was signed by the Prime Minister in May 2017.
2. The National Action Plan for Sustainable Production and Consumption (2016) will be in force until 2020 with a vision to 2030.
3. Circular No. 03/2019/TT-BKHDT dated 22 January 2019 was signed by the Minister of Planning and Investment stipulating a set of 158 national sustainable development statistical indicators.
4. Adoption of the Sustainable Development Strategy of Vietnam, 2011–2020.
5. Adoption of the National Strategy on Environmental Protection by 2020.

6. Adoption of the National Green Growth Strategy.
7. Adoption of the Strategy on Cleaner Production in Industry to 2020.
8. Adoption of the National Strategy for General Management of Solid Waste to 2025.
9. Adoption of the National Action Plan for Sustainable Production and Consumption until 2020 with a vision to 2030.
10. The circular economy was introduced to the business community in 2016 by the Vietnam Business Council for Sustainable Development, which subsequently organized many training courses and workshops on circular economy applications.
11. The Fight Plastic Waste Movement of the Ministry of Natural Resources and Environment was launched by the Prime Minister on 6 September 2019 to encourage citizens to refuse plastic bags and single-use plastic items.

GP Needs of APO Members to Meet the SDGs

GP for the SDGs

The 17 SDGs are integrated, that is, it is recognized that action in one area will affect outcomes in others, and that development must balance social, economic, and environmental sustainability. Through the pledge to “Leave No One Behind,” countries have committed to fast-tracking progress for those furthest behind first. That is why the SDGs are designed to bring the world to several life-changing “zeros,” including zero poverty, hunger, AIDS, and discrimination against women and girls. Everyone must cooperate to reach these ambitious targets. Creativity, know-how, technology, and financial resources from all of society are necessary to meet the SDGs in every context.

The APO’s GP concept is well placed to help member countries in the following:

1. Undertaking micro-level actions that will ultimately lead to meeting the SDGs at national level;
2. Guiding and advising policymakers in framing policies based on the results and outcomes of GP activities that have proven successful in sustainable resource management; and
3. Closing loops by maximizing material loss reductions while reusing and recycling, thereby helping organizations apply circular economy practices scalable from industrial cluster, to city, to national level which could then be expanded to the global level.

Therefore, using GP practices to transit to the circular economy and meet the SDGs is the way forward. To summarize this process simply in a question-and-answer format:

1. How can SMEs contribute to meeting the SDGs?
By adopting GP.
2. How can organizations contribute to meeting the SDGs?
By adopting the circular economy model through GP applications.

3. How can communities contribute to meeting the SDGs?
By adopting sustainable resource management through GP applications.
4. How can governments formulate pro-SDG policies and programs?
By learning from GP success stories at business and community levels.
5. Why should the APO continue to promote GP?
GP is the simplest answer to the most comprehensive question of how to meet the SDGs.

In view of the significance of GP for the SDGs, this research for assessing immediate and emerging needs of APO member countries and NPOs with regard to the adoption of GP in the industry, service, and agriculture sectors is timely and important. The following additional research projects to be undertaken by the APO in the immediate future are suggested:

1. Circular economy investments by companies: Does a higher level of investment mean more circular economy practices in businesses? (tentative title: Investment vs. Circular Economy Practices).
2. Characteristics of financial resources that enhance circular economy adoption (tentative title: Decision Framework for Circular Economy-related Investments by Companies and Supply Chains).
3. Smart company investments leading to circular economy adoption, in which global examples and success stories are examined.
4. How government policies/programs for environmental improvement are influencing the circular scope of companies (tentative title: Policies as Catalysts for Circular Economy Adoption).
5. How consumer behavior pushes companies to adopt circular economy practices irrespective of government policies (tentative title: Consumer Behavior and the Circular Economy).
6. How GP applications at micro level in the agriculture, industry, and service sectors contribute to meeting the SDGs at macro level (tentative title: Micro-level Initiatives vs. Macro-level SDG achievements).
7. Developing best-reference documents on green technologies for key sectors such as textiles, leather, steel, chemicals, mining, food and beverages, etc. to serve as guides for SMEs in member countries.
8. Gap analysis of available knowledge products in the public domain for waste reuse and recycling, to be followed by the development of knowledge products by the APO to fill the gaps identified.
9. PPP models for circular economy projects and PPP frameworks for circular economy efforts at city level. Local bodies could adopt the frameworks to encourage the private sector to make return-based investments in infrastructure facilitating circular economy practices.

10. Integration of circular economy principles and climate change measures in national and sectoral policies.

Recent APO GP Promotion Projects

The APO COE on GP was officially established in Taipei in 2013 to promote GP capability and awareness in member countries. COE on GP projects have taken various formats such as conferences, meetings, workshops, onsite consultations, and pilot demonstrations.

The COE on GP undertakes two basic types of activities: 1) multicountry training workshops held in the ROC; and 2) training activities tailored to the specific needs of beneficiaries or countries. An overview of the activities of the COE on GP [31] showed that more activities since 2013 focused on the following three main green topics:

1. Pollution control, i.e., solid waste management, wastewater treatment, drinking water purification and management, and resource recycling;
2. Green energy and energy saving, i.e., renewable energy like solar PV power generation and biomass energy, micro grid systems for power generation, and energy storage; and
3. Green factories and plants, i.e., green manufacturing processes and green-certified buildings for production facilities.

The topics of the previous COE on GP activities were mainly related to manufacturing and how to make production processes greener. However, some activities demonstrated solutions to achieving the circular economy or carbon emission reductions on different scales. As shown in Table 3, in addition to a significant number of cross-industry training workshops and forums held in the ROC, more COE on GP activities with specific topics were held in India, Indonesia, Lao PDR, Thailand, and Vietnam. Malaysia and the Philippines also frequently hosted projects. Only a few projects took place in Singapore and Sri Lanka. Other APO members such as Bangladesh, Cambodia, Fiji, Hong Kong, IR Iran, Japan, the ROK, Mongolia, Nepal, and Pakistan, did not host any COE on GP projects in previous years.

Need Assessment Questionnaires

The present research was carried out based on questionnaire surveys circulated to all NPOs and past participants and resource speakers in APO GP projects. The questionnaire survey was supplemented with desk assessment and online information available in the public domain. No face-to-face interactions occurred with any stakeholders except in the researchers' own countries. In addition, the summarized results of surveys of participants and resource persons/experts in COE on GP events and activities held from 2016 to 2019 were used [32, 33]. Those surveys were provided by the COE on GP Secretariat in Taipei.

Several Skype calls and online meetings were held among the two authors and APO Secretariat in order to develop the questionnaire and prepare the outline of the research framework. Then from January to February 2020, the new survey of selected experts from all APO member countries was conducted to outline the short-term needs for GP promotion. The experts contributing to this study through the questionnaire in early 2020 are listed in the Appendix to this report. The questionnaire was then designed with the following structure.

TABLE 3
TOPICS AND LOCATIONS OF RECENT COE ON GP PROJECTS.

Host country/ year	2016	2017	2018	2019
India	<ul style="list-style-type: none"> • Biomass energy • Pollution control for industries 	<ul style="list-style-type: none"> • Waste treatment • Solar PV 	<ul style="list-style-type: none"> • Solar PV • Energy storage • Water treatment 	<ul style="list-style-type: none"> • Smart water treatment • Smart energy systems
Indonesia	<ul style="list-style-type: none"> • Green factories • Biomass energy • Pollution control for industries 	<ul style="list-style-type: none"> • Renewable energy • Micro grid systems 	<ul style="list-style-type: none"> • Micro grid systems • Solar PV 	<ul style="list-style-type: none"> • Solar micro grids • Water resources • Environmental technology
Lao PDR	<ul style="list-style-type: none"> • Solar PV • Micro grid systems 	<ul style="list-style-type: none"> • Renewable energy • Micro grid systems 	<ul style="list-style-type: none"> • Micro grid systems • Biomass energy • Energy storage 	<ul style="list-style-type: none"> • Solar PV
Malaysia	<ul style="list-style-type: none"> • Green factories 		<ul style="list-style-type: none"> • Renewable energy • Recycling 	<ul style="list-style-type: none"> • Energy saving • Smart cities
Philippines	<ul style="list-style-type: none"> • Solar PV • Micro grid systems 	<ul style="list-style-type: none"> • Renewable energy • Micro grid systems 		
Singapore	<ul style="list-style-type: none"> • Green factories 			
Sri Lanka		<ul style="list-style-type: none"> • Solar PV • Micro grid systems • Wastewater treatment • Solid waste treatment 		
Thailand	<ul style="list-style-type: none"> • Waste treatment and management systems 	<ul style="list-style-type: none"> • Waste treatment and management systems • Recycling 	<ul style="list-style-type: none"> • Waste treatment and management systems • Recycling • Solar PV 	<ul style="list-style-type: none"> • Waste treatment and management systems • Recycling
Vietnam	<ul style="list-style-type: none"> • Waste treatment and management systems 	<ul style="list-style-type: none"> • Energy saving • Pollution control 	<ul style="list-style-type: none"> • Energy saving • Water pollution control 	<ul style="list-style-type: none"> • Circular economy • Pollution control equipment and services
ROC	<ul style="list-style-type: none"> • GP • Material flow cost accounting • Green supply chain management 	<ul style="list-style-type: none"> • GP • Material flow cost accounting • Green supply chain management 	<ul style="list-style-type: none"> • GP • Material flow cost accounting • Green supply chain management • Total quality management 	<ul style="list-style-type: none"> • GP • Material flow cost accounting • Green supply chain management • Biofertilizers and biopesticides

Source: Summarized from the APO COE on GP website.

Section I. Sustainable Development Goals (SDGs 7, 11, 12, 13)

1. Has your country developed targets/indicators to meet the SDGs?
2. List recent policy initiatives and programs developed by your country for meeting SDGs 7, 11, 12, and 13.

3. List key national institutions along with their web links working in the area of sustainable development (SDGs 7, 11, 12, 13).
4. List at least three specific areas in which capacity building is required at country level to achieve SDGs 7, 11, 12, and 13.
5. List at least three specific areas in which capacity building of NPOs is required in order to contribute to national efforts to meet SDGs 7, 11, 12, and 13.

Section II. Circular Economy/Low-carbon Growth

1. Has your country developed targets/indicators for achieving the circular economy?
2. List recent policy initiatives and programs developed by your country for achieving the circular economy.
3. List key national or private institutions along with their web links working in the area of the circular economy.
4. List at least three specific areas in which capacity building is required at country level for the circular economy.
5. List at least three specific areas in which capacity building of NPOs is required in order to contribute to national efforts to achieve the circular economy.

Note: If there are commonalities between Section I and Section II, please repeat the same answer or write “Same as above.”

Section III. Green Productivity

1. Have the APO’s GP activities contributed to your country’s efforts for sustainable development?
2. Have the APO’s GP activities contributed to NPO capacity building in the areas of the environment, energy, health, and safety?
3. List at least three APO projects/activities that have been found significant in the promotion of GP in the country.
4. List three to five areas in which the APO can develop projects helping your country to achieve the SDGs and circular economy.
5. List at least three key institutions apart from the NPO with which the APO can network to expedite the promotion of GP.

Section IV. APO Projects on Green Productivity

1. Are you satisfied with the number and scale of APO multicountry projects on GP-related subjects?

2. Would you be willing to organize national projects on GP-related subjects with support from the APO?
3. If the answer to question 2 is yes, please list three to five projects that the NPO along with key institutions would be willing to organize in the country.
4. Would you be interested in a database of experts on GP for the SDGs developed by the APO?
5. Please list newer formats of APO projects, whether multicountry or national, that your NPO suggests the APO to adopt (these formats should be different from the current project structure followed by the APO).

Section V. Green Productivity Resources

1. Prioritize by selecting a number from the dropdown list
 - Toolkit on GP for the SDGs
 - GP self-appraisal online system for industries and public-sector enterprises
 - Mobile-based applications on GP for the SDGs
 - Asia-Pacific GP portal for sharing best practices
 - Compendium of policy initiatives taken in the Asia-Pacific and at global level in order to achieve the SDGs/circular economy
 - Instituting GP for SDGs Excellence Awards for organizations
 - Other, please specify:
2. Linkage of GP and Industry 4.0/smart manufacturing/smart services/smart communities/smart farming
 - Capacity building required with support from the APO (list a few specific areas):
 - Technological support required with the support from the APO (list a few specific technologies):
 - Areas in which COE should be developed by the APO:
 - Areas in which the APO could initiate short- and long-term research activities:
 - Specific knowledge-based resources to be developed by the APO (list a few):

New Formats of Projects to Accelerate Capacity-building Efforts of the APO/COE on GP

Based on the results of surveys of experts in APO member countries in early 2020, the suggested topics for COE on GP activities were:

1. Green Productivity
 - GP certification programs
 - GP framework
 - Public awareness of GP
2. Energy management
 - Energy auditing
 - Energy efficiency
3. Waste management and recycling
4. Green supply chain management
5. Material flow cost accounting
6. ISO standards related to the SDGs
7. Smart, digital, and intelligent industry
8. Clean production
9. Financial mechanisms
10. Corporate social responsibility

The summary of survey results from previous workshops, forums, and conferences also provided opinions on formats and topics of COE on GP activities from resource persons or experts and participants from different member countries.

The comments from resource persons/experts on COE on GP projects are summarized as follows:

1. Differentiation of participants in an activity is necessary. Technical and nontechnical personnel have different expectations and ability to understand the activities they participate in.
2. Onsite demos and hand-on activities are very valuable and more should be arranged to lower the proportion of classroom lectures or discussion.
3. e-Learning for longer periods of time can help to deliver more comprehensive GP knowledge and training.

The comments from participants in COE on GP activities are summarized as:

1. More time is needed for better training in a single GP event.

2. Site visits and case studies are more effective in delivering GP concepts and operations.
3. Methodology, tools, books, and guidelines, such as project management toolkits, would benefit participants in their work.
4. After training, follow-up activities such as using Facebook as a dialogue platform or onsite visits would be valuable.

Capacity-building Program Suggestions

The survey results from previous workshops, forums, and conferences and the new survey conducted in 2020 suggested the following topics for GP capacity-building programs:

1. Strengthening of government institutions for allocating financial resources for sustainable natural resource management
2. Reduction, recycling, and reusing waste through application of the circular economy model
3. Sustainable energy solutions for enhancing access to energy including rural areas
4. Projects on natural and organic farming
5. Material recycling transportation and facilities (steel and plastics)
6. Renewable energy projects
7. Smart cities and towns
8. GP diagnosis and recommendations
9. Feasibility studies for energy source substitution
10. Electric vehicles
11. Cleaner production and resource efficiency
12. Energy efficiency and energy management
13. GP for the SDGs
14. Agriculture revitalization in light of the SDGs/circular economy
15. GP for SME transformation
16. Rotating conference on GP for the SDGs (each country to host this conference to highlight their SDG achievements)
17. Renewable energy

18. Urban governance and waste management
19. Ecotourism
20. Sustainable consumption and production
21. Advanced wastewater treatment and management
22. Advanced solid waste management
23. Organic agriculture
24. Energy auditing (also consider an energy auditor certification scheme)
25. Energy-efficient technologies and best practices for the construction and mining sectors
26. Sustainable, climate-resilient infrastructure including buildings (also consider research on developing a rating scheme for sustainable infrastructure)
27. Smart public transport systems
28. Air pollution prevention and control by identifying hotspots at city level
29. Monitoring of sustainable infrastructure projects
30. Reduce, reuse, recycle (3Rs for sustainable waste management)
31. Disaster risk-reduction strategies
32. Energy management system: ISO 50001
33. Smart industry
34. Sustainable food management
35. Strategies to minimize postharvest losses

Additional Support Services Suggested

In addition to event-based activities, continuous consultation services are another type of instrument that can be applied to promote GP among APO members, including online portals, micro COE, and manuals or toolkits.

Online Portals to Be Developed by the APO

1. GP for the SDGs portal providing an information and knowledge base for professionals and the community at large
2. Online training-of-trainers' portal including trainers' toolkits and case studies

3. Toolkit on how to calculate the energy efficiency of utilities with online tools for energy efficiency calculations for motors, pumps, compressors, industrial fans, furnaces, cooling towers, heating and cooling systems, etc.
4. Mobile-based applications and/or web-based platform for GP self-appraisal
5. Online GP advisory services for SMEs (utilizing NPOs with specific expertise, for example, the COE on GP could provide such online advisory services on green technologies through the APO portal)

Potential Ideas for Setting up Micro COE under the COE on GP

1. COE on Innovation in GP for the SDGs, only focusing on compiling, reviewing, and promoting green innovations in collaboration with developed countries
2. COE on Green Technologies, only focusing on compiling and promoting green technologies in a database maintained and updated by the COE
3. COE on the Circular Economy

Expanding the *Green Productivity Manual* into a GP Virtual Toolkit

Table 4 lists potential elements of a GP Virtual Toolkit expanding on the contents of the *APO Green Productivity Manual*.

TABLE 4

ELEMENTS, APPLICABILITY, AND CONTENTS OF POTENTIAL GP VIRTUAL TOOLKITS.

Resource element	Applicability	Suggested contents
<i>GP Base Manual: Concept and Strategy</i>	Supply chains and facilities	<ul style="list-style-type: none"> • Understanding the triple bottom line and sustainability • Introduction to associated concepts relevant to GP • Introduction to the GP concept • Overview of GP methodology • Linkages to handbooks and toolboxes
<i>GP Handbook for Implementers and Facilitators</i>	Supply chains	<ul style="list-style-type: none"> • Key challenges and opportunities in greening of supply chains • GP as a strategy and tool • Supply chain focus areas: resource use and efficiency, energy, health and safety, codes of conduct, product greening, etc. • Addressing global issues and market concerns • Identification of focus areas for GP implementation • GP methodology • Implementing GP programs across supply chains • Metrics, tracking, and reporting • Barrier analysis and enabling measures • Training resources and necessary tools (updated and expanded)
<i>GP Handbook for SMEs</i>	Facilities	<ul style="list-style-type: none"> • Identification of focus areas for GP implementation in facilities • GP methodology (simplified) • GP worksheets for SMEs • Necessary tools (updated and expanded)
<i>GP Handbook for the Service Sector</i>	Facilities	<ul style="list-style-type: none"> • Identification of focus areas for GP implementation • GP methodology (simplified) • GP worksheets for the service sector • Necessary tools (updated and expanded)

References

1. Asian Productivity Organization. Assessment of Green Productivity Implementation and Needs of Member Countries. Tokyo: Asian Productivity Organization; 2014.
2. United Nations Climate Change. <https://unfccc.int>, accessed on 28 February 2020.
3. Committee on Green Growth. Green Growth Korea. <http://www.greengrowth.go.kr>, accessed on 28 February 2020.
4. United Nations. Sustainable Development Goals Knowledge Platform. <https://sustainabledevelopment.un.org>, accessed on 28 February 2020.
5. De Schoenmakere M. and Gillabel J. Circular by Design Products in the Circular Economy. European Environment Agency; 2017.
6. European Commission. Closing the Loop—An EU Action Plan for the Circular Economy. 2015.
7. Ellen MacArthur Foundation. Towards the Circular Economy. 2013.
8. Nestlé. The circular economy: These are the world's most sustainable companies. <https://www.nestle.com/stories/world-most-sustainable-companies-henniez>.
9. Federation of Indian Chambers of Commerce & Industry. Accelerating India's Circular Economy Shift. <http://ficci.in/spdocument/22977/FICCI-Circular-Economy.pdf>. 2018.
10. Giljum S., Dittrich M., Lieber M., and Lutter S. Global patterns of material flows and their socio-economic and environmental implications: A MFA study on all countries world-wide from 1980 to 2009. *Resources* 2014, **3**(1), 319–339; <https://doi.org/10.3390/resources3010319>.
11. OECD. Global Material Resources Outlook to 2060. Paris: OECD; 2018.
12. Faisal A.M. and Umama A. Ensuring sustainability through a circular economy. *The Independent* (2020). <http://www.theindependentbd.com/printversion/details/233602>.
13. Pilat A.-L. Why we need to transition to a circular economy. *Dhaka Tribune* (2018). <https://www.dhakatribune.com/tribune-supplements/tribune-climate/2018/07/19/why-we-need-to-transition-to-a-circular-economy>.
14. Max S. Fiji's eco-resorts lead the way to a green economy. *Environment News Service* (2017). <http://ens-newswire.com/2017/05/31/fijis-eco-resorts-lead-the-way-to-a-green-economy/>.
15. Ministry of Economy, Republic of Fiji. 5-Year & 20-Year National Development Plan: Transforming Fiji. <https://www.fiji.gov.fj/getattachment/15b0ba03-825e-47f7-bf69-094ad33004dd/5-Year-20-Year-NATIONAL-DEVELOPMENT-PLAN.aspx>.
16. Bhattacharjya S. and Kapur S. Reference Report for National Resource Efficiency Policy for India. April 2019.

17. Republic of Indonesia. Voluntary National Review (VNR): Eradicating Poverty and Promoting Prosperity in a Changing World. 2017.
<https://sustainabledevelopment.un.org/content/documents/15705Indonesia.pdf>.
18. Ministry of Foreign Affairs, Japan. SDGs Action Plan 2020.
<https://www.mofa.go.jp/mofaj/gaiko/oda/sdgs/pdf/actionplan2020.pdf>.
19. United Nations High Level Political Forum 2017. Japan's voluntary national review.
<https://sustainabledevelopment.un.org/content/documents/16445JapanVNR2017.pdf>.
20. Ministry of Environment and Korea Environmental Industry & Technology Institute. *Policy Handbook for Sustainable Consumption and Production of Korea*, 1st edition.
https://www.oneplanetnetwork.org/sites/default/files/policy_handbook_for_sustainable_consumption_and_production_of_korea.pdf.
21. Climate Action Tracker: South Korea.
<https://climateactiontracker.org/countries/south-korea/>.
22. United Nations Development Programme. Circular economy strategies for Lao PDR.
<https://www.undp.org/content/undp/en/home/librarypage/climate-and-disaster-resilience-/circular-economy-strategies-for-lao-pdr.html>.
23. Government of Malaysia. Sustainable Development Goals Voluntary National Review 2017.
<https://sustainabledevelopment.un.org/content/documents/15881Malaysia.pdf>.
24. Green Economy Policy Assessment: Mongolia.
<https://www.greengrowthknowledge.org/national-documents/green-economy-policy-assessment-mongolia>.
25. Cave J. Developing 'green' economy through PPP. Philippines News Agency (2019).
<https://www.pna.gov.ph/articles/1072615>.
26. De Vera-Ruiz E. DENR ready to focus on green economy. *Manila Bulletin* (2017).
<https://news.mb.com.ph/2017/03/30/denr-ready-to-focus-on-green-economy/>.
27. United Nations High Level Political Forum 2018. Towards a sustainable and resilient Singapore.
https://sustainabledevelopment.un.org/content/documents/19439Singapores_Voluntary_National_Review_Report_v2.pdf.
28. Dhanapala K. The Green Economy. *LMD The Voice of Business*.
<https://lmd.lk/the-green-economy/>.
29. Gunatilleke N. Towards a green economy in Sri Lanka: A forestry perspective. *Journal of the National Science Foundation of Sri Lanka*, 2013; **41**(4): 271–272.
30. Netherlands Enterprise Agency. Circular economy in Vietnam.
<https://www.rvo.nl/sites/default/files/2018/02/Factsheet-Scoping-Mission-Circular-Economy.pdf>.

31. Asian Productivity Organization, Center of Excellence on Green Productivity, China Productivity Center. <https://www.apo-CoEgp.org/index.aspx>, accessed on 28 February 2020.
32. Asian Productivity Organization, Center of Excellence on Green Productivity, China Productivity Center. Project Evaluation by Resource Persons (unpublished) (17-IN-34-GE-TRC-A, 18-IN-34-GE-TRC-A, 19-IN-32-GE-TRC-A, 19-IN-32-GE-TRC-A); 2017–2019.
33. Asian Productivity Organization, Center of Excellence on Green Productivity, China Productivity Center. Project Evaluation by Participants (unpublished) (17-IN-34-GE-TRC-A, 18-IN-34-GE-TRC-A, 19-IN-32-GE-TRC-A, 19-IN-32-GE-TRC-A); 2017–2019.

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Malaysia
Mongolia
Nepal
Pakistan
Philippines
Singapore
Sri Lanka
Thailand
Turkey
Vietnam

