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Identifying Green, Sustainable and Innovative MSMEs in APEC

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Introduction

Micro, Small and Medium Enterprises (MSMEs) play a key role in APEC, making up 97 per cent of all enterprises and employing 50 per cent of the workforce in the region[1]. Notably, their contribution to GDP varies between 20 to 50 per cent for most APEC economies [2] . While individual small businesses have rather low environmental footprints, their combined impact can exceed that of large businesses [3] , especially given their large number in APEC. MSMEs may produce more pollution than big businesses because of their informal nature and the resulting lack of regulations and supervision[4]. Indeed, studies have estimated that these businesses can contribute up to 60-70 per cent of pollution levels in developing economies[5]. Encouraging MSMEs to adopt green technology and other environmentally-friendly strategies is therefore essential for APEC in tackling climate change.

Developing APEC economies would particularly benefit from adopting a greener approach, as they tend to be more vulnerable to environmental changes and also more reliant on natural resources for their development[6]. Despite currently having low emissions in total compared to their OECD counterparts, developing economies are bound to eventually emit more if they continue to adopt conventional growth patterns. Adopting a greener growth strategy[7] could hence be beneficial to the economies themselves and to the wider global environment[8].

According to the OECD (2010), SMEs tend to be key drivers of innovation in green industries[9]. New firms are more likely to use technological or commercial opportunities to their advantage and also challenge older business models compared to established companies[10]. Taking into account the diverse nature of MSMEs in APEC, their role in promoting green growth is therefore two-fold:
1. Reducing their current levels of pollution, especially for those in the informal sector, and
2. Driving innovation of green technologies by firms with higher technological capabilities.

Recognising the importance of MSMEs in mitigating climate change in the region, APEC SME Ministers encouraged member economies to come to an understanding on the parameters that can help identify what a green, sustainable and innovative MSME is during the 24th Small and Medium Enterprises Ministerial Meeting in 2017 [11] . This policy brief therefore aims to examine the definition of a green, sustainable and innovative MSME, taking into account the existing green growth indicators developed by other organisations.

Challenges of MSMEs

MSMEs face more challenges in pursuing green growth compared to larger firms despite being more flexible in adapting to market changes[12].

- Lack of awareness: MSMEs lack awareness of the environmental impact of their activities, the effect of environmental regulations on the industry and the growing need for green skills[13].
- Limited access to information and technology: SMEs lack knowledge on clean alternatives and technical information to redirect their focus towards more systematic and integrated environmental methods and management practices.
- Strict regulatory requirements: Resource and information constraints prevent understanding and adaptation to a fast paced regulatory environment. Small firms also face difficulties in participating in global value chains as tighter green regulations and higher quality standards result in high costs.
- Lack of qualified personnel: SMEs' insufficient understanding of new green skills inhibit their investment in training and increase their tendency to rely on methods like on-the-job training or learning-by-doing which are insufficient to deal with substantial shifts in skills, leading to a lack of qualified personnel.
- Limited access to finance: In addition to the drop in demand for goods and services, and the tightening of credit terms in the post-crisis period, SMEs incur higher risk premiums when borrowing to invest in innovative technology due to uncertainty, making it difficult for them to invest in green growth.
- Barriers to markets: High barriers to international markets due to rapidly changing, complex and competitive environments prevent SMEs from benefiting from the global green

goods and services market. SMEs also face limited access to public procurement which is important for expanding green markets.

In order to implement the right measures to improve green growth among MSMEs, it is necessary to be able to measure their current level and potential progress, which will be examined in later sections.

Key Initiatives by APEC

In recent years, APEC has undertaken a number of initiatives regarding green, sustainable and innovative development of MSMEs. Most of them take the form of workshops to share best practices amongst participants. In general, APEC's green growth policy adopts a two-pronged approach: lowering carbon output, and increasing the use and trade of environmental goods and services (EGS).

Promoting green growth of MSMEs is in line with the APEC Growth Strategy of achieving inclusive and sustainable growth. Inclusive growth aims to ensure all APEC citizens have the opportunity to participate in, contribute to, and benefit from global economic growth. Promoting SME and entrepreneurship development is one way of doing so. Indeed many initiatives by APEC have helped to promote business opportunities for SMEs in global markets, and address barriers that restrict their ability to trade. Sustainable growth, on the other hand, advocates for economic growth that is compatible with environmental protection. This includes promoting low-carbon policies, improving access for EGS and nurturing the development of green technologies.

Green Initiative
The Green Initiative is the second cycle of the Daegu Initiative on SME Innovation Action Plan, and was endorsed by APEC SME Ministers in 2010. It aims to create a conducive economic and policy environment to facilitate green growth of SMEs in APEC through sharing of policy experiences of member economies. In 2011, an in-depth study into the Green Initiative was conducted, with a workshop to disseminate the findings of the study in Thailand. A second workshop was later conducted in Brunei Darussalam as a follow-up.

Reducing Import Tariffs for Environmental Goods
In the 2011 APEC Leader's declaration, Leaders agreed to take measures to reduce the most-favoured nation (MFN) tariff rates on environmental goods to 5% or less by 2015. An assessment conducted in 2016 showed most economies had successfully reduced their MFN tariff rates or had specific plans to do so during the course of the year. As part of this agenda, the APEC process also resolved issues relating to the identification and classification of environmental goods[14].

International Workshop and Training the Role of Business Incubators in Developing Green Technology-Based SMEs
In 2011, a workshop was conducted to develop recommendations for new SMEs focusing on green technology. It aimed to provide these firms with access to new markets, as well as to establish business networks in the region.

APEC Green Business Forum
The forum, organised in 2013, sought to prepare SMEs for the international green supply chain by focusing on capacity building and developing a conducive environment.

APEC SME Finance Forum
The forum, held in the Philippines in 2015, discussed measures to increase MSMEs' engagement in global value chains specifically through financial inclusion. As part of this initiative, economies supported the Cebu Action Plan (CAP) which involves improving policy frameworks that make it easier for MSMEs to attain finance, hence enabling easier investments into green and sustainable growth.

Greening Micro, Small and Medium Enterprises (MSMEs): A Pathway towards Sustainable Economic Growth in the APEC Region
In 2016, the forum was conducted to disseminate best practices on the green economy in APEC and to explore possible means for APEC members to collaborate on creating a conducive environment for MSMEs to adopt green practices.

The Green and Sustainable MSMEs in the APEC Region
The workshop was conducted in Peru in 2016 to share best practices and policies that can promote green and sustainable MSMEs, as well as highlight successful cases of sustainable small businesses. This included policy experiences from other multilateral fora such as OECD and UNIDO.

APEC Energy Working Group (EWG) projects
Most of the 158 APEC Energy Working Group (EWG) projects undertaken between 2010 and 2017 to support reliable, affordable and environmentally sustainable energy in the APEC region benefit MSMEs as significant energy consumers. They aim to lower the carbon intensity and use of energy supply across the APEC region. For instance, the Energy Smart Communities Initiative, as its name suggests, promotes energy-smart innovations among SMEs in the APEC region by providing a platform for information sharing. There have also been projects to boost the Energy

Efficiency of Electrical Appliances, which lowers energy costs to MSMEs.

A Review of Green Growth Indicators

Green growth is becoming an increasingly popular term as economies recognise that natural resources are finite and persistent economic growth requires careful management of these resources. In particular, the OECD defines green growth as "fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies" [15]. In essence, green growth entails investing in the environment as a source of economic growth[16].

Green growth indicators generally chart the progress of members across various environmental aspects and are usually based on the System of Environmental-Economic Accounting (SEEA) framework. The SEEA framework integrates economic and environmental statistics to provide a more comprehensive perspective[17]. It contains the internationally agreed standard concepts, definitions, classifications, accounting rules and tables for producing internationally comparable statistics and accounts, and follows a similar accounting structure as the System of National Accounts (SNA).

Examples of such indicators include OECD's Green Growth Indicators; the Green Growth Knowledge Platform (GGKP) indicators developed jointly by the Global Green Growth Institute, OECD, UNEP, and World Bank; UNESCAP's Green Growth Indicators; the UNEP's work towards developing green economy indicators; European Commission's industry indicators; and specific economy and local level indicators (See Annex for full list of indicators). In general, these indicators span across three broad categories: 1. Conventional environmental indicators that measure waste generation and resource use (eco-efficiency), 2. Indicators that account for social welfare, and 3. Policy-related indicators.

International Indicators

The initial green growth indicators were developed at an international level to enable measurement and tracking among economies. The primary list of international indicators developed by international organisations is closely based on the categories developed above.

Conventional indicators measuring environmental health include amount of waste generated in terms of carbon emissions or hazardous substance produced per unit output. They also measured resource consumption in terms of energy, water and land use. For instance, UNEP's indicators for environmental issues and targets measure energy productivity (Btu/$US), material productivity (ton/$US) and water productivity (m3/$US). Likewise, OECD considers environmental and resource productivity.

In addition, aspects of social welfare and policy responses are considered in some frameworks. The OECD's Green Growth Indicators have a section on Economic Opportunities and Policy Responses which also includes skill development and regulations such as taxes that help internalise negative environmental externalities. The GGKP additionally extends the OECD list of indicators to include socio-economic indicators, and suggests the use of wealth accounting to measure progress. This helps create a link between green growth and social goals like inclusion and poverty reduction.

UNEP's indicators take a slightly different track as they are meant to assist in green economy policy making and not measure green growth specifically. Some indicators highlighted by them include those for identifying issues that can be resolved using the green economy approach, as well as indicators for policy implementation and monitoring.

Regional Indicators

Regional indicators are generally similar to international level indicators. The European Commission's assessment framework called IGrowGreen adds onto the OECD's Green Growth Indicators with a calculation of aggregated performance scores.

UNESCAP's Green Growth Indicators, while also addressing conventional environmental factors, place greater emphasis on measuring institutional and policy support in developing economies. In particular, they note that indicators that explicitly address "inequality, access to basic ecosystem services, human capital investments (including traditional knowledge); urbanisation patterns and infrastructure development; governance (transparency, accountability and inclusiveness); resilience and a sectoral perspective (including in particular agriculture)" require closer attention[18].

Economy and Local Level Indicators

Economy, local and industry level indicators may adapt international level indicators to specifically suit their context. For instance, the Copenhagen Green Growth Indicators developed from the OECD green growth strategy, include only some of the indicators from the broad OECD framework. In particular, three out of five headline indicators from

the OECD Green Growth Indicators were deemed applicable to the local level: 1. Environmental and resource productivity, 2. Economic opportunities and policy responses, and 3. Socio-economic context indicators. The other two were left out due to data collection and policy jurisdiction issues.

Korea also developed its own National Green Growth Indicators, based on the OECD Green Growth Indicators. There are several differences between the OECD and the Korean indicators with regards to the natural asset indicators, the importance given to lifestyle and consumption patterns, the assessment of economic transformation, and the emphasis on policy performance measures. Most of the natural asset indicators were not included in the Korean indicators as they were deemed external and could not be used to measure policy performance and green growth. The Korean framework paid more attention to consumption and urban environment compared to OECD. Structural reform and industrialisation were also given more importance in the Korean framework as is apparent from the additional indicators. The same is noted for indicators measuring policy implementation and performance[19].

China developed the Resource and Environment Performance Index (REPI) [20], which reflects an economy's level of resource use by quantifying resource consumption and pollutant emissions per unit of GDP. This indicator focuses on the eco-efficiency of an economy, and does not include a social or policy aspect. This highlights China's concern over the sustainability of economic growth that depends on high fuel consumption and the resulting high pollution levels.

Australian indicators used to evaluate green growth in the cities of Perth and Melbourne include: built environment, climate change and energy, biophilia (urban greenery), transport and traffic, waste, water, and economic growth [21]. Australian cities place stronger emphasis on protecting their biodiversity compared to their counterparts in the rest of the world, and including biophilia indicators in their framework reflects this difference.

Indicators may also be industry specific such that they can be defined for the particular material used in the industry and resource use can be measured based on the production and consumption of the material in that specific sector. The industry level indicators identified by the European Commission mostly measure resource efficiency and waste production. Expenditure on R&D is also included. However, these indicators are limited in their ability to show the extent of efficiency of economic activities due to a lack of baselines.

Green Growth Indicators for MSMEs in APEC

While there is a wealth of information on existing green growth indicators, the main role of such metrics is to measure the progress of an economy, region or industry. In general, indicators relating to resource productivity and waste generated appear to be the most applicable for MSMEs in APEC. Other socio-economic indicators [22] and policy indicators may not be as pertinent, simply because the size of MSMEs generally does not allow them to enact change on that scale.

In order to identify a green, sustainable and innovative MSME, APEC can consider looking at the criteria from the World Bank's Green Bonds initiative[23]. For projects to qualify under this program they need to meet either of the two broad criteria, namely: 1. Mitigation of climate change (including utilising clean energy sources, recycling waste, and so on), and 2. Adaption (through investments in climate-resilient growth).

Similarly, the National Resource Canada (NRC), in defining clean technology has classified it into two main categories: 1. Any product, process or service with the primary purpose of preventing any type of environmental damage, or 2. A product, process or service that is less polluting or more resource-efficient than an equivalent normal product. Their primary use, however, is not one of environmental protection.

Combining these two definitions, the following two overall criteria to identify a green, sustainable and innovative MSME in APEC can be considered:

A. An MSME that mitigates negative environmental effects by adopting green business practices like recycling waste and installing solar panels, amongst others. Their primary business however need not necessarily be related to environmental protection. For instance a food stall that uses environmentally friendly packaging would fall under this category.
B. An MSME that actively adapts to the new market created by climate change, namely the green market, by becoming involved in producing green goods and services such as research and investment in EGS, and manufacturing recyclable and bio-degradable inputs.

More detailed sub-sections adapted from the international, regional or economy level indicators can then be included under the two broad classifications. To suit the context of MSMEs, the definitions may differ slightly from the original versions.

Additionally, the World Bank's Climate Technology Programme collaborated with three local partners in South Africa to test an outcome-based funding initiative to increase investments into green small and growing businesses (SGB). A set of indicators were developed to evaluate the outcomes of green SGBs and trigger payments, which can also be used to measure green growth of MSMEs in APEC.

Examples of green growth indicators suitable for MSMEs include, but are not limited to:

i. Waste generated: A green MSME is one that either adopts practices that reduce the amount of waste generated, or produce a good or service that helps user firms reduce the amount of waste generated. The European Commission is encouraging waste preventive initiatives as SMEs are often not fully aware of the environmental damage they create[24].
ii. Resource efficiency: Similar to the amount of waste generated, an MSME could either adopt methods that improve their resource efficiency, or produce a good or service that increases the resource efficiency of user firms.
iii. Business certification: International standards such as the ISO 14000 family of standards, which provides practical tools for companies and organisations looking to manage their environmental responsibilities, or the ISO 50001 (Energy management) certification can aid MSMEs in becoming more environmentally friendly. However while international certification is ideal, it is often complex and costly for an MSME to attain formal certification. Domestic or sectoral green label schemes can therefore also be considered.
iv. Share of environmental taxation: Environmental taxes are levied on businesses whose activities cause environmental damage. The tax can be imposed on each unit of environmentally harmful substance produced, for instance, per unit of CO_2 released[25]. It is intended to act as a source of revenue for the government and a deterrent against environment harming activities. Therefore the tax deductions encourage MSMEs to adopt green business practices that mitigate environmental harm. Environmental taxes may not be imposed in all economies, thus preventing comparisons across them. However, they can be used to evaluate businesses across an economy that imposes them.
v. Participation in environmental projects and knowledge based institutions: This strengthens the capacity of MSMEs through their participation in knowledge clusters. More innovative MSMEs can in turn contribute back to the cluster by increasing the dynamism of the network.
vi. Development of "green" jobs or skills: This could be in terms of R&D employment, or development of other skills that lead to the mitigation or adaption of climate change. It could also be linked to hiring workers with education or prior experience relating to "green" jobs.

Way Forward for APEC

Given the substantial proportion of MSMEs in the APEC region, there is considerable potential for developing a sustainable and inclusive Asia-Pacific by encouraging small firms to operate in a more environmentally-conscious manner.

However, there is first a need to identify what a green, sustainable and innovative MSME is. While this policy brief outlines some guidelines based on international, regional and economy level green growth indicators, there is still much work to be done in APEC. Firstly, baseline data at the firm level could be collected from member economies to provide a clear picture of the current situation. An APEC-specific framework may then be developed from this, suited to the particular features of the region. Secondly, APEC has undertaken many initiatives regarding green, sustainable and innovative development of MSMEs. The impact of these programs could be gauged to determine how much more work is needed to be done, and what form is most effective.

Lastly, multiple sources[26] agree that adapting local level indicators from international level ones require some degree of modification to ensure their relevancy. According to the OECD[27], green growth needs to be tracked at all levels: international, economy and local as the impact of climate change varies across them. Policy impacts may also differ according to local situations. For instance, in the European Commission's guide on supporting members in applying the OECD Green Growth Indicators locally, they noted that economies placed different importance on the indicators. The economies either excluded non-applicable indicators or added new ones specific to them, depending on their domestic situation. However, there is no specific criteria on how these changes should be made as it depends on the local context. In this same vein, a framework to identify green, sustainable and innovative MSMEs in APEC needs to be flexible enough to be applied by both industrialised and developing economies, as well as take into account geographical differences. More in-depth studies could be conducted to first determine specific indicators to identify green MSMEs and consequently policies could be developed to

encourage greater uptake of green practices among them and other firms. Finally, focus group discussions can be arranged to facilitate exchange of ideas to identify context specific indicators.

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ANNEX

Table 1: OECD Green Growth Indicators 2017

Environmental and resource productivity
1. Carbon and energy productivity 2. Resource productivity 3. Multifactor productivity adjusted for the use of natural resources and environmental services
Natural asset base
4. Availability and quality of renewable natural resource stocks 5. Availability and accessibility of non-renewable natural resource stocks 6. Biological diversity and ecosystems including productivity of land and soil resources
Environmental quality of life
7. Human exposure to pollution and environmental risks, associated effects on health and quality of life, and related health costs and impact on human capital and labour productivity 8. Public access to environmental services and amenities, characterizing the level and type of access of different groups of people to environmental services
Economic opportunities and policy responses
9. Technology and innovation that are important drivers of growth and productivity in general, and of green growth in particular 10. Investment and financing that facilitate the uptake and dissemination of technology and knowledge, and contribute to meeting the development and environmental objectives 11. Production of EGS that reflect an important, albeit partial, aspect of the economic opportunities that arise in a greener economy 12. Prices, taxes and transfers that provide signals to producers and consumers and help internalize negative environmental externalities, and which are complemented by indicators on regulation and on management approaches 13. Education, training and skills development

Source: Green Growth Indicators 2017 (http://www.keepeek.com/Digital-Asset-Management/oecd/environment/green-growth-indicators-2017_9789264268586-en#page17)

Table 2: GGKP's Socio-Economic Indicators (extension to the OECD Green Growth Indicators)

Socio-economic indicators
1. Economic growth, productivity and competitiveness 2. Labour market, education and income

Source: http://www.oecd.org/greengrowth/48224574.pdf

Table 3: UNESCAP Green Growth Indicators

Equitable distribution and access
1. Distribution of benefits from resource, energy, ecosystem services, and distribution of burden of degradation 2. Institutional and policy support for inclusion and participation
Structural transformation
3. "Green" investment, investment in EGS 4. Institutional and policy support for social technology and other innovation
Eco-efficiency
5. Resource/waste emissions intensity/efficiency 6. Institutional and policy support for efficiency or productivity improvement
Investment in natural capital
7. Natural capital stock and natural resource flows 8. Institutional and policy support for investment in natural capital
Planetary limits
9. Policy regarding resource use and emissions limits and targets at regional, sub-regional, national and/or sub-national levels 10. Institutional and policy support for science-policy interface and stakeholder involvement in setting limits and target, monitoring and feedback mechanisms

Source: http://www.unescap.org/publications/green-growth-indicators-practical-approach-asia-and-pacific

Table 4: UNEP Policymaking for Green Economy Indicators

Indicators for issue identification
1. Identify potentially troublesome trends 2. Assess the issue and its relationship to the natural environment 3. Analyse the underlying causes of the issue of concern broadly 4. Analyse how the issue impacts the society, the economy and the environment
Indicators for policy formation
5. Identify desired outcomes: define policy objectives 6. Identify intervention options and expected outputs
Indicators for policy assessment
7. Estimate policy impacts across sectors 8. Analyse impacts on the overall well-being of the population 9. Analyse advantages and disadvantages and inform decision-making
Indicators for policy monitoring and evaluation
10. Measure policy impact in relation to the initially identified issue 11. Measure the investment leveraged and assess enabling policies implemented 12. Measure impacts across sectors and on the overall well-being of the population

Source: http://web.unep.org/greeneconomy/sites/unep.org.greeneconomy/files/publications/indicators-synthesis_final_22april_web.pdf

Table 5: UNEP Green Economy Transition measuring Indicators

Economic indicators
1. Measure investment, output and employment in green sectors
Environmental indicators
2. Assess the efficiency of resources and pollution intensity
Aggregate progress and well-being indicators
3. Analyse the integration of environmental and economic accounting, natural capital depreciation, and other broader measures of well-being

Source: UNEP: Towards a Green Economy (presentation)

Table 6: European Commission's Industry Indicators

Material resources
1. Consumption and savings of input materials
Natural resources
2. CO_2 emissions 3. Emissions to water
Energy
4. Consumption and savings of energy, fossil fuels 5. Thermal efficiency 6. Substitution of conventional fuels by alternatives 7. Consumption and savings of primary energy
Waste
8. Recycling and waste collection
General
9. Expenditure on resource related R&D

Source: http://www.gppq.fct.pt/_7pq/_docs/brochuras/online/resourceefficiencyindicators-feb2013.pdf

Table 7: National Green Growth Indicators- Korea

Measures for climate change and securing energy independence
1. Greenhouse gas emissions and absorption 2. Energy consumption, self-developed oil and gas, and new and renewable energy 3. Self-sufficiency of food, accuracy of rainfall, and preparedness for disaster management
Creation of new growth engines

4. Investment in R&D in general and green R&D in particular 5. Domestic material consumption, and environmental and renewable industry sales 6. Value added from service sector, and knowledge intensive and information and communication industries 7. ISO 14001 certified businesses and environmental taxes
Improvement of quality of life and contribution to international community
8. Urban green spaces, public passenger transportation, and environment protection 9. Household energy consumption, and municipal water usage and generation 10. Total official development assistance (ODA) and green ODA

Source: https://www.unido.org/sites/default/files/2015-05/GLOBAL_GREEN_GROWTH_REPORT_vol2_final_0.pdf

Table 8: Copenhagen Green Growth Indicators

Environmental and resource productivity
1. Resources' productivity
Economic opportunities
2. Examine capacity of local area to act on low carbon opportunities by measuring • research and knowledge intensity • students and learning • value and number of jobs associated with green economy
Skills and training ecosystems
3. Progress of green skills development 4. Patterns of change in skills and training ecosystems
Socio-economic context
5. Describe social and industrial characteristics
Policy responses
6. Capture the progress of local policy actors in green policymaking

Source: http://www.oecd.org/cfe/leed/Measuring%20Local%20Green%20Growth_Copenhagen_29%20January%2013%20FINAL%20for%20Francois.pdf

Table 9: Green Growth Indicators for Australian Cities

Built environment
1. Green buildings and green infills 2. People density and proximity to critical amenities
Climate change and energy
3. Renewable energy generated and emissions abated
Biophilia (urban greenery)
4. Green space and urban forestry 5. Community participation, well-being and green jobs
Transport and traffic
6. Investment in infrastructure and public transport systems, and job creation 7. Use of public transportation and emissions abated
Waste
8. Waste generation 9. Recycling, illegal dumping, and processing of waste
Water
10. Water quality and access
Economic growth
11. City level GDP and carbon intensity of GDP

Source: https://www.rees-journal.org/articles/rees/full_html/2017/01/rees170007s/rees170007s.html

Table 10: Green Outcomes Fund's Green Metrics (World Bank's Climate Technology Programme)

Mitigation/Diversion
1. CO_2 equivalent emissions mitigated or saved 2. Energy efficiency- energy saved based on deemed savings values

3. Waste to landfill avoided, avoided waste incinerated, waste recycled/re-used, chemical recovery 4. Water use reduction, wastewater treated, water productivity
Generation
5. Green energy generated 6. Water sourced from an alternative sustainable resource
Access to green energy
7. Persons reached by reliable green energy grid/source that were with and without prior access to the traditional energy grid
Job creation
8. Green sector direct and indirect jobs created*

Source: http://documents.worldbank.org/curated/en/222801506074703147/pdf/119912-BRI-climate-technology-program-in-brief-8-can-outcome-based-financing-ca.pdf

China's Resource and Environment Performance Index (REPI)

$$REPI_j = \frac{1}{n}\sum_{i}^{n} W_i \frac{g_j/x_{ij}}{G_0/X_{i0}}$$

W_i = The weight of resource consumption or pollutant discharge performance of resource i

x_{ij} =The total quantity of resource consumption or pollutant discharge of resource i in province (or region) j

g_j = The GDP (total) in province (or region) j

X_{io} = The total quantity of resource consumption or pollutant discharge of i in the economy

G_o = GDP of the economy

g/x and G/X = The intensity of resource consumption or pollutant discharge that results in each province (or region) (g/x) and the whole economy (G/X)

n: the number of types of consumed resources or pollutants discharged

* The larger the number, the higher the REPI, and the poorer the performance of the economy or the province (or region). For simplification, it is assumed that the weight of all resources and pollutant discharge results is identical.

Source: Extracted from Chinese Academy of Science, China Sustainable Development Strategy Report 2011: Greening the Economic Transformation, http://www.unescap.org/sites/default/files/13.%20CS-China-Resource-and-Environment-Performance-Index.pdf