UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

Statistical Yearbook for Asia and the Pacific 2015

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Sustainable Development Goal 12
Ensure sustainable consumption and production patterns

Sustainable consumption and production refers to "the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations."[1] Consumption and production patterns that are more sustainable than is currently the case would result in a reduction in adverse environmental impacts and contribute towards poverty eradication without undermining the basis of human development through opportunities such as creation of new markets, green and decent jobs, and more efficient management of natural resources.

In other words, sustainable consumption and production involves "doing more and better with less,"[2] it is about increasing resource efficiency and promoting sustainable lifestyles. Over the past several decades, economic development has enabled millions of people to get out of poverty. However, corresponding increases in the consumption of resources have led to an increase in pollution and waste, which has harmed the environment and eroded ecosystems. Hence, national and global leaders at the United Nations Conference on Environment, which was held in Rio de Janeiro in June 2012, issued an outcome document[3] and adopted a 10-year framework of programmes on sustainable consumption and production patterns to enhance international cooperation in accelerating the shift towards sustainable consumption and production.[4]

12.1 Resource use

As the engine of manufacturing for the world, the Asian and Pacific region is a fundamental part of material utilization globally. As such, the consumption of goods manufactured in Asia and the Pacific has created a large "material footprint" across the manufacturing sector's supply chain, involving many different kinds of material. The growth in material use by the manufacturing sector has resulted in economic growth in many parts of the region; the less developed countries are now starting to catch up with the living standards enjoyed by their more developed counterparts. An expanding middle class has increased the demand for and consumption of material-intensive products, such as cars, furniture and household appliances. Understanding the rate of material utilization is crucial in ensuring the sustainability of consumption and production patterns as the utilization process results in products and services that generate unwanted waste products.[5]

Material consumption in the Asia-Pacific region has increased at a higher rate than the population growth rate and that of GDP

The economies in the Asia-Pacific region are endowed with a wide range of natural resources – materials, energy and water – available for domestic consumption. Such materials include biomass, fossil fuels, metal ores and non-metallic minerals that support the cultivation of food, the production of energy, infrastructure and transport systems, and production of consumer goods.[6] The term "domestic material consumption" is defined as the total amount of materials used by an economy, extracted from the domestic territory plus all physical imports minus all physical exports.

Between 1990 and 2010, the domestic material consumption of the region increased threefold from 12.4 billion tons to 37.1 billion tons, which equates to an average growth rate of 5.6 per cent annually – more than four times the population growth rate and 0.9 percentage points higher than the average GDP growth rate during the period. China (23.6 billion tons per year) largely dominated domestic material consumption at the regional (and global) level in 2010, followed by India (5.0 billion tons per year), Indonesia (1.6 billion tons per year), Japan (1.2 billion tons per year) and Australia (1.0 billion tons per year). The average annual growth rates between 1990 and 2010 in the low- and lower middle-income economies in Asia and the Pacific were 2.0 and 4.2 per cent respectively compared with 0.5 per cent among the high income economies. (Fig 1)

In Asia and the Pacific, the utilization of non-metallic minerals – mostly construction and industrial minerals – increased by 4.8 times between 1990 and 2010. Over the same period, consumption of fossil fuels and metal ores increased by 2.6 and 3.0 times respectively. These increases reflect a shift from non-durable or short-lived investments towards more permanent and long-lasting infrastructural projects. Better understanding of changes in domestic material consumption over time and by region will help policymakers to develop specific resource use strategies and initiatives. (Fig 2)

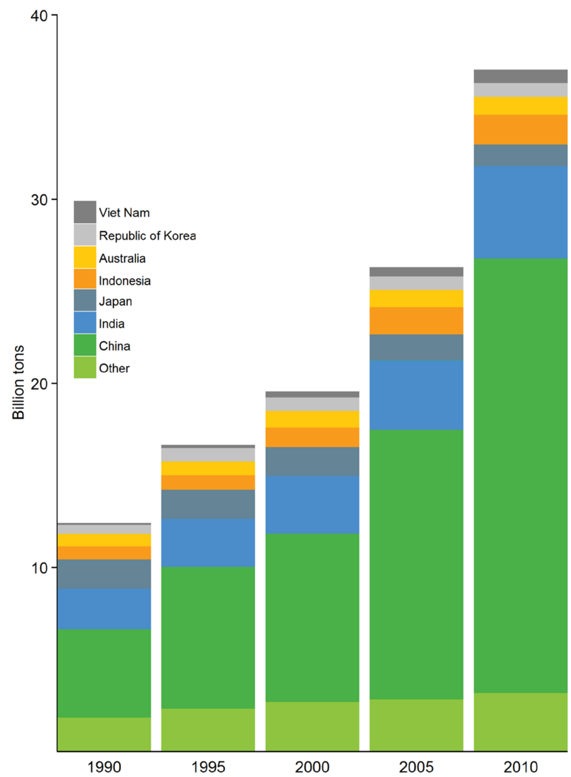


Figure 1
Domestic material consumption, Asia and the Pacific, 1990 to 2010

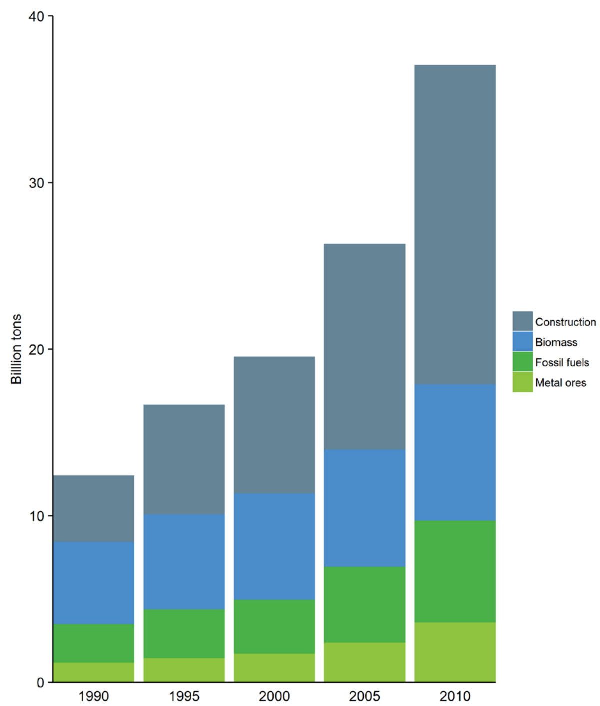


Figure 2
Domestic material consumption by material category, Asia and the Pacific, 1990 to 2010

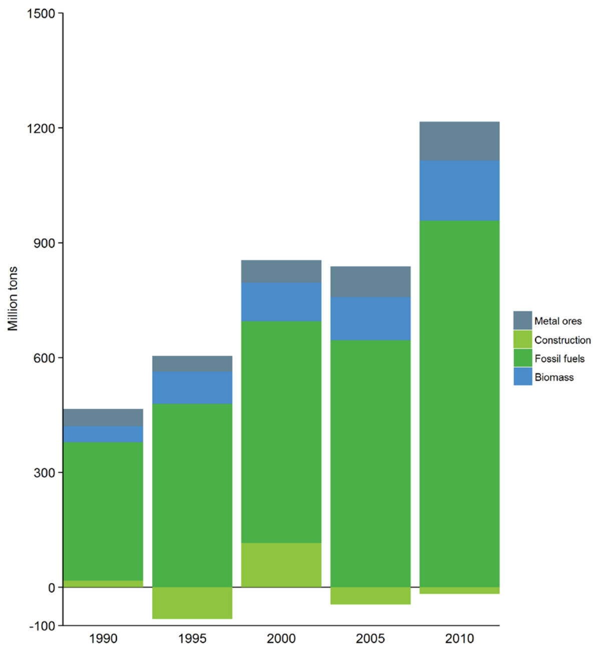
Material consumption in Asia-Pacific economies depends on natural resources from outside the region

Over the past four decades, raw materials, particularly fossil fuels and metal ores, have been supplied from outside the Asia-Pacific region to support economic growth. The domestic supply of raw materials has been unable to meet the growing demand in many countries in the region; consequently physical trade balances – physical mass of imports minus the physical mass of the export of materials – are changing. Some countries have positive physical trade balances, that is, they are net importers of primary materials, while others have negative physical trade balances, that is, they are net exporters of primary materials.

The region as a whole had positive physical trade balances throughout the last two decades, which means it imported more materials from the rest of the world than it exported. The upper middle-income and high income countries contribute the majority of net imports of materials in the region. China (1.1 billion tons) and Japan (0.6 billion tons) were the region's leading net importers of materials in 2010, while Australia (0.7 billion tons) and Indonesia (0.4 billion tons) were the region's highest net exporters of materials. During the last two decades, China, the country with the largest trade in materials in the Asia-Pacific region, shifted from being a net material exporter to a net material importer as its domestic markets grew.

In 2010, the Asia-Pacific region was a net importer of fossil fuels (1.0 billion tons), metal ores (0.1 billion tons) and biomass (0.2 billion tons). The largest net importers of fossil fuels were China and Japan, whereas Indonesia and Australia were the largest net exporters of fossil fuels. On the other hand, the Asia-Pacific region is a net exporter of construction materials (16.9 million tons), mainly as a result of exports from China and Thailand. (Fig 3)

Figure 3
Physical trade balance, Asia and the Pacific, 1990 to 2010



Material use per person has been increasing over the last two decades

The total increase in domestic material consumption in Asia and the Pacific is partly a result of population growth. However, consumption per capita also increased steadily, resulting in a doubling of domestic material consumption from 4.2 tons per capita in 1990 to 9.7 tons in 2010. This represents an average annual increase of 4.3 per cent.

Increases in per capita domestic material consumption have varied considerably in the region. In China, the region's largest economy, domestic material consumption increased from 4.1 tons per capita to 17.6 tons, a much greater increase than that in India, the region's second largest economy, where domestic material consumption increased from 2.5 tons per capita to 4.1 tons. These changes in domestic material consumption can be attributed to the corresponding economic reforms and controls implemented in China, which started in the late 1970s, and in India following its "balance of payments" crisis in 1991.

While most countries in the region increased their per capita domestic material consumption between 1990 and 2010, it decreased in Papua New Guinea, Japan, Mongolia, Fiji, Democratic People's Republic of Korea, Afghanistan and the Philippines. In Papua New Guinea, the decline was attributable largely to the population's decreasing dependence on certain groups of materials, such as fossil fuels. In Fiji, biomass and metal ore consumption per capita declined by 39 per cent and 33 per cent respectively. (Fig 4)

Material footprint of consumption in Asia and the Pacific has grown rapidly since the 1990s

"Material footprint" is a consumption-based indicator of resource use and represents the "global allocation of used raw material extraction to the final demand of an economy".[7] The material footprint offers additional information, as it attributes final material extraction to countries of final demand, and as such corrects the upstream requirements of imports and exports.

Reliance on imports of finished goods for domestic consumption is on the rise. The reliance on non-domestic materials and resources suggests that the full material requirements or material footprint of countries in the region extend beyond national borders. The practice of outsourcing materials has resulted in industrialized countries in the region increasing their material consumption, with the adverse environmental impacts being felt in the exporting economies.

Since 1990, the Asia-Pacific region increased its material footprint of consumption on average by 5.5 per cent annually. The majority of the expansion in the material footprint originated from the growing final consumption and capital investment in the less developed economies in the region. The middle-income economies continue to lead the region in average rate of increase per capita in the footprint of consumption.

In 2010, the highest material footprint per capita was recorded in Singapore at 70.5 tons per capita, followed by Australia (37.8 tons per capita) and the Republic of Korea (22.9 tons per capita). Even if China and India have the highest total material footprint overall, at 20.1 and 4.3 billion tons respectively, owing to their large populations their material footprint per capita is not among the highest in the region at 15.0 and 3.5 tons per capita respectively. (Fig 5)

Material footprint by sector in the Asia-Pacific region has increased significantly in the last two decades. The largest increase was for the construction sector where the material footprint more than tripled from 3.0 billion tons in 1990 to 11.5 billion tons in 2010. In 2010, the

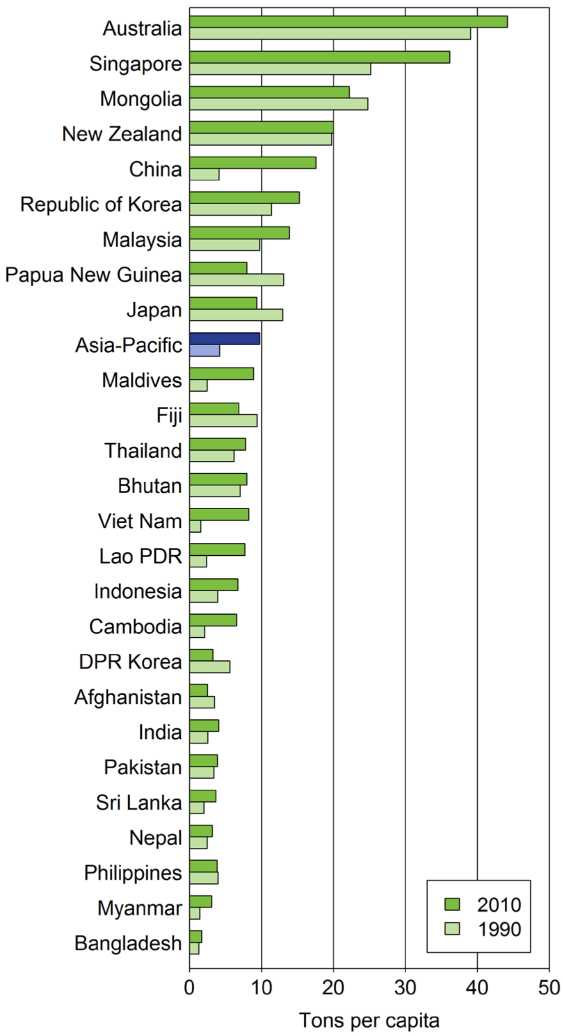


Figure 4
Domestic material consumption per capita, Asia and the Pacific, 1990 and 2010

construction sector was the largest consumer of material, with its share being 34.2 per cent of the total, followed by the manufacturing sector, with 30.5 per cent of the total material footprint in Asia and the Pacific. (Fig 6)

Figure 5
Material footprint and domestic material consumption per capita, Asia and the Pacific, 2010

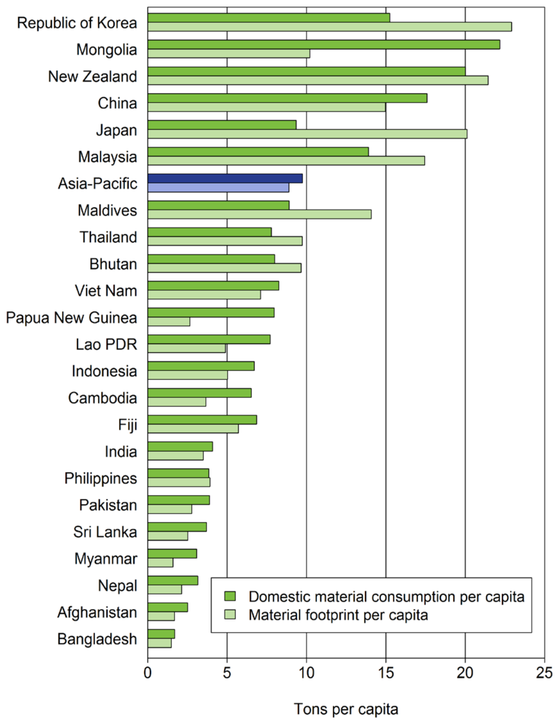
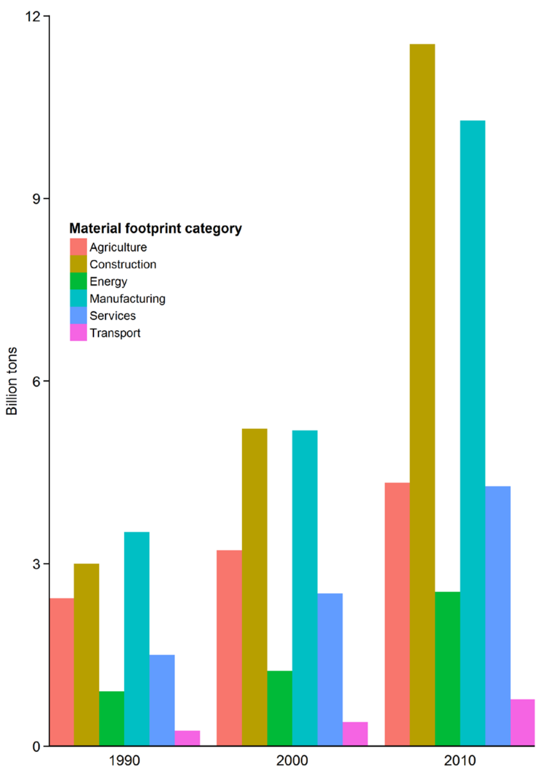


Figure 6
Material footprint, Asia and the Pacific, 1990, 2000 and 2010



Energy consumption of fossil fuels in the Asia-Pacific region continues to increase

Total energy utilization is measured in terms of the total amount of energy available to businesses and households in an economy, which may come in the form of coal, petroleum, natural gas, uranium and renewable energy sources, such as hydro, solar and wind. As a key factor in domestic and industrial production, energy utilization is closely associated with economic growth, and with this linkage, the amount of energy used and the characteristics of energy sources largely determine the emission profile of an economy.

Trends in the regional total primary energy supply[8] show that demand for electricity, gas and transport fuel almost doubled between 1990 and 2012. This increase is partly the result of rapid urbanization, mainly in China, which represents almost half of the region's total primary energy supply. A similar pattern of increase was observed for India during the past decade. While total primary energy supply is increasing for most countries in the region, the total primary energy supply of Japan has remained stable during the past two decades. The total primary energy supply of most Central Asian economies declined during the same period. Overall, per capita energy consumption remains unequal in the region, with the industrialized countries utilizing more than double the amount of energy as that consumed by developing countries. (Fig 7)

12.2 Efficiency in resource use

The basic principle of resource use efficiency is to produce more output per unit of resource input used. From a macroeconomic perspective, resource use efficiency is commonly measured in terms of (a) material or energy intensity, which is the physical mass or energy input needed to produce a unit of GDP and (b) material productivity, which is the GDP generated by a unit of material input or material consumption – the inverse of intensity. In the context of these measures, improvement in efficiency translates into a decrease in intensity.

Mixed signals concerning economic efficiency of material utilization in Asia and the Pacific

On average, GDP produced in Asia and the Pacific in 2010 required the use of 2.8 kg of materials per United States dollar GDP (constant 2005), an increase from 2.0 kg per dollar in 1990. This increase compares with a global material intensity of 1.0 kg per dollar in 2010. In 2010, the low income economies and upper middle-income economies in the region consumed 16.8 and 12.4 times as many resources per dollar as the high income ones respectively. Despite the high levels in 2010, the material intensity in middle-income economies has been declining over the last decade.

The decline in kilograms of material consumption per dollar is mirrored by the reduction in national material intensity for 22 of the 26 countries in the region for which data are available. Great disparities can be observed in material intensity among countries in the region in 2010, with Mongolia using 17.4 kg of materials per dollar and the Lao People's Democratic Republic using 12.1 kg per dollar while Japan was using 0.3 kg per dollar. This situation is indicative of the fact that the less developed economies in the region are engaged in economic activities with lower value addition, resulting in low levels of resource efficiency. (Fig 8)

Energy intensity is improving at a sluggish rate

Energy intensity is a measure of the amount of energy used for producing goods and services, and is promoted as part of the transition to low carbon development. However, energy intensity is higher in Asia and the Pacific than the global average, despite substantial improvements since 1990.

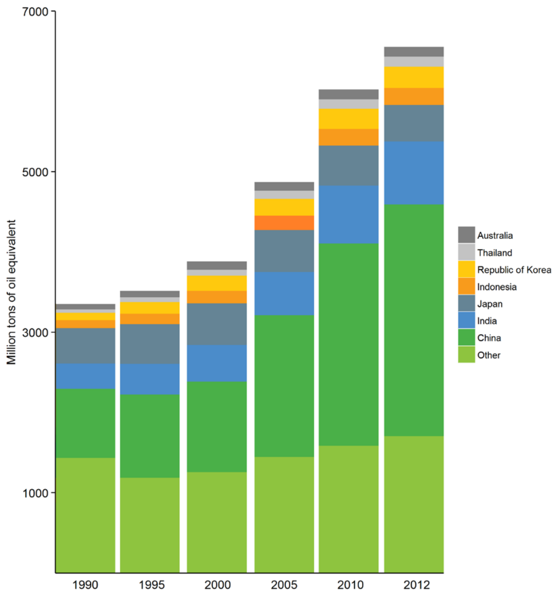


Figure 7
Total primary energy supply, Asia and the Pacific, 1990 to 2010

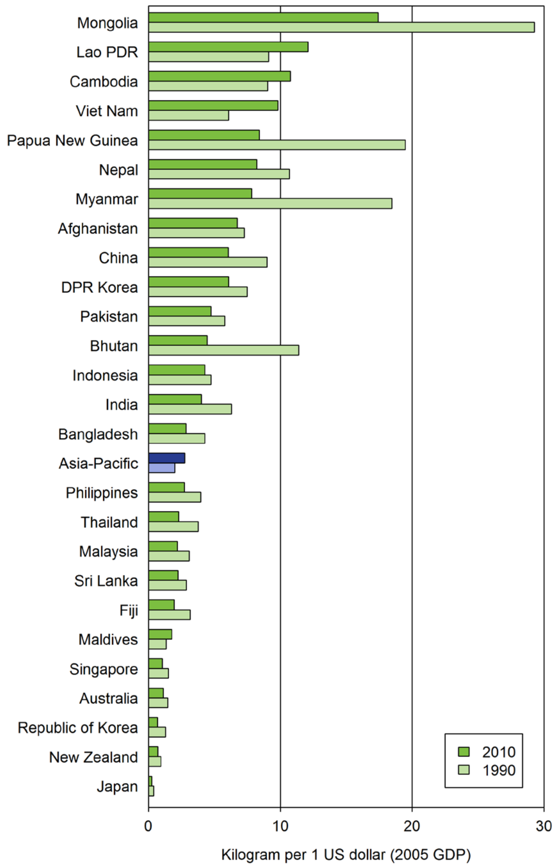


Figure 8
Material intensity, Asia and the Pacific, 1990 and 2010

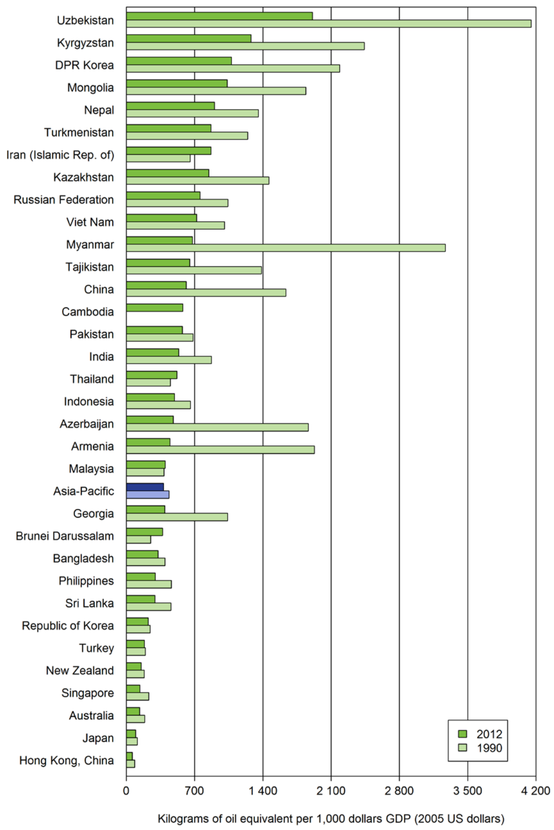
Improvements in energy intensity have been driven mainly by the upper middle economies which improved their energy efficiency by 44.4 per cent between 1990 and 2012. In 2012, the energy intensity of the upper middle-income economies in the region was 576.1 kg of oil equivalent per $1,000 GDP (constant 2005 prices in United States dollar), a decrease from the 1,033.4 kg of oil equivalent in 1990, or in percentage terms an average annual decrease of 2.6 per cent. Meanwhile, the energy intensity in high income economies decreased from 266.2 kg of oil equivalent per $1,000 GDP in 1990 to 193.3 in 2012, or an average annual reduction of 1.4 per cent.

Main drives the power energy intensities include the change in fuel mix in most developed countries. For instance, there is an increased use of gas in Australia and Singapore as well as gas and nuclear power in Japan and the Republic of Korea. Meanwhile, many upper middle-income countries have managed to increase their economic output with fewer energy requirements.[9] (Fig 9)

12.3 Production and consumption impact greenhouse gas emissions

Production and consumption processes generate waste and pollutants. In order to transition to sustainable production and consumption patterns, it is necessary to increase efficiency and at the same time reduce the generation of waste through "reduction, recycling and reuse". The reduction in the generation of these waste products throughout all stages in the life cycle of a product or a service would, in turn, alleviate the intensity of resource use and pressure on primary resources.

Figure 9
Energy intensity, Asia and the Pacific, 1990 and 2012



Greenhouse gases (GHG) emitted into the atmosphere and effluents into water bodies are some of the most common waste products of the production and consumption processes resulting from the rapid urbanization and industrialization in Asia and the Pacific. Additionally, the generation of food waste is a growing problem in terms of consumption.[10] Due to data availability issues, this section focuses solely on greenhouse gas emissions.

Aggregate and per capita greenhouse gas emissions are increasing

Rapid urbanization and industrialization in many parts of Asia and the Pacific have contributed to increases in the levels of greenhouse gas emissions over the last two decades. In some parts of the region, particularly in South-East Asia – Cambodia, Indonesia and the Lao People's Democratic Republic – natural land use change also contributed to the rates of GHG emissions. Total GHG emissions of economies in Asia and the Pacific increased from 15.8 billion tons of carbon dioxide (CO_2) equivalent in 1990 to 26.7 billion tons in 2012, a 2.4 per cent average rate of annual increase. The region also increased its share of global GHG emissions from 42.0 to 50.6 per cent of the total between 1990 and 2012.

GHG emissions per capita in Asia and the Pacific increased from 4.8 tons of CO_2 equivalent per capita in 1990 to 6.3 tons in 2012. In most economies in the region, GHG per capita increased over this period, with the most notable exceptions being countries in the North and Central Asian subregion and several Pacific economies. There are also examples of low GHG emission-intense energy sectors – in the case of Myanmar, 74.6 per cent of the country's electricity is generated from renewable energy sources. (Fig 10)

Greenhouse gas emissions per unit of GDP decreased over the past two decades

Globally, GHG emissions increased by 40.7 per cent between 1990 and 2012, and GDP increased by 73.9 per cent. Asia and the Pacific followed this global trend, with GHG emissions increasing by 69.6 per cent and GDP doubling. These increases suggest that the GHG emission-intensity of the economies in the region – the amount of GHG emissions per unit of economic output – declined despite an overall increase in aggregate and per capita GHG emissions.

The decrease in GHG intensity is partly due to the shift from agriculture, which was responsible for the largest share of GDP in the 1970s and the primary source of emissions, to manufacturing. With economic structural changes, countries in the region diversified their sources of emissions from agriculture to industry, transport and energy. The industrialization process in low income economies resulted in GHG emissions increasing more slowly than increases in economic output, thus leading to a decrease in emission intensity. The rates of decline observed during the past two decades for these economies are therefore also generally larger than that of middle- and high income economies. (Fig 11)

12.4 Data and monitoring issues

Sustainable consumption and production patterns described in this chapter are focused on resource use (materials and energy), the efficiency of resource use and GHG emissions. Additional information on the generation of wastes other than air pollutants, as well as private and public sustainability practices, is crucial in gaining a full understanding of sustainable consumption and production patterns. Unfortunately, there are currently too many data

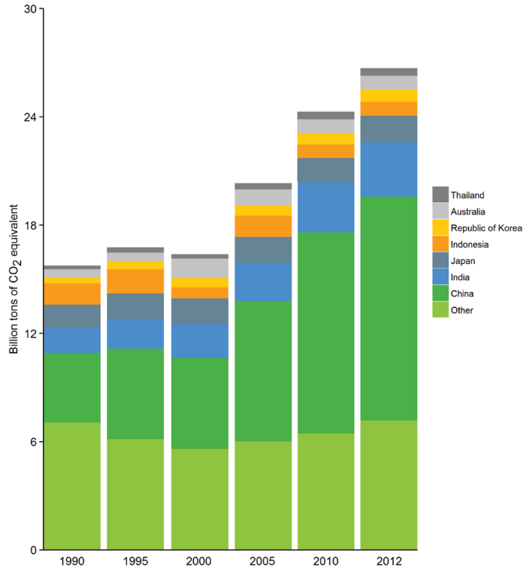


Figure 10
Greenhouse gas emissions, Asia and the Pacific, 1990 to 2012

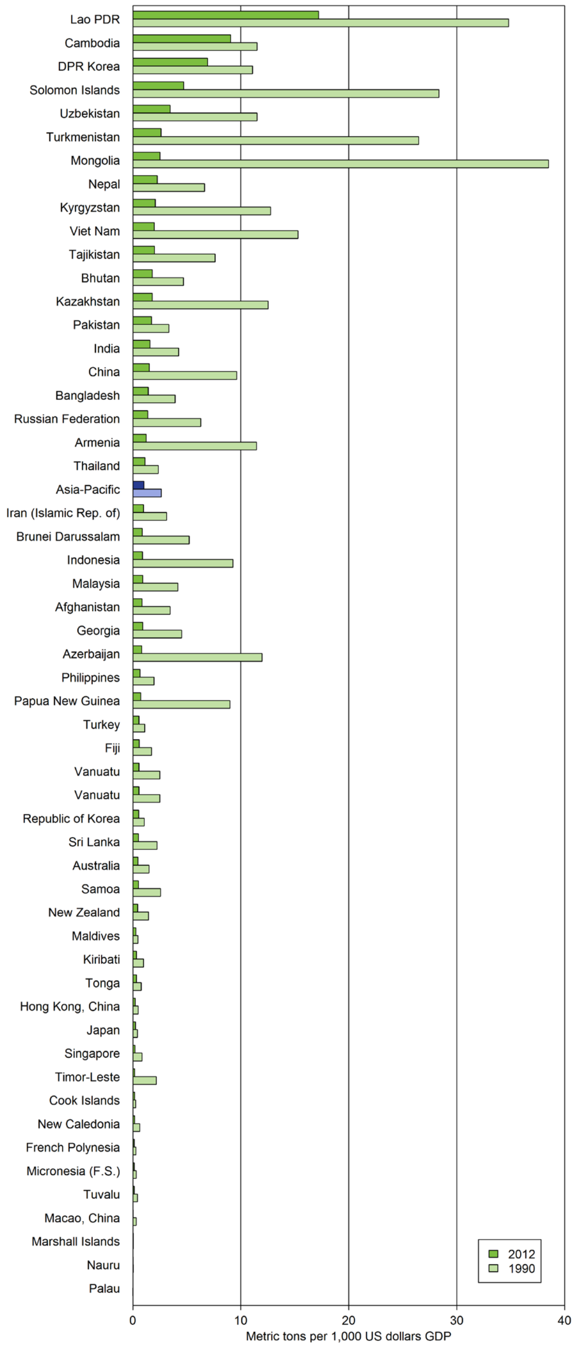


Figure 11
Greenhouse gas emissions intensity, Asia and the Pacific, 1990 and 2012

gaps to enable monitoring of these aspects at a regional level.

Large data and capacity gaps for monitoring sustainable consumption and production

There is a large gap in the data required to measure progress towards sustainable consumption and production. There are also several technical and capacity issues faced by many countries with respect to collecting and reporting the data necessary to operationalize sustainable consumption and production-related indicators for the Sustainable Development Goals. Filling these gaps will require a broader scope and strengthened role for national statistical offices and relevant ministries overseeing local and national monitoring and data collection, particularly ministries of environment.

Assessment of data available for the measurement of indicators for sustainable consumption and production patterns shows that data availability is greatest for monitoring trends in the use of natural resources, using indicators such as domestic material consumption and material footprint, compiled by UNEP, CSIRO (Commonwealth Scientific and Industrial Research Organisation) and the University of Sydney. Data also exist for monitoring waste released into the air, namely greenhouse gas emissions, as well as the number of countries that are parties to international multilateral environmental agreements on hazardous chemicals and waste. Similarly data collection on the business sector's compliance with Corporate Social Responsibility requirements needs to be improved. Ensuring these data are easily accessible would help investors find more environmentally and socially friendly practices.

A number of independent reports from the Global Reporting Initiative, International Integrated Reporting Council, United Nations Global Compact and Sustainability Accounting Standards Board provide some information on companies engaging in sustainability practices. However, the information does not exist as time series and is not sufficiently standardized to enable comparison across countries. (Box 1)

Data on food waste and waste generation are poor or non-existent for most countries and therefore should be made a priority in coming years. Similarly, data on public procurement policies and awareness of sustainable development and lifestyles are poor. Some information is available on national policies, but the implementation and results of such policies are more difficult to monitor and measure.

Measuring production, consumption and generation of waste products

It is estimated that roughly one third of the food produced globally for human consumption is lost or wasted, amounting to about 1.3 billion tons per year,[11] which according to Lipinski and others[12] is equivalent to about one quarter of all calories produced globally. The resources used in the production of wasted food and the greenhouse gas emissions associated with that production are also lost or wasted. There are large differences between countries in food loss and waste, which occur at different stages in the supply chain – referred to as *food loss* in lower segments of the supply chain and *food waste* in segments closer to the consumer. High income economies waste larger quantities of food, mainly at the consumption stage, whereas in low income countries, the food loss occurs mainly in the early stages of the supply chain.

Currently no reliable data exist to measure global food waste, but measurement standards are being developed. The Food Loss and Waste (FLW) Protocol[13] is a multi-stakeholder effort to develop a global accounting and reporting standard for quantifying food and associated inedible parts removed from the food supply chain. It is designed to enable a wide range of entities – countries, companies and other organizations – to account for and report in a credible, practical and internationally consistent manner on how much food loss and waste has been created and to identify where it occurs. In addition, a global food loss index is being developed and will be integrated into the FLW Protocol.[14] The intention is for the index to measure quantitative food losses; it is based on a model which uses observed variables that conceivably influence food losses, such as road density, weather and pests, to estimate quantitative loss ratios for specific commodities and specific countries over time.

Reducing the generation of waste requires reductions in the input of resources and increases in recycling and reuse, in other words the "3R" approach – reduce, reuse and recycle.[15] A reduction in the generation of waste, relevant for both household and industrial waste, results in a reduction in the amount of waste being sent to landfills and incineration plants, as well as a reduction in the overall resource use of and pressure on primary resources.

Measurement of waste generation and management practices requires data in four separate categories: municipal solid waste, sludge, industrial and other waste.[16] Municipal solid waste is generally defined as waste collected by municipalities or other local authorities, and usually includes household waste, garden/yard and park waste, and commercial/institutional waste. Sludge is waste from domestic and industrial wastewater treatment plants. In some cases, sludge from domestic wastewater treatment plants may be included under municipal solid waste and sludge from industrial wastewater treatment in industrial waste. Industrial wastes are generated by industrial units; other waste categories include clinical, hazardous and agricultural waste.

Data to measure national waste generation and recycling rates are very poor at the moment. The United Nations Centre for Regional Development, in partnership with the Government of Indonesia and the Government of Japan, has developed a core set of 3R policy indicators, which proposes a list of sample indicators useful in monitoring waste management.[17] The list comprises nine indicators for 3Rs in municipal solid waste, industrial sector, rural areas, and new and emerging forms of waste, such as marine plastic waste and e-waste.

Box 1

Business sustainability reporting

Given the core role of businesses in achieving sustainable development, there has been a proliferation of modalities, international initiatives and instruments to advance corporate sustainability and responsible business practices.[a] One of the modalities is "sustainability reporting", a tool for organizations, including businesses, to communicate to their stakeholders through "the practices of measuring, disclosing and being accountable for organizational performance while working towards the goal of sustainable development".[b] An increasing number of companies, especially large transnational corporations, have adopted sustainability reporting mechanisms. According to one source, of the world's 250 largest corporations, 93 per cent of them report on their sustainability performance.[c] There are a number of frameworks and initiatives, and two of the most widely adopted such global initiatives are: the Guidelines for Multinational Enterprises of the Organisation for Economic Co-operation and Development, and the Global Reporting Initiative Standards for Sustainability Reporting.

Although existing reporting standards and indices have been improved in recent years, a number of difficulties are still associated with measuring sustainability impacts.

(continued)

First, as yet there is no globally agreed single standard for capturing the multidimensional and complex concept of sustainability. In addition to the two initiatives mentioned above, some other global sustainability reporting initiatives exist, such as the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, which is produced by ILO, the United Nations Global Compact Principles and ISO 26000, and the International Integrated Reporting Council' s Integrated Reporting framework. Many of these are focused only on one aspect of sustainability and therefore are inadequate for providing a holistic view on sustainability. Another approach is to create aggregate indices of various aspects of sustainability, such as the Dow Jones Sustainability Indices. Such indices assess issues related to corporate governance, risk management, branding, climate change mitigation, supply chain standards and labour practices. These indices enable comparability; however, their criteria vary and are debatable.

Second, among different standards and even within a single standard, comparability and consistency are issues. For example, the standards of the Global Reporting Initiative do not provide either quantitative or comparable data; hence, they do not make it possible to compare performance. Another example is the Global 100,[d] which has shown inconsistency over time, with drastic changes in the rankings of listed companies. In addition to these, there are also government laws and regulations, and industry-specific regulations and codes which are not always aligned with global sustainability reporting initiatives.[e] Although there have been efforts to harmonize sustainability reporting standards, there are still disparities among sustainability reports, including inconsistency in reporting time periods, sustainability indicators, reporting formats and metrics. A continuing challenge is the attempt to reach a global consensus on a common set of indicators to measure sustainability.

Third, existing indicators, indices and reports on sustainability make assessments at the level of individual companies or organizations. In view of the cross-border operations of transnational companies, measuring sustainable development at the country or even regional level is very tricky, if not impossible. Even with the well-established global sustainability reporting initiatives mentioned above, when large and complex global value chains are considered, it is extremely difficult to accurately map, measure and monitor suppliers and customers in the second and lower tiers and beyond. While national data are available to enable an analysis of many of the indicators related to the Sustainable Development Goals, the use of organizational-level sustainable development data for the purpose of national and/or regional policy decision-making would be much more challenging.

a For details contained in "The future we want", see General Assembly resolution 66/288, annex.

b Global Reporting Initiative, "Sustainability reporting guidelines", version 3.1 (Amsterdam, 2006). The publication can be downloaded from a link at http://www.globalreporting.org/Pages/resource-library.aspx.

c KPMG, "Corporate responsibility reporting survey 2013". Available from http://www.kpmg.com/au/en/issuesandinsights/articlespublications/pages/corporate-responsibility-reporting-survey-2013.aspx.

d The Global 100, an e-magazine published by the Canadian consultancy firm Corporate Knights, highlights its choice of the top 100 sustainable companies globally. Available from http://www.corporateknights.com/reports/global-100/.

e See M. Abe and M. Chee,"Integrating sustainability reporting into global supply chains in Asia and the Pacific", in Implementing Triple Bottom Line Sustainability into Global Supply Chains, L. Bals and W. Tate, eds. (Sheffield, United Kingdom, Greenleaf Publishing, forthcoming).

Endnotes

All figures in this chapter are adapted from United Nations Environment Programme, *Indicators for a Resource Efficient and Green Asia and the Pacific: Measuring Progress of Sustainable Consumption and Production, Green Economy and Resource Efficiency Policies in the Asia-Pacific Region* (Bangkok, 2015). Available from http://www.unep.org/AsiaPacificIndicators.

1 Definition adopted by the Oslo Symposium on Sustainable Consumption in 1994. See United Nations Environment Programme, ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production –towards a 10-year framework of programmes on sustainable consumption and production. Available from http://www.unep.org/10YFP/Portals/50150/downloads/publications/ABC/ABC_ENGLISH.pdf.

2 Ibid., p. 12.

3 General Assembly resolution 66/288, annex.

4 For more information about the global framework, see http://www.unep.org/10yfp/Home/tabid/133135/Default.aspx.

5 Data on resource use are sourced from United Nations Environment Programme, *Indicators for a Resource Efficient and Green Asia and the Pacific: Measuring Progress of Sustainable Consumption and Production, Green Economy and Resource Efficiency Policies in the Asia-Pacific Region* (Bangkok, 2015). Available from http://www.unep.org/AsiaPacificIndicators.

6 For the purposes of this chapter, materials are composed of biomass (crops, crop residues, wood, animal products, grazed biomass, fodder crops), fossil fuels (coal, petroleum, natural gas), metal ores (ferrous ores, non-ferrous ores) and non-metallic minerals (industrial minerals, construction minerals). See United Nations Environment Programme, *Indicators for a Resource Efficient and Green Asia and the Pacific: Measuring Progress of Sustainable Consumption and Production, Green Economy and Resource Efficiency Policies in the Asia-Pacific Region* (Bangkok, 2015), pp. 15-16. Available from http://www.unep.org/AsiaPacificIndicators.

7 Thomas Wiedmann and others, *The material footprint of nations", Proceedings of the National Academy of Sciences of the United States of America* (PNAS), vol. 112, No. 20, pp. 6271-6276.

8 Total primary energy supply (TPES) equals production plus imports minus exports minus international bunkers plus or minus stock changes. TPES includes fuels such as coal and gas that are subsequently transformed into other forms of energy, such as electricity.

9 United Nations Environment Programme, *Indicators for a Resource Efficient and Green Asia and the Pacific: Measuring Progress of Sustainable Consumption and Production, Green Economy and Resource Efficiency Policies in the Asia-Pacific Region* (Bangkok, 2015). Available from http://www.unep.org/AsiaPacificIndicators.

10 Food and Agriculture Organization of the United Nations, *Global Food Losses and Food Waste: Extent, Causes and Prevention* (Rome, 2011). Available from http://www.fao.org/docrep/014/mb060e/mb060e.pdf.

11 Ibid.

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