

State of Resource Efficiency in Cambodia, Lao PDR, Philippines, and Viet Nam in 2019

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Land and Water

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Foreword

The Asia-Pacific region consumes over two-thirds of the world's natural resources, at a rate of resource efficiency three times lower than the rest of the world. The region is also in a continuous state of rapid urbanisation and economic growth. Such dynamics partly drive the rate of resource use, as infrastructure and housing are built for the first time and the economy transitions from primary to manufacturing activities.

The United Nations Economic and Social Commission for Asia and the Pacific seeks to support countries integrating resource use sustainability into their policies and development strategies. ESCAP is partnering with CSIRO, a world leading research institution for resource efficiency and material flows policy research, which is the basis for designing sustainable consumption and production policies.

This report has been produced under an agreement between ESCAP and CSIRO to strengthen the capacity of ASEAN policymakers to analyse the economic, social, and environmental effects of resource consumption and the benefits of decoupling economic growth from natural resource use and its environmental impacts.

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Macro-economic overview

Cambodia

Cambodia's economy is one of the fastest growing in the ASEAN region. From 2010 to 2019, GDP grew by 7% per year, unemployment increased from 0.77% to 1.22%, per capita GDP (2015 US dollars) increased from \$891 to \$1,440, and the inflation rate declined from 4% to 2% (Table 1). Strong economic growth, tax compliance and improvements in tax collection increased total revenue from 15% of GDP in 2013 to 22.2% of GDP in 2018. In the same period, public debt was around 30% of GDP per year. Severe poverty, i.e. people with income below the international poverty line of \$2.19 per day (in 2020 prices), was 17.8% in 2020. The human development index barely increased from 0.539 in 2010 to 0.594 in 2019, and during this period, the country's economic complexity rank moved from 108 to 88 (Table 1). The economy continues shifting from agriculture to industry, but tourism, garments, and construction are still key sectors. The ongoing COVID pandemic generated a contraction in GDP of around 2.8% in 2020¹. The sustained economic growth and increased revenue have encouraged economic transformation, productivity improvement, increased consumption, public expenditure in multiple sectors and infrastructure development. This helped Cambodia achieve its Millennium Development Goals around poverty, hunger, nutrition, death and health.

Lao PDR

The main drivers of economic growth in the country are natural resource extraction, energy generation and construction (Government of Lao PDR, 2021). Although the country has had steady economic growth in recent years, there has been limited private sector investment, and outdated trade laws and regulations impact long-term economic improvements (USAID, 2019). From 2010 to 2019, GDP grew 7.3% per year, per capita GDP (2015 US dollars) increased from \$1,584 to \$2,553, and the inflation rate declined from 6% to 3% (Table 1). However, unemployment increased from 0.71% in 2010 to 9.41% in 2017. Severe poverty declined from 14.5% in 2010 to 10% in 2019. In the same period, the Gini coefficient (a measure of income inequality) moved from 36.0 to 38.8, and the human development index increased from 0.552 to 0.613, representing a change in the country's economic complexity rank from 102 to 92 (Table 1). The sectors with slow economic growth were agriculture, mining and processing industries. Important factors influencing the decline in economic growth are natural disasters such as floods and the COVID-19 pandemic. The country's economy has recently started to shift toward higher-quality processing and services sectors, which could result in job creation and income generation in a more sustainable direction (Government of Lao PDR, 2021).

Philippines

The Philippines' economy grew at an annual rate of 6.4% between 2010 and 2019. However, significant reductions in consumption and investment, exports, tourism, remittances and other COVID-19 related impacts generated a 9.6% reduction in GDP between 2019 and 2020. From 2010 to 2019, unemployment decreased from 3.61% to 2.24%, per capita GDP (2015 US dollars) increased from \$2,341 to \$3,478, and the inflation rate decreased from 3.79% to 2.48% per year (Table 1). Severe poverty, i.e. people with income below the

¹ <https://www.dfat.gov.au/geo/cambodia/cambodia-country-brief>

international poverty line of \$2.19 per day (in 2020 prices), declined sharply from 10.7% in 2009 to 2.7% in 2018⁷. These economic changes contributed to a decrease in the Gini coefficient from 46.3 in 2009 to 42.3 in 2018. The human development index increased from 0.671 in 2010 to 0.718 in 2019, and during this period, the country's economic complexity rank moved from 41 to 28 (Table 1).

Table 1 Changes in macro-economic indicators between 2010 and 2019

Indicator	Year	Cambodia	Lao DPR	Philippines	Viet Nam
GDP (billion USD 2015)	2010	12.8	9.9	220	145
	2019	23.7	18.3	376	251
GDP annual growth (%)	2010	5.96	8.53	7.33	6.42
	2019	7.05	5.46	6.12	7.02
Population (million people)	2010	14.3	6.2	93.6	87.9
	2019	16.5	7.1	108.1	96.4
Per capita GDP (USD 2015)	2010	891	1584	2341	1648
	2019	1,440	2553	3478	2602
Unemployment rate (%)	2010	0.77	0.71	3.61	1.11
	2019	1.22	9.41 (2017)	2.24	2.04
Inflation, consumer prices (%)	2010	4.00	5.99	3.79	9.21
	2019	1.94	3.32	2.48	2.80
Revenue as a proportion of GDP (%)	2010	12.08 (2013)	13.38 (2012)	11.3 (2011)	22.30
	2019	19.36	11.2 (2018)	13.5	18.62
Poverty rate (% of the population)	2012	NA	14.5	10.4	2.7
	2018	NA	10	2.7	1.8
Gini coefficient	2012	NA	36	46.5	35.6
	2018	NA	38.8	42.3	35.7
Human development index	2010	0.539	0.552	0.671	0.661
	2019	0.594	0.613	0.718	0.704
Human development index (rank)	2010	108	107	41	70
	2019	88	92	28	56
Economic complexity index	2010	-0.86	-0.85	0.49	-0.10
	2019	-0.50	-0.65	0.95	0.05
Economic complexity index (rank)	2010	108	107	41	70
	2019	88	92	28	56

Data sources:

<https://datacommons.org/tools/map>

<https://data.worldbank.org/indicator>

<https://www.ceicdata.com/en/indicators>

<https://tradingeconomics.com/countries>

<https://hdr.undp.org/en/indicators/137506#>

<https://atlas.cid.harvard.edu/rankings>

Viet Nam

Viet Nam's economy continues shifting from primary production (agriculture) towards value-added production (manufacturing). From 2010 to 2019, GDP grew by 6% per year, unemployment increased from 1.11% to 2.04%, per capita GDP (2015 US dollars) increased from \$1,217 to \$3,478, and the inflation rate decreased from 9.21% to 2.8%. Severe poverty, i.e. people with income below the international poverty line of \$2.19 per day (in 2020 prices), decreased from 4% in 2010 to 1.3% in 2019. These economic changes contributed to a decrease in the Gini coefficient from 39.3 in 2010 to 35.7 in 2018 (Table 1). The human development index

increased from 0.661 in 2010 to 0.704 in 2019, and during this period, the country's economic complexity rank moved from 70 to 56. COVID-related impacts are expected to slow the country's economic growth, which could have a negative impact on poverty reduction efforts, employment, revenue, and other economic indicators. However, by 2022 the World Bank projects GDP growth of around 5.5% in Viet Nam, driven by recovery in the service sector and steady demand for manufactured products from international markets².

² [https://www.worldbank.org/en/news/press-release/2022/01/13/vietnam-s-economic-growth-is-expected-to-accelerate-to-5-5-in-2022-and-greening-its-trade-would-offer-new-opportunities-](https://www.worldbank.org/en/news/press-release/2022/01/13/vietnam-s-economic-growth-is-expected-to-accelerate-to-5-5-in-2022-and-greening-its-trade-would-offer-new-opportunities)

Resource efficiency context

Resource efficiency is a macro-economic concept and refers to the products and services generated per unit of use of natural resources. If the resource efficiency of a country is low, it means that it does not create significant benefits from its natural resource base. If resource efficiency is high, a country has usually achieved a certain state of economic maturity, and can benefit much more from the natural resources it manages.

The importance of natural resource use has also been highlighted by the 2030 Sustainable Development Agenda, which recognises that economic and social development in the medium and long term depends on the sustainable management of natural resources, and the ability to increase resource efficiency and reduce waste and emissions. Two sustainable development goals directly address resource efficiency and the sustainable management of natural resources, namely SDG 8.4 and SDG 12.2. This policy brief shows the extent to which the four countries have been able to improve the resource efficiency of their economies and how they have been managing materials in the economy.

Resource efficiency, in the context of the SDGs, is measured with two indicators, material footprint per unit of GDP and domestic material consumption per unit of GDP. Domestic material consumption (DMC) is the amount of material that is managed in an economy, whereas material footprint is a measure of the material requirement of final demand of a country, considering materials along global supply chains. Both are headline indicators derived from economy-wide material flow accounting and inform policy makers about the physical scale of the economy looked at from a production (DMC) or consumption (MF) perspective.

Hence DMC can be used as a proxy for the overall environmental pressure and impact that need to be managed domestically, and it depends on public policy and investment in a country. Agriculture, forestry, fishery, mining policies and urban planning intersect with environmental policy to mitigate the negative environmental consequences of economic development. MF, by contrast, is a proxy for a country's material living standards and the material requirements that are fuelling a certain level of material wellbeing. It is highly dependent on the purchasing behaviours of government, companies, and households and on capital investment in a country.

On both measures, the material intensity of production and material intensity of consumption, the four countries perform below the global average. In 2019, the material intensity of consumption in the four countries was between 2.5 kg per US dollar in the Philippines and 4.0 kg per US dollar in Cambodia (Table 2). This compares to a global average of 1 kg per US dollar. The material intensity of production in the same year was between 2.4 kg per US dollar in the Philippines and 5.7 kg per US dollar in Lao PDR compared to the 0.8 kg per US dollar global average. Of the four countries, the Philippines is the most material-efficient economy. The extractive pattern of the Lao PDR economy, with a large metal producing sector, is reflected in its significantly low material efficiency of production.

All four countries have ample space to invest in improved resource efficiency, which will allow them to generate higher social and economic values from their natural resource endowment. The indicators for SDG 12.2 (Table 2) measure the sustainability of materials management at the national scale. Per capita values of domestic material consumption are between 7.5 tonnes per capita in Cambodia and 14.7 tonnes per capita in Lao PDR. This compares to a world average of about 11 tonnes per capita. The significantly higher value for Lao PDR is caused by the material-intensive sectors in mining and forestry in the country. Per capita material footprint, by comparison, is more similar among countries, between 8.5 tonnes per capita in Viet Nam and 9.6 tonnes per capita in Lao PDR. Only Cambodia has a lower material footprint, at 5.7 tonnes per capita, which signifies lower material living standards, on average, when compared to the other three countries.

Table 2 State of SDG targets 8.4 and 12.2 in 2019 for selected countries



SDG Target 8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead.

Indicator	Cambodia	Lao DPR	Philippines	Viet Nam
8.4.1 Material Footprint³ (MF) per unit of GDP (tonnes per 2015 US\$)	4.0	3.8	2.5	3.3
8.4.2 Domestic material consumption (DMC) per unit of GDP (tonnes per 2015 US\$)	5.2	5.7	2.4	3.5



Target 12.2 By 2030, achieve the sustainable management and efficient use of natural resources.

Indicator	Cambodia	Lao PDR	Philippines	Viet Nam
12.2.1 Material footprint (million tonnes)	94	69	948	822
12.2.1 Material footprint per capita (tonnes per capita)	5.7	9.6	8.8	8.5
12.2.2 Domestic material consumption (million tonnes)	124.1	105.2	888	879
12.2.2 Domestic material consumption per capita (tonnes per capita)	7.5	14.7	8.2	9.1

In total, both the Philippines and Viet Nam required about 0.9 billion tonnes of materials in 2019, which is understandable for these populous countries. Cambodia and Lao PDR, by comparison, only required about 0.1 billion tonnes of materials in 2019, servicing a much smaller population. Values for DMC per capita and MF per capita for Cambodia are commensurate with the average for a lower middle-income country, whereas Lao PDR, the Philippines and Viet Nam had twice the material requirements of an average lower middle-income country but only half compared to the average for upper middle-income countries. All four countries, in all likelihood, will see their material use increase in the future. In order to achieve the material living standards and wellbeing outcomes of the SDGs, such as reduced poverty, quality food, water security and improved sanitation, modern mobility and energy, and improved infrastructure in cities and regional areas, additional materials will be required. If managed well, the additional material requirements will allow countries to achieve high human development. The trade-offs between human development, resource conservation, and reducing environmental and climate impacts are obvious and create a difficult context for environmental and sustainability policy in the four countries. Well-designed policies that enable resource efficiency, waste reduction, and greenhouse gas abatement will put Cambodia, Lao PDR, the Philippines, and Viet Nam on a sustainable path, ensuring future prosperity and environmental sustainability.

Resource efficiency trends for the period 1970 to 2019, covering five decades, look generally encouraging for all four countries, showing a history of improved resource efficiency over time. Perhaps Lao PDR has been an

³ The total material footprint is the sum of the material footprint for biomass, fossil fuels, metal ores and non-metal ores, measured in tonnes per person per year.

exception since about the year 2000. From that time on, the material intensity of production reversed, and the resource efficiency of production has been steadily decreasing. This is the result of significant investment in the mining and electricity sectors, which either mobilise large amounts of primary resources (such as in metals mining) or require large amounts of materials for electricity generation infrastructure, such as for the construction of hydroelectric dams. Viet Nam also saw a step change in material intensity since about the year 2000 but has, after a period of stagnation, been able to improve its resource efficiency.

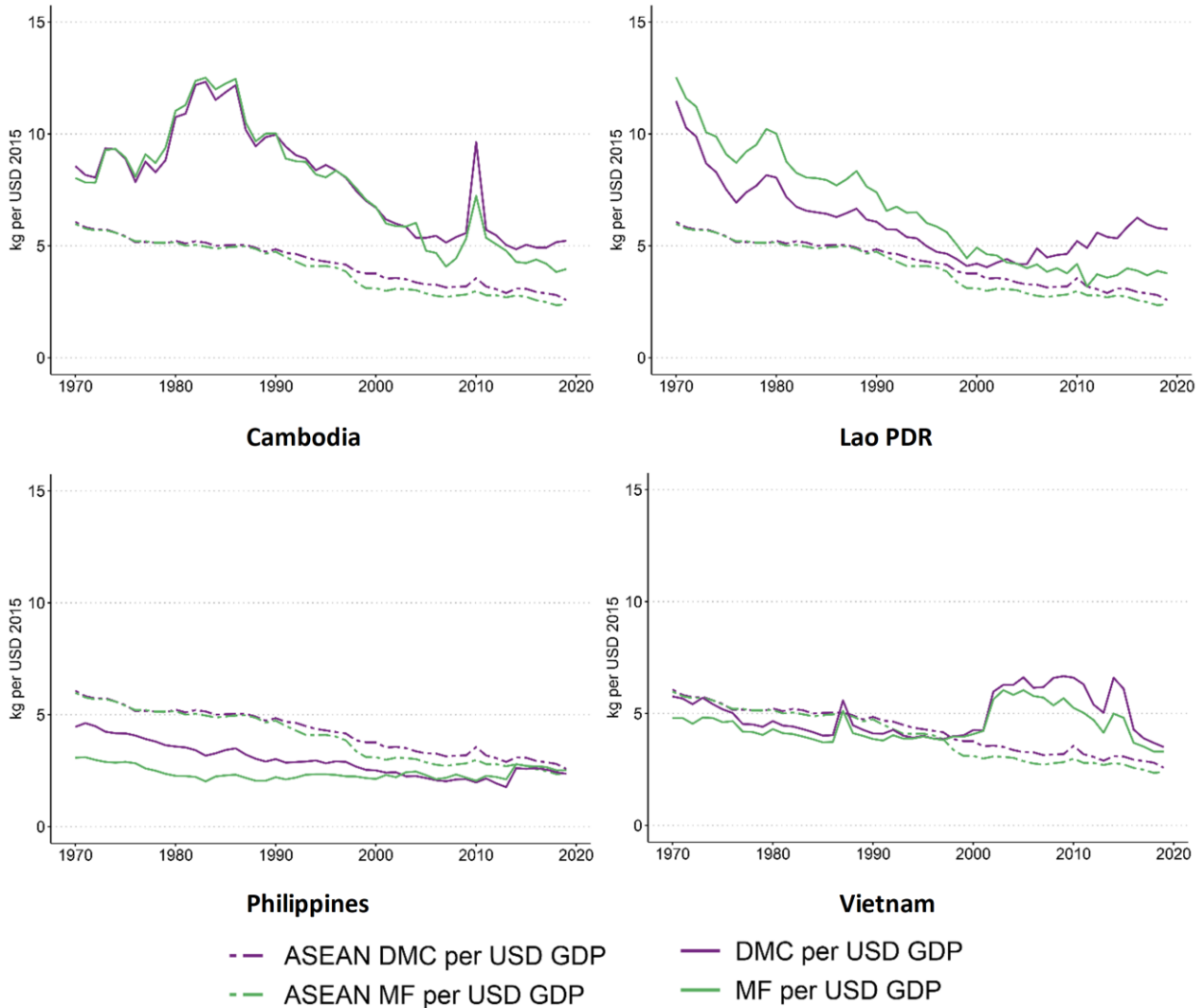


Figure 1 Trends in Material Footprint and Domestic Material Consumption per unit of GDP (SDG target 8.4) in 2019

Data source: International Resource Panel (2022)

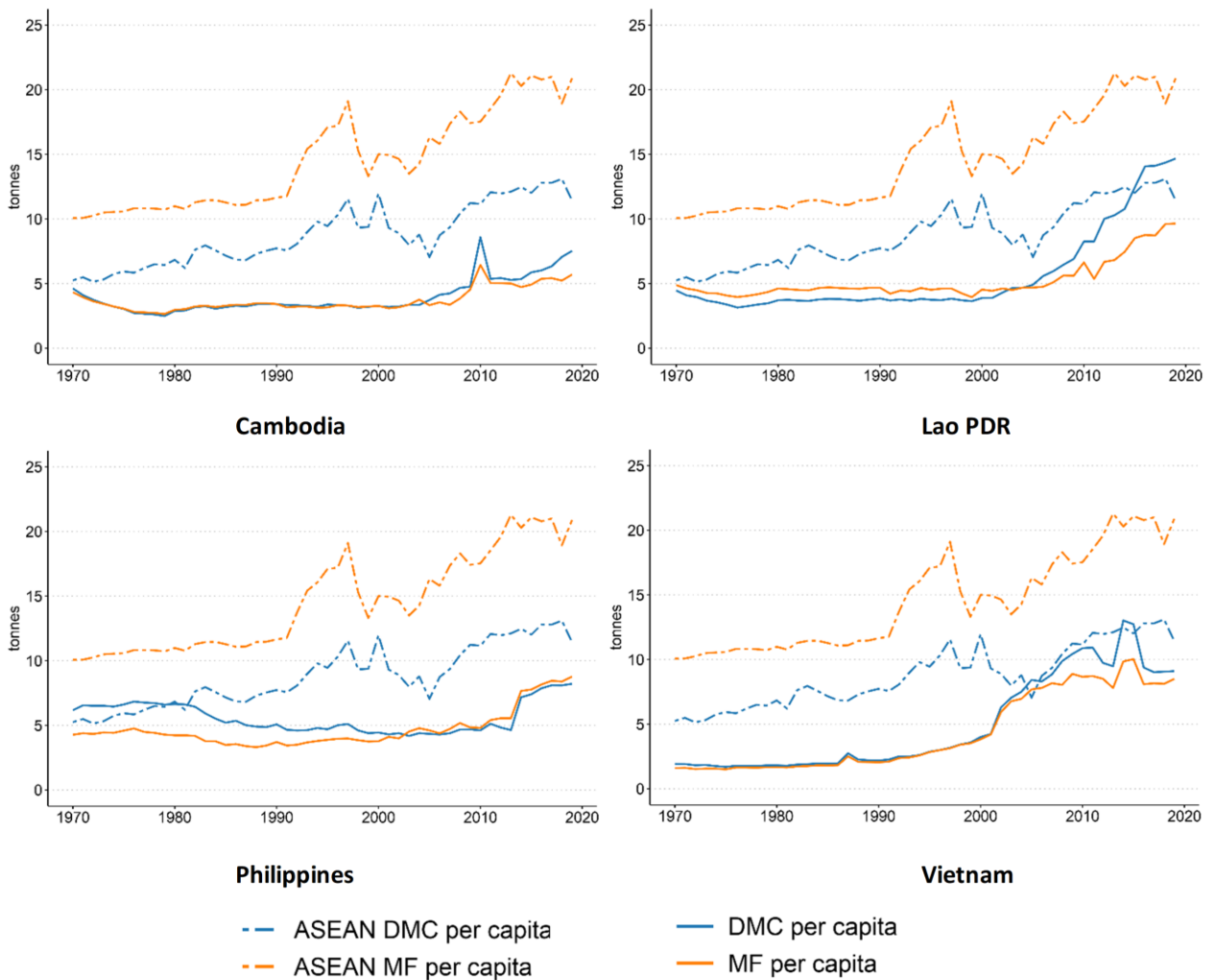


Figure 2 Trends in Material Footprint and Domestic Material Consumption per capita (SDG target 12.2) in 2019

Data source: International Resource Panel (2022)

Three of the four economies, when compared to the ASEAN average, have been less resource efficient. The Philippines has been most successful in resource efficiency but since the global financial crisis in 2007–08 it has become closer to the ASEAN average. Lao PDR made great progress between 1970 and 2000 and has since seen a reversed trend in resource efficiency, somewhat similar to Viet Nam and Cambodia, which has been lagging consistently.

When comparing the per capita material use of the four economies to the ASEAN average, it can be observed that all four countries had less resources per capita. Compared to countries such as Singapore and Thailand, which embarked on an economic development path of rapid structural change resulting in improved material living standards since the 1980s, the four economies have not been able to keep pace. The opening of the domestic market in Lao PDR and Viet Nam had a significant impact on domestic material consumption since about the year 2000. Both economies are now managing similar levels of materials per capita as the average ASEAN country does, which also comes with significant environmental pressures and impacts related to agriculture, forestry mining and quarrying.

Per capita material footprint during the 1970s and 1980s was stagnant in the ASEAN countries at around 10 tonnes per capita. It grew fast between 1990 and the Asian financial crisis in 1997, which saw a dip in per capita material footprint and material living standards. The region has since recovered in material footprint

per capita and has reached 20 tonnes on average. Cambodia, Lao PDR, the Philippines, and Viet Nam do not match those values. This means that Lao PDR and Viet Nam are facing similar environmental pressures and impacts compared to the ASEAN countries but with lesser improvements in living standards.

Sectoral overview of raw material consumption

Structural change in economic activities, accumulation of productive knowledge to develop more complex industries and products, and higher income and employment will naturally improve resource productivity. However, well-designed policies for agriculture and the food industry and good urban planning can provide additional resource efficiency gains. Here we provide information about the main sectors using raw materials in the analysed countries using 2018 data obtained from the Sector Profiles sections of the SCP Hotspot Analysis database⁴.

Cambodia

The largest contributors to domestic raw material consumption were the agriculture and construction sectors. Agriculture was responsible for 35% of total material use and employed 18% of the total workforce. Construction activities required one-fourth of all materials used in the Cambodian economy and employed 9% of the total workforce. Both sectors, therefore, lowered the overall resource efficiency of the economy.

Lao PDR

The construction sector accounted for 32% of the total raw material consumption in the country, followed by the agricultural sector with 14%, and food with 10%. While the construction sector has the largest share of raw material use, it employs 5% of the total workforce. By comparison, agriculture was the sector with the largest number of employees, at 44% of the total workforce. The large use of materials by the Lao PDR construction sector lowered the country's performance on total resource efficiency indicators.

The Philippines

The construction sector used around 22% of the domestic raw material consumption with a share of 22%, followed by the food sector with 19%, agriculture with 14% and energy with 10%. While construction used the largest share of raw materials, it only employed 9% of the total workforce. Agriculture employed the largest proportion of the workforce (20%). Like other countries, improvements in resource use efficiency of the construction sector could reduce total domestic materials demand.

Viet Nam

The largest contributor to raw material consumption is the construction sector, with a share of 40%, followed by agriculture (22%) and food (12%). While construction used the largest share of raw materials, it employed only 8% of the total workforce. Agriculture employed the largest share of the total workforce (28%). Significant resource use efficiency improvements could be promoted through policies focused on the construction sector.

⁴ <http://scp-hat.lifecycleinitiative.org/sector-profiles/?fbclid=IwAR0uzTmysTKVAAHQ86YLQ-T5Y3Ket8rVo5yhkXODbz7Yavmt17zWDg7QQE>

Policy options

Improving resource efficiency in the four countries will be enabled by the integration of economic, social, and environmental policy agendas that will, taken together, enhance sustainability outcomes.

Economic policy opportunities

Investing for the future

An important policy consideration for many lower middle-income and resource extractive economies is to ensure responsible and long-term management of revenue from their natural resource proceeds so that such wealth benefits current and future generations. The development of sovereign wealth funds can shield an economy from ups and downs in resource revenue and serve as financial reserves and long-term savings for national and community benefit (Heffron, 2018). Establishing such a fund or extending existing schemes addresses the need for sustainable development to ensure that the overall human, manmade, and natural capital of an economy does not decline and that a reduction in natural capital, i.e., the exploitation of a non-renewable resource, is compensated by other means. Such investment in the future economic and social base becomes even more important in a situation of changing market requirements for many resources on which the economy depends.

Viet Nam established the State Capital Investment Corporation in 2005, which is the 60th largest sovereign wealth fund, worth around \$2.4 billion USD, with profits in 2020 of around \$270 million⁵. Although such a fund is focused on state-owned companies, its structure could be used to facilitate the long-term management of domestic resources. The Philippines, Cambodia, and Lao DPR could benefit from the development of mechanisms to manage resource wealth more efficiently.

Economic diversification and investing in economic complexity

Economic complexity refers to the capacity of a country to produce a variety of products based on the technologies and human capital that are held in that country (Hidalgo and Hausmann, 2009). It is a well-established fact that greater economic complexity is a good predictor of future economic growth opportunities and enhances the resilience of a national economy to sectoral shocks and market fluctuations (Hausmann and Hidalgo, 2011). There is also a strong link between economic complexity and income inequality, showing that economies that are more complex are generally more inclusive in income distribution. In addition, it has been shown that economic complexity is a better predictor of economic growth compared to traditional measures of governance, competitiveness, and human capital. The four economies rank relatively low in economic complexity, except for Viet Nam, which has a more complex economy. For all four countries, effort to increase economic complexity could be a worthwhile goal for economic and social development.

Trade policies to improve supply security

The four countries have become more integrated into global markets since about the year 2000. As global agricultural production systems are put under more stress because of a changing climate, soil degradation, and lack of water availability, building resilience towards less reliable international supply chains becomes an important priority in domestic economic planning and investment and trade policy. Recent studies show that climate change has negatively impacted global agricultural productivity, especially in Africa and Latin America

⁵ [https://www.investopedia.com/terms/s/state-capital-investment-corporation.asp#:~:text=The%20State%20Capital%20Investment%20Corporation%20\(SCIC\)%20is%20a%20sovereign%20wealth,around%2033%25%20of%20Vietnam's%20GDP.](https://www.investopedia.com/terms/s/state-capital-investment-corporation.asp#:~:text=The%20State%20Capital%20Investment%20Corporation%20(SCIC)%20is%20a%20sovereign%20wealth,around%2033%25%20of%20Vietnam's%20GDP.)

and the Caribbean, and the vulnerability of agro-ecosystems has increased (Ortiz-Bobea *et al.*, 2021). The four countries have not been exempt from this global trend, with agricultural productivity being impacted by a changing climate in many countries of the region as well. This puts additional pressure on countries to supply their people with quality nutritious food and to achieve the desired sustainable development outcomes. The governments of the four countries are aware of the emerging issue and have set out policies focusing on strengthening national food security, as seen by incorporating policies to promote sustainable agriculture and improve resource efficiency in the agricultural sector into National Development Plans (Government of Cambodia, 2019; Government of Lao PDR, 2021; Government of the Philippines, 2021; Government of Vietnam, 2021).

Integration of environmental and economic policy

Achieving the sustainable development goals and ensuring a prosperous economy and increased material living standards and human wellbeing requires well-designed policies that can address the complexity of many environmental and sustainability issues, which can achieve consensus among the broader public for the implementation of policy measures and help reduce uncertainty. To be successful in the 21st century requires the integration of economic and environmental policy to ensure that the foundational base of any economic activity, namely the availability of natural resources and reliance on functioning ecosystems, can be guaranteed over the long term (Hatfield-Dodds *et al.*, 2015).

All National Development Plans of the four countries contain integrative policies aiming toward green growth. Cambodia, Lao PDR, and Viet Nam have also formulated National Green Growth Strategies or Road Maps that propose initiatives to foster environmental sustainability of economic growth. For the Philippines, although the government does not officially generate a specific plan, the government has passed a number of laws to make the economy more circular and tackle emerging environmental concerns, such as the *Biofuel Act 2006*, the *Renewable Energy Act 2008*, the *Climate Change Act 2009*, and the *Green Jobs Act 2016* (ADB, 2019).

Social policy opportunities

Reducing income and wealth inequality within and between countries

One of the cornerstones of the sustainable development agenda is more balanced economic development that ensures living standards are accrued across a large share of people in a country being inclusive of everyone's needs and opportunities. This can be expressed by the income differential between the lowest and highest incomes, measured by the well-known Gini coefficient, which is a high-level measure of income inequality at the national level. Income and wealth distribution is both a cause and consequence of economic growth. Studies have shown that, on average, increases in income inequality reduce economic growth (GDP per capita). On average, a 1% increase in the Gini coefficient has been found to reduce GDP per capita by around 1.1% over a five-year period, and the long-run (cumulative) effect is larger and amounts to about a reduction of 4.5% (Brueckner, Dabla Norris and Gradstein, 2015). Results are, however, different in low-, middle- and high-income countries, pointing to stronger negative effects of income inequality on economic growth and human capital in middle- and high-income countries. Efforts for distributional justice will, however, be of importance for achieving sustainable development outcomes.

In 2018, Cambodia, Lao PDR, the Philippines, and Viet Nam had relatively similar income inequality (Gini indices⁶: 38%, 39%, 36%, and 42%, respectively). The trends are declining in the Philippines (from 1997 to 2018) and Cambodia (from 1997 to 2012). For Lao PDR and Viet Nam, the trends of inequality have been

⁶ <https://data.worldbank.org/indicator/SI.POV.GINI?view=chart>, <https://www.wider.unu.edu/project/wiid-%E2%80%93-world-income-inequality-database>

slightly increasing in recent years. The poverty rates in all four countries have declined over the past two decades, especially in Lao PDR and Viet Nam, where the poverty rate decreased multiple fold from 1997 to 2018 (International Monetary Fund, 2019; The World Bank, 2019).

Ensuring access to affordable and quality housing, mobility, energy, food

A key aspect of the sustainable development goals is achieving outcomes for people by reducing poverty and guaranteeing access to essential services of housing, mobility, electricity supply, and water and sanitation, as well as servicing communication needs such as internet and telephone services (Spangenberg and Lorek, 2002). Countries and regions in Asia need improved access to reliable and affordable services, and there is a key role for public policy and public investment to ensure service provision. There is a need to improve essential infrastructure in all four countries, which could help raise material living standards substantially and contribute to improved economic participation and competitiveness.

The high rates of economic growth and urbanisation observed in the studied countries have been accompanied by significant investments in infrastructure development, including transport and communication networks. Viet Nam is planning to invest around \$120 billion in road and power sectors and \$22 billion in improvements in urban transportation systems⁷. However, according to the Global Infrastructure Outlook, under current investment trends, Viet Nam may only achieve around 83% of its infrastructure goals by 2040⁵. The gap between infrastructure investment at current trends and investment needs is around 16% for the Philippines and 33% for Cambodia⁸. Upgrading transportation, electricity and communications infrastructure is also a key part of Lao PDR's development strategy to improve its access to markets in the region, e.g. China and Thailand⁹. While significant progress has been made to improve building codes in the countries studied, existing frameworks and their implementation could be improved around energy efficiency performance, environmentally friendly construction materials, and improved operational performance.

Workforce participation and access to talent

Successful economic and social development relies on countries utilising their human capital to its full extent, independent of gender or regional origin. Most countries and cities are competing for the global talent base, which requires an open and accessible economy and society, liveability, safety, and environmental quality. At the same time, domestic human capital needs to be grown and utilised through education and schooling, lifelong training, and access to knowledge and information. Workforce participation of women and access to leadership positions in government and business appears to be an important factor in a nation's ability to use its potential to the fullest. Research shows that the underutilisation of females in the labour force and in leadership roles limits economic development and living standards (Lahoti and Swaminathan, 2016).

The Philippines Government passed the *Green Jobs Act* in 2016, designed to engage government institutions to provide an enabling environment for creating, sustaining, and incentivising green jobs (ADB, 2019). In addition, the program 'Greening MSMEs and Promoting Greenpreneurship' in the Philippines aims to promote climate-smart industries under the National Climate Change Action Plan (The Global Green Growth Institute, 2020). Moreover, there have been multiple capacity-building activities to improve resource efficiency in Mini, Small, Medium Enterprises (MSMEs) in Cambodia and Lao PDR, e.g., promoting the initiatives 'One Village One Product' in Cambodia and 'One District One Product' in Lao PDR to create local income while improving the standard of living of residents (Government of Cambodia, 2019; Government of Lao PDR, 2021). Further to that, the 'Lower Mekong Initiative Young Scientist Program' in Cambodia, Lao PDR, and Viet Nam, supported by the United States Agency for International Development (USAID), has been implemented to invest in the

⁷ <https://infrastructurevietnam.com/>

⁸ <https://outlook.gihub.org/>

⁹ <https://laos.opendevdevelopmentmekong.net/topics/infrastructure/>

next generation of students and young professionals to build their skills. The program focuses on improving environmental, public health, entrepreneurial, and scientific skills, innovation in agricultural technologies as well as on the use of informatics to tackle public health issues (USAID, 2021).

Urban and infrastructure planning

Infrastructure such as buildings, transport and communication networks, energy generation, transmission and storage and water and sanitation infrastructure is of crucial importance for social and economic outcomes. Infrastructure decisions most often involve large financial investments, they have a long legacy, and the quality of infrastructure provided will make a lasting difference to economic, social, and environmental outcomes. The way cities are planned, and the extent to which different infrastructure planning can be integrated into an urban planning process, creates very large differences in outcomes of urban sustainability, the city economy, and the life of urban dwellers. In many countries, there is a lack of urban governance (Meijer and Bolívar, 2016) and national engagement in city planning, which can be overcome by a specific national responsibility or agency for urban development that can interact with local city councils, and by specific city deals between national government and cities to achieve specific outcomes that are tailored to the needs and characteristics of an urban settlement, its economy, people and environment.

City Deals are essentially bespoke packages of funding and decision-making negotiated between the national government and local authorities. In countries such as the United Kingdom or Australia, city deals are increasingly used for promoting urban economic growth (Jones *et al.*, 2017). Each City Deal is seen to reflect the needs of individual cities and their surrounding regions, and each has its own distinctive funding and development agenda.

Environmental policy opportunities

Enabling resource efficiency improvements through sustainable consumption and production

Research has shown that there are many economically attractive opportunities for resource efficiency in the short term and that investing in resource efficiency is a superior strategy in the medium and long term compared to business as usual (Schandl *et al.*, 2016). Developing policies that favour sustainable consumption and production and encouraging business models that improve the efficiency of production, foster sustainable procurement of governments, businesses and encourage responsible consumer behaviour can all contribute to more efficient use of natural resources. Infrastructure investment in particular, because of the legacy of housing, commercial and industrial buildings, transport, and communication infrastructure, as well as energy generation capacity, has a profound impact on environmental, social, and economic outcomes. Improvements in resource efficiency at the national level can be a side effect of structural change and increasing economic complexity, creating a focus on economic activities that generate more revenue and are less material intensive. Such improvements can result from good economic policy. In most circumstances, decoupling of economic growth from resource use, that is, resource efficiency, does not occur spontaneously however but benefits from well-designed policies.

There are a number of projects and programs implemented and currently being implemented to promote sustainable consumption and production across the four countries. Several of them are supported by international partners such as the European Union through the Switch Asia-SCP facility program, USAID, UNDP, and the Global Green Growth Institute. Examples include Switch to Solar, Improving Energy Efficiency, Waste to Energy, Reducing Plastic Waste, Seed Trade Capacity Building, Fish Right Program, Solid Waste Management, Promoting Sustainable Tourism, and Zero-carbon Resort (SWITCH-Asia, 2021a, 2021b, 2021d, 2021c; USAID, 2022).

Reducing waste and pollution by investing in a circular economy

Increasing levels of waste and pollution are often unintended consequences of raising living standards. Construction and demolition waste, commercial and industrial waste, and municipal waste amounts are a consequence of increased production and consumption, higher income levels, and result from a transition from traditional resource-efficient and low waste provision systems for housing, mobility, food, energy, water, and sanitation to modern, industrial and more resource-hungry and wasteful systems. Changing lifestyles and consumption patterns in Cambodia, Lao PDR, the Philippines, and Viet Nam have led to increased waste and pollution that require improved waste management and resource recovery strategies and infrastructure. The four countries can benefit from a more circular economy that designs waste out from the get-go, uses materials more often and hence adds value more often, and conserves natural resources. This requires investment in collection and sorting and in building industries that can absorb secondary material from recycling facilities. It also requires innovation in the ways in which essential services are provided to the growing population in the four countries. This large potential for industrial symbiosis, shared consumption and improved public infrastructure would enable improved wellbeing and living standard outcomes at a lower environmental cost.

The four countries, especially Viet Nam and the Philippines, have directly incorporated the concept of circular economy into legal frameworks and established programs to support this concept across the countries. For example, the National Action Plan on Sustainable Consumption and Production of the Philippines listed the intention of institutionalising the ‘Polluter Pays Principle’ for consumers and ‘Extended Producer Responsibility’ (EPR) for manufacturers, as mentioned in the material and waste section on EPR on plastic packaging (The National Economic and Development Authority, 2019). For Viet Nam, the government has recently initiated programs to transform traditional industrial parks into eco-industrial parks (UNIDO, 2020).

Reducing greenhouse gas emissions and managing land sustainably

A key objective of the sustainable development goals is the availability of reliable, affordable and clean energy to all people in the four countries. Creating a reliable electricity supply has immense economic and social benefits but needs to be achieved with renewable generation infrastructure to avoid negative climate implications and enable a net-zero development pathway for the four countries. Renewable energy systems require significant investment in transmission lines and battery storage to balance the intermittency of renewable sources such as wind and solar. In addition, renewable generation infrastructure such as photovoltaic panels, wind turbines and batteries pose new challenges around how to efficiently manage energy metals and other materials at the end of their useful life.

Sustainable land management, reforestation, avoiding deforestation and improving carbon storage in soils all play an important role in combating global warming. Managing land sustainably is also an important objective for food security, and countries can invest in agricultural and forestry practices that minimise soil degradation, water use and reduce the negative impact on biodiversity.

Green growth strategies are a priority to maintain the high rates of economic growth observed in Cambodia, Lao PDR, the Philippines and Viet Nam over the past decade. Many regions in those countries are among the most vulnerable to climate change impacts (e.g. cyclones, droughts, floods, sea-level rise) in Southeast Asia (Anshory Yusuf and Francisco, 2009). CO₂ emissions (metric tonnes per capita) in 2018 were 0.7 in Cambodia, 1.3 in the Philippines and 2.7 in Lao PDR and Viet Nam¹⁰. Those levels of per capita emissions are below the world average (4.5) and the value observed in East Asia & Pacific countries (6.3). However, in all those countries, emissions per capita have an increasing trend as economic growth generates higher levels of consumption and production.

¹⁰ https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=KH&name_desc=false

The economic growth observed in all four countries assessed is based on an increased economic relevance of the manufacturing sector and a decrease in the relative contribution to GDP of agriculture and forestry. Such economic dynamics contributed to the shift from net forest loss to gains (forest transitions) in Viet Nam and the Philippines in the early 1990s and Lao PDR in 2010 (Youn *et al.*, 2016). On the other hand, Cambodia lost around 24% of its forests (2.2 million hectares) from 2001 to 2018 and is one of the world's deforestation hotspots¹¹. Controlling deforestation and managing forest regrowth in these countries could improve the provision of multiple ecosystem services.

¹¹ <https://www.globalforestwatch.org/blog/data-and-research/whats-happening-in-cambodias-forests/>

Conclusion

An initial step to advance the sustainable development policy agenda in Cambodia, Lao PDR, the Philippines, and Viet Nam is a policy needs assessment to identify areas of capacity strengthening that could be undertaken and be supported by the Economic and Social Commission for Asia and Pacific and the solution space science of the ASEAN Resource Panel. Such an assessment would reveal areas of policy excellence and identify gaps in policy settings; it can promote collaboration between countries in Asia and encourage good practice and good policy design to be used across countries by learning from each other's experience. The assessment would need to include all aspects of the policy process and assess the state of public concern, the extent to which issues of public concern have been addressed by the policy process, the state of policy implementation and the availability of suitable monitoring and evaluation processes that allow assessment of the efficacy, effectiveness, and efficiency of current policy settings and identify areas of policy investment and improvement.

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