

# STATE OF THE REGION 2021-2022



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## EXPLANATION OF TERMS USED IN THE REPORT

<b>AF</b>	Adaptation Fund (World Bank)	<b>GRI</b>	Global Reporting Initiative
<b>ACCUs</b>	Australian Carbon Credit Units	<b>GSMA</b>	Global System for Mobile Communications
<b>BAU</b>	Business as usual	<b>IAMs</b>	Integrated Assessment Models
<b>BEVs</b>	Battery-powered electric vehicle	<b>IATA</b>	The <i>International Air Transport Association</i>
<b>CAFE</b>	Corporate Average Fuel Economy	<b>ICAO</b>	the International Civil Aviation Organization
<b>CAGR</b>	Compound Annual Growth Rate	<b>ICE</b>	Internal combustion engine
<b>CBA</b>	Cost-benefit analysis	<b>IEA</b>	The International Energy Agency
<b>CBAM</b>	Carbon border adjustment mechanism	<b>IET</b>	International Emissions Trading (IET) system
<b>CCS</b>	Carbon capture and storage	<b>IMF</b>	International Monetary Fund
<b>CDM</b>	Clean Development Mechanism	<b>IMO</b>	The International Maritime Organization
<b>CEPI</b>	The <i>Coalition for Epidemic Preparedness Innovations</i>	<b>IOCs</b>	International oil and gas companies
<b>CIF</b>	Climate Investment Funds	<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>CIS states</b>	Commonwealth of Independent States	<b>IRENA</b>	International Renewable Energy Agency
<b>CMIM</b>	Chiang Mai Initiative Multilateralization	<b>LDCF</b>	Least Developed Countries Fund
<b>CO<sub>2</sub></b>	Carbon Dioxide	<b>LULUCF</b>	Land use, land use change and forestry
<b>COP26</b>	UN's 26th Conference of Parties	<b>MBIs</b>	Market-based incentives
<b>Covax</b>	COVID-19 Vaccines Global Access	<b>MRV</b>	Measurement, reporting, and verification
<b>CPE</b>	Commercial primary energy	<b>NDCs</b>	National Determined Commitments
<b>CPI</b>	Climate Policy Initiative	<b>NGFS</b>	Network of Central Banks and Supervisors for Greening the Financial System
<b>CPTPP</b>	Comprehensive and Progressive Agreement for Trans-Pacific Partnership	<b>OECD</b>	Organization for Economic Co-operation and Development
<b>CSR</b>	Corporate Social Responsibility	<b>PHEVs</b>	Plug-in Hybrid Electric Vehicles
<b>CTF</b>	Clean Technology Fund	<b>PPCR</b>	Pilot Program for Climate Resilience
<b>DEFA</b>	ASEAN Digital Economy Framework Agreement	<b>R&amp;D</b>	Research and development
<b>DEPA</b>	Digital Economy Partnership Agreement	<b>RCEP</b>	Regional Comprehensive Economic Partnership
<b>DICE</b>	Dynamic Integrated Climate-Economy	<b>REDD</b>	Reducing Emissions from Deforestation and Forest Degradation
<b>DSM</b>	Demand-side management	<b>REDD+</b>	Extends REDD by including sustainable forest management, conservation of forests, and enhancement of carbon sinks
<b>DSSI</b>	Debt Service Suspension Initiative	<b>RGGI</b>	Regional Greenhouse Gas Initiative
<b>EAASR</b>	Enhanced APEC Agenda for Structural Reform	<b>RPS</b>	Renewable portfolio schemes
<b>ECB</b>	European Central Bank	<b>SASB</b>	Sustainable Accounting Standard Board
<b>EIA</b>	US Energy Information Administration	<b>SCC</b>	Social cost of carbon
<b>ERF</b>	Emissions Reduction Fund	<b>SDG</b>	Sustainable Development Goals
<b>ESG</b>	Environment Social and Governance	<b>SDRs</b>	IMF - Special Drawing Rights
<b>ETS</b>	Emission trading scheme	<b>SEEE</b>	Shanghai Environment and Energy Exchange
<b>EU</b>	European Union	<b>SMEs</b>	Small and Medium Enterprises
<b>EVs</b>	Electric vehicles	<b>TCFD</b>	Task Force on Climate-related Financial Disclosures
<b>FDI</b>	Foreign Direct Investment	<b>tCO<sub>2</sub>e</b>	Ton of carbon dioxide equivalent
<b>FITs</b>	Feed-in tariffs	<b>The BASIC</b>	Bloc of leading developing economies which comprise Brazil, South Africa, India, and China
<b>FSB</b>	Financial Stability Board	<b>Twh</b>	terawatt hours or twh
<b>FTAAP</b>	Free Trade Area of the Asia-Pacific	<b>UNCTAD</b>	The United Nations Conference on Trade and Development
<b>G20</b>	Group of Twenty (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom, United States, and the European Union)	<b>UNEP</b>	United Nations Environment Program
<b>G-7</b>	The Group of Seven (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States)	<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>GCF</b>	Green Climate Fund	<b>USMCA</b>	The US-Mexico-Canada Agreement
<b>GDP</b>	Gross Domestic Product	<b>WHO</b>	World Health Organization
<b>GEF</b>	Global Environment Facility	<b>WTO TRIPS</b>	The <i>WTO Agreement</i> on Trade-Related Aspects of Intellectual Property Rights
<b>GHG</b>	Greenhouse Gas	<b>WTO</b>	World Trade Organization
<b>GNI</b>	Gross National Income		
<b>GPIF</b>	Government Pension Investment Fund		

## MESSAGE FROM THE CO-CHAIRS

The purpose of this report is to provide a longer-term perspective on the issues and developments affecting our region. It is produced under the guidance of an editorial committee whom we thank for their efforts in providing guidance and advice for the project. Our annual survey provides an opportunity for those who work on regional issues – whether in government, business, academia, civil society, and beyond to provide feedback on what they think are the most pressing issues facing the Asia-Pacific economy.

When the editorial committee met earlier this year there was clear and resounding message that this year's report should include a thematic focus on climate change. Little did we know that, after Covid-19 respondents to our survey would select climate change as the top risk to growth. This represents a sea change in perceptions even from just a year ago when climate change was the 9<sup>th</sup> highest risk to growth.

A key takeaway from this report is that the regional policy community is optimistic about the prospects for growth over the next 12 months. This is to be welcomed. We have not seen these levels of optimism among our survey panelists since the recovery from the Global Financial Crisis. This is in spite of the ongoing Covid-19 pandemic and the emergence of new variants of the virus which was by far the top risk to growth in our survey.

While there are many downside risks to the outlook, some perspective is needed. At this point in time last year vaccines were only on trial, estimates of global manufacturing capacity was between 2-4 billion doses and the forecast was that global economy would grow by 5.1 percent this year. To date more than 6 billion vaccine doses have been delivered and the global economy is expected to grow by about 5.9 percent this year.

What has been somewhat of shock has been the emergence of inflationary pressures in some regional economies. This may be a result of the faster than expected recovery in some economies, supply-demand mismatches, and the surge in the cost of international transportation. Central banks are carefully watching this issue with some already raising interest rates. However, given that many economies are recovering much more slowly than others it is a situation that needs to be watched carefully.

There are many lessons to be learnt from the Covid-19 crisis. Our focus in PECC remains, as ever, on a long-term vision of the Asia-Pacific. The optimism among our survey respondents is an important takeaway. Our last survey in 2020 showed a deep fear that the economic impact of the pandemic would be a drag on our economies' growth for as long as 3 years. But we cannot rest on our laurels, as shown by our survey, in addition to the ongoing pandemic, stakeholders are concerned about climate change and rising protectionism.

APEC's post 2020 vision for the Asia-Pacific driven by trade and investment; innovation and digitalisation; and strong, balanced, secure, sustainable and inclusive growth needs economies to start generating ideas on achieve each of these drivers. We hope that our work in PECC can contribute to that process. One place to start is by ensuring that the barriers that were put in place because of the pandemic for health reasons not become an issue that we need to deal with in the post-Covid reality. A fragmented set of rules for travel is not the best starting point for achieving an open, dynamic, resilient and peaceful Asia-Pacific community.

We express our appreciation to Mr Eduardo Pedrosa, Dr Tilak Doshi, Dr Bo Chen, Ms Cindy Hook, and Mr Mike Horne for their contributions to this report as well as the tireless efforts of the team at the PECC International Secretariat.

**Richard Cantor**  
Co-Chair

**Zhan Yongxin**  
Co-Chair

## EXECUTIVE SUMMARY

In the year and a half since the global pandemic started the Asia-Pacific economy has undergone an extraordinary decline but is set to post a sharp recovery this year thanks to unprecedented policy support and the remarkable innovation and manufacture of vaccines.

The region is expected to grow by 6.1 percent in 2021 and 5.1 percent in 2022. PECC's annual survey of the regional policy community (run from 12 August to 17 September) shows a sense of optimism among respondents with 55 percent expecting stronger economic growth for the world economy next year.

However, the divergent recovery from the crisis is evident in forecasts as well as in the views of respondents for specific economies and sub-regions. Respondents are far more optimistic about the prospects for growth for those economies that had achieved higher levels of vaccination at the time they were surveyed, notably, the United States and China. This underscores the importance of achieving vaccine equity across all economies of the region.

Although most growth forecasts for 2021 have been downgraded since April this year due to the emergence of the Delta variant, the outlook for 2022 remains on the brighter side with the hope that vaccine distribution will spread more broadly across regional economies with most achieving 60-70 vaccination rates by mid-2022. However, vaccine equity remains an enormous challenge with several economies well below those averages.

### Top Risks to Growth

The top risk to growth by far was future waves of Covid-19, this was followed by:

- Climate change/extreme weather
- Lack of political leadership
- Increased protectionism and trade wars
- Slowdown in world trade growth
- Failure to implement structural reforms

These perceptions of risk are likely related, with respondents concerned about the capacity to lead and implement the necessary policy reforms for a sustainable and inclusive recovery. Regional cooperation can play a useful role in mitigating these risks, capacity building where needed, and building confidence in the direction of reform. This is especially important given concerns about rising protectionism.

### Priorities for APEC Leaders

Stakeholders' perceptions of risk aligned strongly with what they think APEC Leaders should discuss when they meet this November.

- How to ensure the equitable and affordable access to Covid-19 vaccines
- How economies can open up their borders to travel while maintaining adequate safeguards against the spread of the virus
- The China-US trade conflict and rising trade tensions.
- The region's response to climate change including support for successful outcomes at the UN Climate Change Summit (COP 26, Glasgow 2021)
- Addressing inequality and the promotion of more inclusive growth in the region

Clearly stakeholders expect leaders to focus on Covid-19 issues – both how to deal with the problem of vaccine inequality as well as how economies can safely open their borders to travel. At the same time there is a strong hope that the Asia-Pacific can deliver meaningful input to global climate change discussions while addressing problems of inclusive growth. Equally there is a view that progress requires cooperation between the region's two biggest economies the United States and China.

One issue that business stakeholders think should be a priority for Leaders' discussions that was not on the overall list was the region's progress towards its goals on freer trade and investment and a Free Trade Area of

the Asia-Pacific (FTAAP). This priority along with the US-China trade conflict and rising trade tensions addresses stakeholders' perceptions of risks about rising protectionism and slowing trade. On the bright side, there is momentum in the region with the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the Regional Comprehensive Economic Partnership (RCEP) as well as the Pacific Alliance. APEC can provide a useful platform for further dialogue on issues related to the expansion and indeed updating of these agreements.

One clear impact of the Covid-19 crisis has been the acceleration of the digital transformation of the region's economies. Within the Asia-Pacific there is a trend towards digital trade agreements: the Digital Economy Partnership Agreement among Chile, New Zealand and Singapore (with interest from Canada and Korea in joining), the Pacific Alliance has set out a roadmap for creating a regional digital market, and ASEAN members have announced the goal of starting negotiations on a Digital Economy Framework Agreement by 2025. The question is where does this leave APEC's work on the digital economy?

### Dealing with Covid-19 and its Economic Consequences

The ongoing pandemic continues to influence stakeholders' perceptions of risk as well priorities for policy cooperation. Respondents believe that new waves of Covid-19 is the top risk for growth over the next 12 months and the best way to deal with this is through vaccination. Dealing with international mobility issues were seen as more important as the typical issues that the policy community has been discussing such as a WTO agreement on trade and health, a temporary waiver of the WTO TRIPS agreements, mechanisms to enhance visibility on input supplies for Covid-19 vaccines.

The high priority given to *'the safe international movement of people starting with those involved in logistics and supply chains'* may be because of the high cost of international freight associated with the constraints in the industry and the need for dealing with the frictions in the system. While the common standards for vaccination passport and test results reflects the need to reboot the tourism and travel sector which is not only a critical sector for many APEC economies in terms of jobs and growth but also provides capacity for the transport of goods.

### Climate Change

Climate change was the second highest risk to growth in addition to being a top 5 priority for APEC Leaders' discussions, indeed, 60 percent of respondents to our survey believe that *'immediate and drastic action is necessary to address climate change'*, with a further 30 percent saying that *'some action should be taken now.'* Chapter 2 addresses how the region can support global efforts to address climate change. It attempts to identify key areas for regional cooperation in climate mitigation and adaptation initiatives.

While mitigation actions like the increased use of renewables and energy efficiency topped the list of policy responses, adaptation policies such as a sustainable forest management and reforestation and promotion of circular economy were not far behind. Most green finance portfolios tend to emphasize mitigation despite a recognized need to increase adaptation finance. Of the \$78.9 billion in climate finance transferred by high income economies in 2018, only 21% was spent on adaptation. APEC member economies could play a strong and positive role as a group in supporting adaptation finance at the COP26 summit.

Respondents to PECC's survey tended to focus on APEC's traditional areas of work, i.e. reducing barriers to trade and investment in renewable energy components and equipment in the region. This is an issue APEC members have a clear track record on with their commitment to reduce tariffs on a specific list of environmental goods in 2012. With the rapid developments in technology this list may be out of date and need revisiting. A further issue that needs to be explored is what constitutes an environmental service. These actions could help to reduce the uncertainty that stakeholders are concerned about with *'rising protectionism'* at least insofar as trade in renewables is concerned.

APEC member economies could propose climate mitigation and adaptation policies and measures at COP26 which are consistent with the rapid resumption of economic growth and free trade to meet broadly-shared development and environmental goals.

The chapter raises many important issues for the region. APEC member economies could play a lead role in carbon pricing by establishing region-wide carbon markets to promote emission mitigation in a market-friendly manner.

However, there are also problems. One concern is the threat of ‘carbon trade tariffs’. APEC member economies could constructively strive for a cooperative outcome that avoids such threats to free trade and reciprocity norms under the aegis of the WTO.

### Index of Integration

Chapter 3 is an update to PECC’s integration index based on 2019 data, ie pre-Covid-19 crisis. The index measures the degree of integration taking place in the Asia-Pacific region based on intraregional flows of: goods; investment; tourists; and five measures of convergence: gross domestic product (GDP) per capita; share of non-agriculture to GDP; the urban resident ratio; life expectancy; and share of education expenditure in gross national income (GNI). The index was developed in 2008 as a tool to measure the degree of integration taking place in the Asia-Pacific. The latest update to PECC’s index of economic integration in the Asia-Pacific region in 2019 continued to show an increased level of integration, even surpassing the previous peak in 2010.

An important feature of the index is that it excludes trade and investment flows among geographically contiguous sub-regional trading partners. This is to control for the effect that sub-regional flows may have on the index, whereby a very high degree of integration among, for example, Southeast Asian economies could result in a falsely high measure of integration with the Asia-Pacific region as a whole.

When APEC leaders set out the Bogor Goals in 1994, they set out a vision through which the region would not only maintain high growth rates but also narrow development gaps. While the region has done well in integrating and overall incomes have increased at a dramatic pace, the index shows that there is a long way to go in terms of closing development gaps.

# CHAPTER 1

## ASIA-PACIFIC ECONOMIC OUTLOOK



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## Chapter 1: Asia-Pacific Economic Outlook

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# CHAPTER 1: ASIA-PACIFIC ECONOMIC OUTLOOK

*Contributed by Eduardo Pedrosa*

## Prospects for Growth

In the year and a half since the global pandemic started the Asia-Pacific economy has undergone an extraordinary decline but is set to post a sharp recovery this year thanks to unprecedented policy support and the remarkable innovation and manufacture of vaccines.

### Forecasts

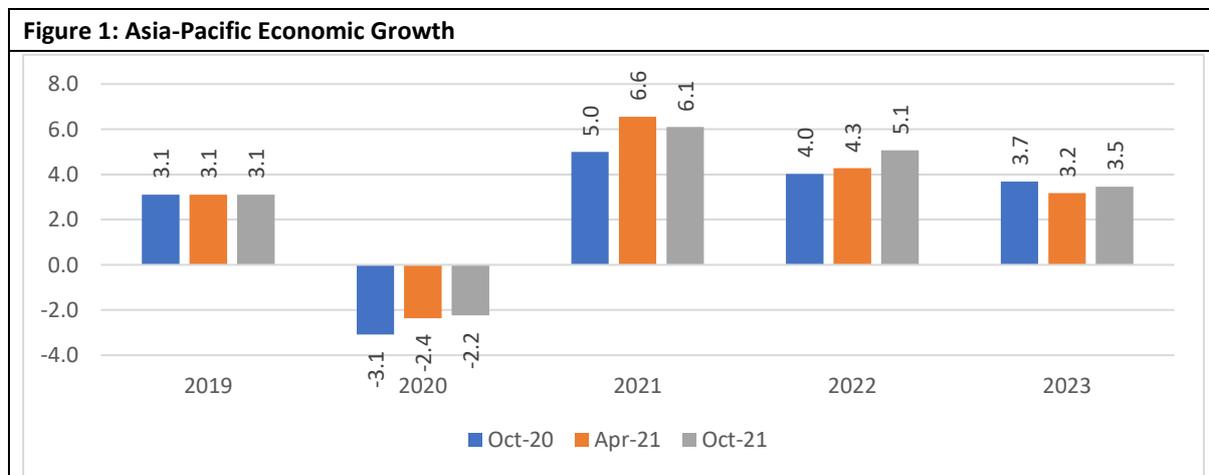
The region is expected to grow by 6.1 percent in 2021 and 5.1 percent in 2022 (see Figure 1). While all economies are expected to bounce back from last year's nadirs, the robust recovery this year comes largely from those economies in the region that have been able to move ahead with vaccinating a large portion of their populations notably China and the United States.

Due to their economic weight and relatively rapid recoveries from the crisis they are expected to account for 72 percent of the region's growth this year. The estimates for the recovery are significantly better than the 5.0 percent and 4.0 percent growth for 2021 and 2022 respectively made at this time last year (see Figure 1) largely due to the magnitude of the stimulus measures as well as the accelerated pace of vaccination in a few economies. However, while expected growth for 2021 has been downgraded since April due the resurgence of the pandemic as well as supply side constraints, much of this is expected to be made up in 2022 with an improved economic forecast for regional economic growth of 5.1 percent compared to earlier expectation of 4.3 percent.

It is also the nature of a pandemic shock where economies are temporarily shut down to stymie transmission and then re-opened. This recession is where the taps are turned off by lockdown and closed borders, and the waters of economic activity flow again quickly when the taps are turned on so long as there is no structural damage. The imperative for governments is to enable, and not impede, recovery.

The top risk to growth remains the pandemic. PECC's annual survey of the regional policy community (run from 12 August to 17 September) reveals an unambiguous message that dealing with the Covid-19 crisis must be a priority and also believe that time is ripe to work out how to safely open borders to travel. This was not just identified as a top issue for dealing with the ongoing pandemic and its economic consequences but also as a top issue for APEC Leaders to discuss when they gather in November.

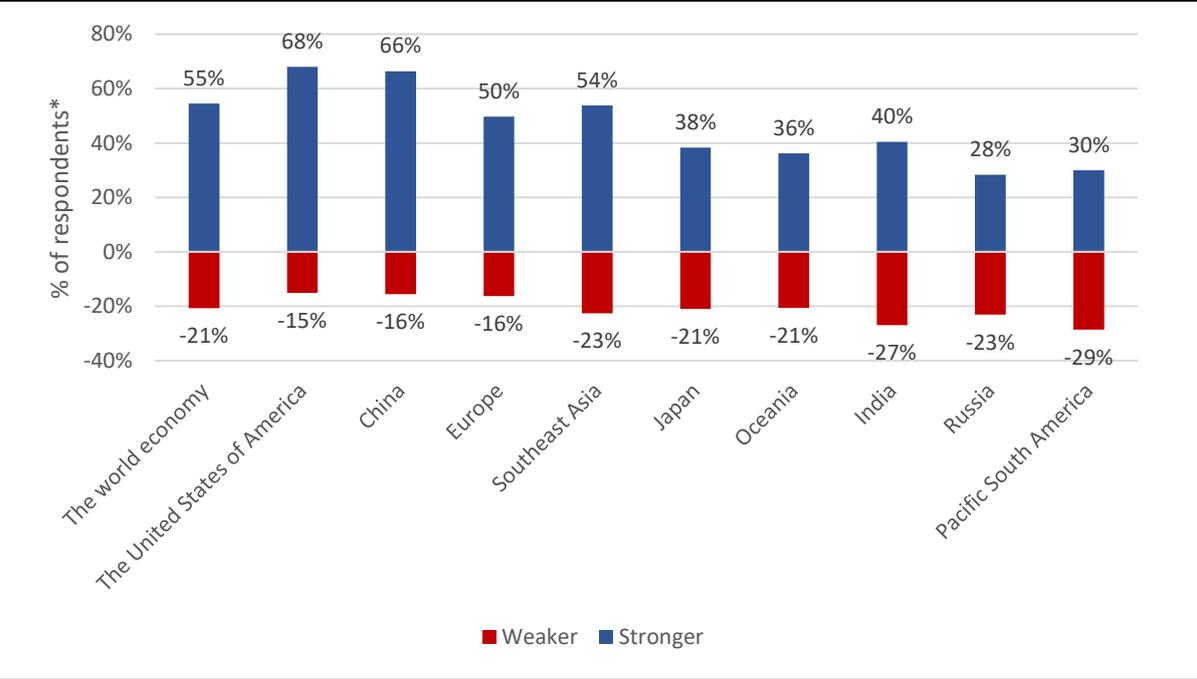
At the outset of the pandemic the discussion was whether the shape of the recovery would be v, w, or u shaped, a new letter has entered into the lexicon of economic literature 'the k-shaped recovery' signaling the divergent pathways that economies and societies are exiting from the crisis.



Source: IMF World Economic Outlook

As the world emerges from the recession caused by the Covid-19 pandemic, our survey respondents’ views mirror forecasts of diverging growth patterns with most decidedly much more optimistic about the prospects for growth in those economies that had higher vaccination rates at the time of the survey – the United States and China (see Figure 2). This underscores the urgency of the equitable distribution and delivery of vaccines across the region and the world in order to improve the prospects of slower growing economies and strengthen robust Asia-Pacific and global growth.

**Figure 2: Views of Asia-Pacific Policy Community on Prospects for Economic Growth**



Question: What are your expectations for economic growth over the next 12 months compared to the last year for the following economies/regions? Please select/tick the appropriate box.

\*Percentages do not sum up to 100% as ‘don’t know’ and ‘about the same’ responses are omitted.

While this may sound much more optimistic than most reports, some context is needed. Last year, in August 2020, the Coalition for Epidemic Preparedness Innovations (CEPI) assessed the global manufacturing capacity for Covid-19 vaccines, and from a survey of 113 vaccine manufacturers, estimated that the global capacity to produce COVID-19 vaccines through to end of year 2021 was between 2-4 billion doses.

Recalling the target set by CEPI in 2020 to distribute 2 billion doses of COVID-19 vaccine by the end of 2021 with a target of 20 percent of the population, as of the beginning of October, about 30 percent of the eligible global population has been fully vaccinated or some 6.4 billion doses have been administered – at a rate of 28.9 million a day. This is a testament to the ability of the global manufacturing and trading systems to deliver during an emergency. The problem, however, has been that vaccination rates are uneven, with Asia at 39 percent, South America at 42 percent, North America at 48 percent, Europe at above 50 percent but Africa at less than 5 percent.

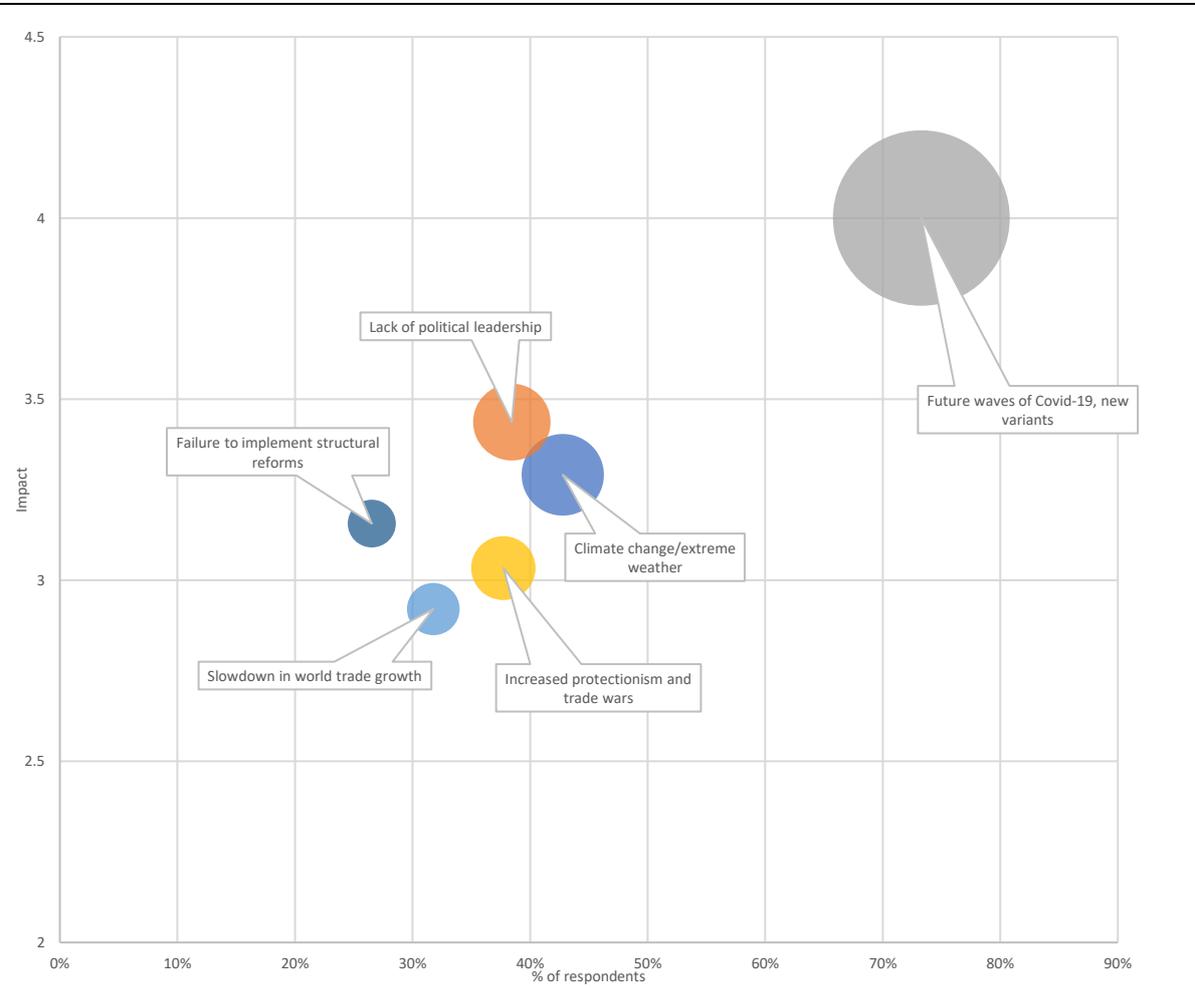
**Risks to Growth**

The potential for future waves of COVID-19 while there are still large unvaccinated populations and new variants is by far the most important risk to growth as perceived by survey respondents. However, others also matter. The top 5 risks to growth over the next 2-3 years selected by respondents are shown in Figure 3. In addition to pandemic risks they include the following:

- Climate change/extreme weather
- Lack of political leadership
- Increased protectionism and trade wars
- Slowdown in world trade growth
- Failure to implement structural reforms

The perceptions of these risks are likely related in some way. Respondents are concerned about climate change and its consequences as well as the capacity to design and drive the economic reform programs needed to ‘build back better.’ Regional cooperation can play a useful role in mitigating these risks, capacity building where needed, and building confidence in the direction of reform.

**Figure 3: Top 5 Risks to Growth**



*Question: Please select the top five risks to growth for your economy over the next 2-3 years. Please select ONLY five (5) risks, using a scale of 1-5. Please write 1 for the most serious risk, 2 for the next most serious risk, 3 for the next third highest risk, 4 for the fourth highest risk and 5 for the least serious*

The bubble size shows the overall assessment of the risk: the percent of respondents who selected it as top 5 risk x weighted risk assessment. The x-axis is the risk assessment of those respondents who selected it as a top 5 risk multiplied by weighted risk assessment. The y-axis is the percentage of respondents who selected the issue as a top 5 risk.

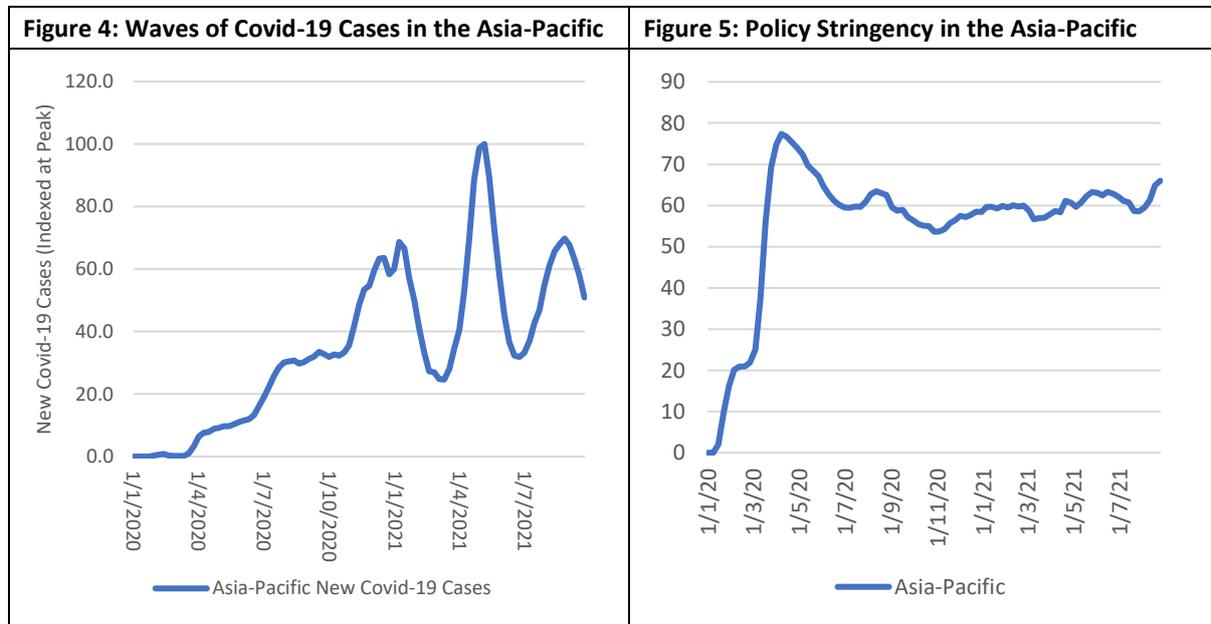
### Concerns Over Future Waves of Covid-19

The central risk to the outlook continues to be the ongoing Covid-19 pandemic, especially the emergence of new variants. According to the World Health Organization ‘when a virus is widely circulating in a population and causing many infections, the likelihood of the virus mutating increases’<sup>1</sup> therefore the faster the world can stop the spread of the virus globally the less likely variants will emerge.

This was strongly affirmed by findings of our survey. Health pandemics were the top risk to growth in last year’s survey and continue to dominate the policy community’s concerns for the next 2-3 years. This was equally shared across all sub-regions and stakeholder groups, with 73 percent of respondents selecting it as a top 5 risk to growth for their economy.

While the number of new Covid-19 cases in the region peaked in May 2021, a new wave hit the region in July and August (Figure 4). This wave largely caused by the more contagious Delta variant also affected some economies in Southeast Asia and East Asia, that had previously managed to cope relatively well with the pandemic and impacted regional supply chains.

These waves have occurred in spite of a consistently ‘stringent’ policy regime in the region (Figure 5) to contain the spread of the pandemic through non-pharmaceutical interventions such as the closing borders, implementing work from home policies, shutting and curtailing public gatherings.



Source: Our World in Data, 30 September 2021

Source: Oxford COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford.

In last year’s survey we asked respondents what were the factors they thought should be taken into account for exiting from lockdown. The top 3 were:

- Sufficient medical capacity to deal with expected number of cases (including hospital beds, doctors and nurses, personal protective equipment, and medical supplies)
- Evidence that the number of new cases is reducing
- The development of a vaccine<sup>2</sup>

These findings mirrored analysis from those who studied ‘non-pharmaceutical interventions’ who stressed that the goal was to mitigate the spread of the virus and prevent healthcare systems from being overwhelmed.

<sup>1</sup> <https://www.who.int/news-room/feature-stories/detail/the-effects-of-virus-variants-on-covid-19-vaccines>  
<sup>2</sup> <https://www.pecc.org/resources/covid-19/2659-state-of-the-region-report-impact-of-the-covid-19-crisis>

*“The major challenge of suppression is that this type of intensive intervention package – or something equivalently effective at reducing transmission – will need to be maintained until a vaccine becomes available (potentially 18 months or more).<sup>3</sup>*

Vaccines did become available in less than 18 months but the problem has been the emergence of variants (the delta variant emerging in a mostly unvaccinated developing economy), their unequal distribution across the world, and the refusal of some populations in richer economies to become vaccinated despite the availability of vaccines.

This underscores the need for international cooperation. An IMF policy paper put forward a proposal to: (1) vaccinate at least 40 percent of the population in all economies by the end of 2021 and at least 60 percent by the first half of 2022, (2) track and insure against downside risks, and (3) ensure widespread testing and tracing, maintaining adequate stocks of therapeutics, and enforce public health measures in places where vaccine coverage is low.<sup>4</sup>

The estimated cost of the proposal was US\$50 billion which the authors compared favorably against an estimated US\$9 trillion benefits the implementation of the measures would bring. PECC urges APEC, which is home to 38 percent of the world’s population, to take note of this proposal and support it.

### **Two-Speed Recovery**

The proposition of a K-shaped recovery is linked to different patterns of success in the application of vaccines. By our estimates based on IMF forecasts, economies with current vaccination rates above 30 percent rates as at 1 September 2021 are expected to recover from the crisis at a faster pace and grow by 6.3 percent in 2021 compared to 5.4 percent growth of those with vaccination rate currently below 30 percent. The recovery is expected to become more broad-based across the region as vaccines become more widely available in 2022.

The K-shaped recovery is also evident within economies. For example, within the United States while growth has been strong in 2021 and employment rates have rebounded past pre-COVID-19 levels for high-wage workers, they remain significantly lower for low-wage workers, with employment rates still 25.6 percent lower for those earning less than US\$27,000.<sup>5</sup> While those circumstances may be unique to the United States, there is a fairly strong correlation at the industry level with jobs in leisure and hospitality down 7.8 percent.

The International Labor Organization estimates that in 2020 the equivalent of the hours worked by 255 million full-time workers were lost. Much of the income loss fell disproportionately on lower income groups.<sup>6</sup> While the recovery is expected to create new jobs, there are risks that many of these will be in higher skills categories further exacerbating the K-shape of the recovery. The ILO’s model estimates bear out those at the economy level with an estimated 13 percent global drop in employment in the accommodation and food section.<sup>7</sup>

A key economic concern arising from K-shaped recoveries, is the risk of tightening financial conditions. Some economies are recovering quickly and face inflation pressures, aggravated by supply chain bottlenecks, while others are improving at a much slower pace due to much lower vaccination rates. Markets are carefully watching signals from the US Federal Reserve (Fed) for any indication of when interest rates might rise. The IMF has been at pains to warn of the potential of a repeat of the ‘taper tantrum’ which occurred in 2013 when bond prices crashed (they have an inverse relationship) and equity markets slumped more than four per cent in three days after the then-chairman of the Fed raised the prospect of tapering its QE program, that is, slowing down its bond purchases. Following the subsequent rise in interest rates, emerging markets suffered from capital flow reversals. There are current fears of a re-run. IMF Chief Economist, Gita Gopinath warned in an interview with the Financial Times that

*“[Emerging markets] are facing much harder headwinds...[T]hey are getting hit in many different ways, which is why they just cannot afford a situation where you have some sort of a tantrum of financial markets originating from the major central banks”.*<sup>8</sup>

<sup>3</sup> <https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf>

<sup>4</sup> <https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2021/05/19/A-Proposal-to-End-the-COVID-19-Pandemic-460263>

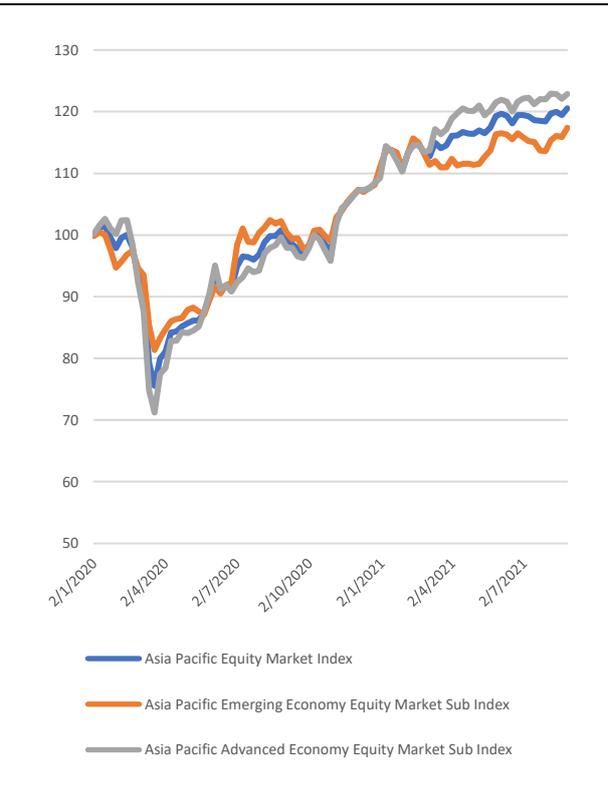
<sup>5</sup> As at 1 August 2021, source: <https://tracktherecovery.org/>

<sup>6</sup> [https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms\\_795453.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_795453.pdf)

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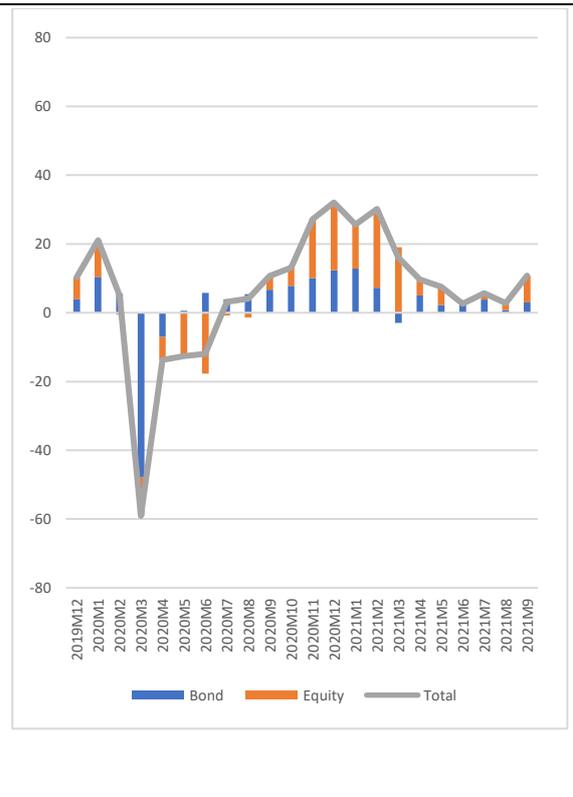
<sup>8</sup> Emerging economies cannot afford ‘taper tantrum’ repeat, says IMF’s Gopinath, <https://www.ft.com/content/873ca2e8-63d2-40dd-842d-5409169166fa>

**Figure 6: Asia-Pacific Composite Index of Equity Markets**



Source: <https://www.investing.com/indices/major-indices>

**Figure 7: Inflows to Emerging Markets: Equity and Bonds**



Source: IMF World Economic Outlook, October 2021

To date, both advanced and emerging market Asia-Pacific equity markets have moved in lockstep (Figure 6) responding to broader macroeconomic concerns over the course of the pandemic. The steep drop seen in the first quarter of 2020 has been followed by a strong bull run in equity markets largely due to the unprecedented injections of liquidity into the financial system by central banks. Across the Asia-Pacific the GDP-weighted index of equity markets is up 20 percent since the start of the pandemic. Advanced economy equity markets are up slightly higher by 21 percent, while emerging economy markets equity markets are up by 17 percent as at the end of August 2021.

As shown in Figure 7, portfolio inflows to emerging markets have remained robust throughout the pandemic period. There was some slowdown of flows from May to August but they picked up again in September 2021.

**Debt Servicing**

While no pressures are immediately evident, the US Federal Reserve has indicated that it may begin the process of tapering its easy monetary policy by the end of 2021. While markets interpreted the news positively, memories in the region will be fresh of the ‘taper tantrum’ in 2013, and there remain risks of reversals of capital flows and exchange rate depreciations.<sup>9</sup> While markets have been relatively stable throughout the pandemic, they have recently been subject to volatility uneasy. There were significant differences between PECC survey emerging and advanced economy respondents on this issue, with 70 percent of emerging economy respondents rating this as an important or very important issue compared to 49 percent of those from advanced economies.

The G20 Finance Ministers and Central Bank Governors meeting in July welcomed the progress under the Debt Service Suspension Initiative (DSSI), undertaken in April 2020 to assist developing countries struggling debt servicing during the pandemic. The G20 is undertaking an Independent Review of Multilateral Development Banks’ Capital Adequacy Frameworks and the IMF has increased SDRs by an equivalent of US\$650 billion to increase global liquidity. However, only one APEC member is part of the DSSI.

<sup>9</sup> <https://www.imf.org/external/pubs/ft/sdn/2014/sdn1409.pdf>

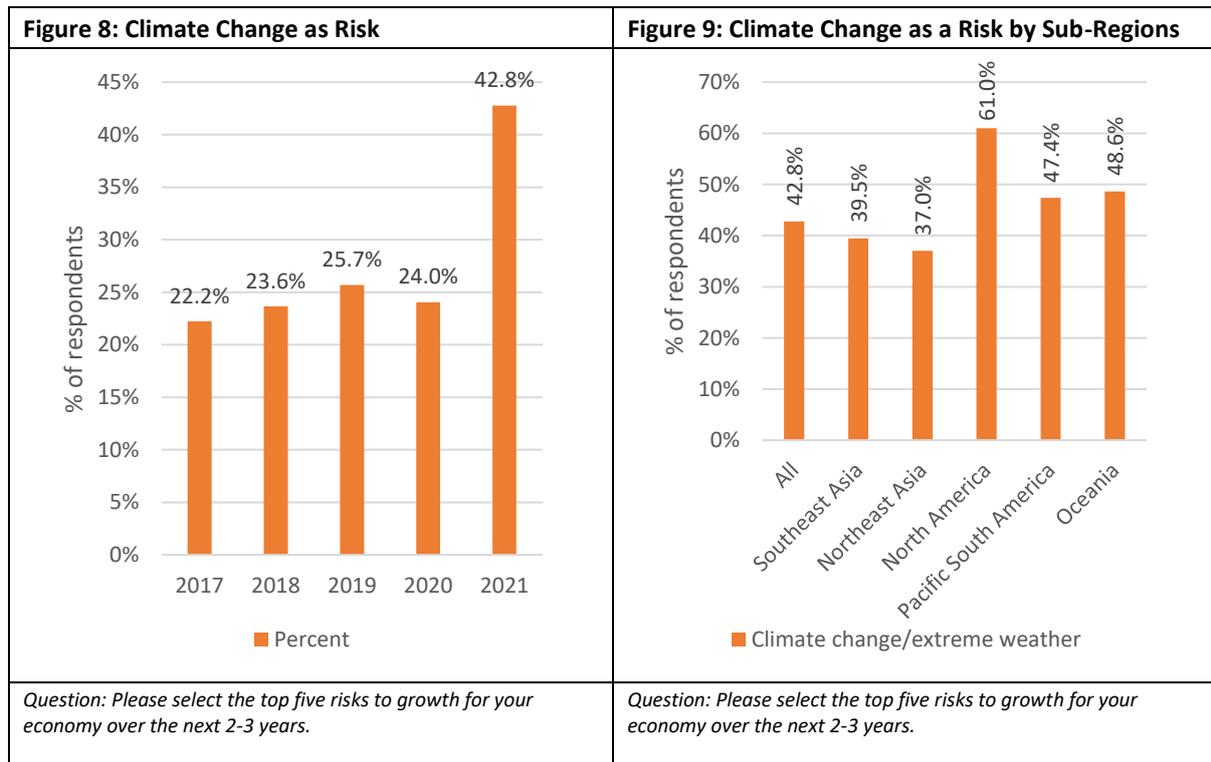
While economic activity has recovered, borders are only gradually being opened in the Asia-Pacific due to continued concerns over the spread of the Covid-19 virus and differential rates of vaccination across the region. This has significant consequences for the travel and tourism sector, including business travel, which accounts for large parts of regional economies but also knock-on implications for regional supply chains constraining fleet capacity of air cargo.

**Climate Change as a Risk to Growth**

The second most frequently selected risk to growth in this year’s survey was climate change/extreme weather events, with 43 percent of respondents selecting it as a top 5 risk to growth for their economies (Figure 8). This is a huge increase from previous years when roughly 25 percent of respondents selected climate change as a risk to growth for their economies. It may in part be because the thematic focus of this year’s report is on climate change, or the timing of the survey happened to coincide with the release of the Intergovernmental Panel on Climate Change (IPCC’s) 6<sup>th</sup> Assessment report<sup>10</sup> which warned of “widespread, rapid, and intensifying climate change.” Or it may simply reflect growing awareness of the economic consequences of climate change as a consequence of increased evidence and greater incidence of devastating climate change-related events including storms, fires, and heat records.

There were significant differences between sub-regions on the perception of climate change as a risk to growth (Figure 8) with more North American respondents selecting it as top5 risk to growth, compared to other parts of the Asia-Pacific. What drove the relatively large percentage of respondents selecting climate change were relatively higher numbers from Northeast and Southeast Asia. Although larger percentages of North American respondents selected climate change as a risk as seen in Figure 8, due to the larger number of Asian economies and respondents the overall response reflects that reality.

Climate change issues will be discussed in more depth in Chapter 2.



<sup>10</sup> <https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/>

## CLIMATE CHANGE: A TURNING POINT – HOW CLIMATE ACTION CAN DRIVE OUR FUTURE

*Cindy Hook, CEO, Deloitte Asia Pacific & Mike Horne, CEO, Deloitte New Zealand*

The recent Sixth Assessment Report from the Intergovernmental Panel on Climate Change (IPCC)<sup>1</sup> makes it clear that climate change is real and man-made, and that the race is on to stop the world warming by more than 1.5°C on average in the next 20 years.

It is also well understood that the problem will be keenly felt in Asia Pacific, due to its large share of the world's population and many geographic areas that are vulnerable to the effects of climate change. More than half of the world's workforce lives in Asia Pacific, and Deloitte estimates that 75 percent of the region's economy is exposed to climate change.

Fortunately, we've seen governments and businesses in Asia Pacific join others around the world in announcing ambitious plans to address climate change. This includes China's plans to become carbon neutral by 2060<sup>2</sup>, Korea's plan to be a net zero economy by 2050<sup>3</sup>, and Deloitte's own goal to reach net zero emissions by 2030, to name a few examples.

The challenge now is to turn these ambitions into actions and find ways for governments, businesses, and communities to work together to drive change. This will not be easy given that Asia Pacific currently emits a majority of greenhouse gases globally, includes an array of developed and emerging economies, and is geographically and culturally diverse. But it can be achieved if economies and organizations act decisively this decade.

Deloitte has recently published research forecasting that if Asia Pacific continues on its current path, the region's economies will be a collective US\$96 trillion smaller than they otherwise would be by 2070.<sup>4</sup> We will also see a devastating rise in heatwaves, floods, droughts and other weather events that sap the region's productivity and living standards.

However, our analysis also shows that if Asia Pacific helps limit global temperatures to a maximum of 1.5°C and capitalizes on its unique capacity to provide the solutions the world needs to decarbonize, it can grow by an extra US\$47 trillion by 2070.

To achieve this feat, Asia Pacific needs to accelerate towards net zero by making a range of significant changes to the way that it operates. The changes should start with decarbonizing electricity grids by introducing renewable energy sources such as solar and wind.

The region should also invest in domestic and inter-regional transmission and energy storage systems. These efforts should align to a region-wide zero carbon energy strategy that considers how zero-carbon electricity can be efficiently stored and redistributed from areas of production to areas of demand across Asia Pacific. It should also allow for governments and companies sequestering carbon or offsetting emissions that must be generated.

At the same time, the region should seek to "electrify everything". This means transitioning from using direct fossil fuel-based energy sources to electricity in cars, other vehicles, domestic cooking and heating, manufacturing and more.

These changes will need to be supported by clear government policies

Such improvements will enable regional leaders to better understand trends and the risks being faced by economies, companies and communities. They will also be essential to the region's ability to reinvent its economies during the coming climate transition, which is essentially a large system of systems challenge spanning energy, transport, industry and manufacturing, agriculture and land use.

There is already significant pressure coming from groups such as the Institutional Investors Group on Climate Change, a pan-European group, which manages assets worth more than €33 trillion. The group has asked for directors to deliver accounts that are aligned to the 2015 UN Paris Agreement climate agreement goals and reflect the impact on companies of getting to zero emissions by 2050 for assets, liabilities, profits and losses.

As time moves on, societies will need to have difficult conversations about adaptation as temperatures rise by the 1.5°C that the IPCC forecasts is already coming. This will involve accepting that some regions or assets are no longer usable, such as areas that continue to be flooded and carbon-intensive energy plants.

Geographies must also consider how the climate transition is to be funded, accepting that while everyone shares the problem, some economies have more resources available to address it. Further, there is a need to find equitable pathways that take into account economies' strengths and needs to ensure that climate action is effective, and the transition is just for everyone.

A key feature of climate change is that it has the potential to exacerbate social and economic inequities because many of its impacts will fall squarely on the shoulders of already vulnerable citizens. This is unfair because most emissions are generated by the world's wealthiest people, for instance, with the top 1 percent emitting twice as much as the poorest 50 percent.<sup>5</sup> Further, most historic emissions have come from the industrialisation that has typically left today's more prosperous economies with their greater resources.

Minority and low-income communities that may be disproportionately exposed to environmental harms must be safeguarded and workers in emissions-intensive industries need to be offered paths to better economic futures, even as the world transitions.

But as our analysis above highlights, Asia Pacific should not have to sacrifice economic growth for equitable prosperity and ecological stewardship. Achieving this balance will take a careful blend of public policy, private-sector action and community engagement. By working together, the geographies and organisations of Asia Pacific are well positioned to strike this balance and ensure that climate action is the start of another bright chapter for the region.

<sup>1</sup> Intergovernmental Panel on Climate Change 2021, *Sixth Assessment Report*, <https://www.ipcc.ch/assessment-report/ar6/>

<sup>2</sup> The State Council of the People's Republic of China 2020, 'Nation to set obligatory carbon goals', [http://english.www.gov.cn/statecouncil/ministries/202010/29/content\\_WS5f9a019dc6d0f7257693e947.html](http://english.www.gov.cn/statecouncil/ministries/202010/29/content_WS5f9a019dc6d0f7257693e947.html)

<sup>3</sup> Korea.net 2021, 'Gov't raises goal of cutting CO2 emissions to 40% by 2030', <https://www.korea.net/NewsFocus/policies/view?articleid=205222>

<sup>4</sup> Deloitte Global 2021, *Asia Pacific's turning point*, <https://www2.deloitte.com/global/en/pages/about-deloitte/articles/asia-pacific-turning-point.html>

<sup>5</sup> Oxfam 2020, '5 things you need to know about carbon inequality', <https://www.oxfam.org/en/5-things-you-need-know-about-carbon-inequality>

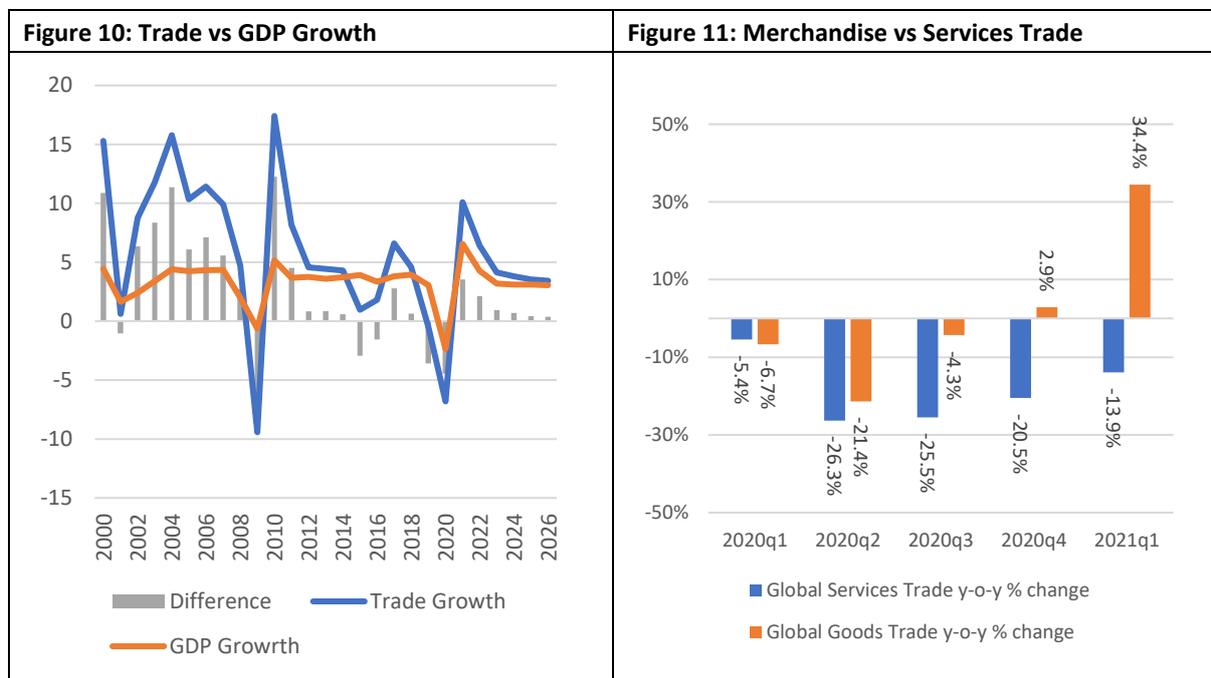
**Lack of Political Leadership**

A lack of political leadership was once again a top 5 risk to growth. Overall 38 percent of respondents selected it as a risk to growth, up from 33 percent last year. The most concerned were respondents from Southeast Asia, Oceania and Pacific South America.

This is a little different from last year when respondents from North America and Pacific South America were the most concerned. It is difficult to know what exactly respondents were concerned about with respect to the perception of lack of political leadership. One common correlate among Southeast Asian and Pacific South American respondents was a concern about a failure to implement structural reforms. It could also be connected more generally to economies responses to common issues such as the response to Covid-19, which was a common top-5 risk across all sub-regions.

**Increased Protectionism and Slowdown in Trade Growth**

Concerns over protectionism and a slowdown in trade growth remained high among the regional policy community. This has been a top risk to growth for many years reaching a peak in 2019 when 64 percent of respondents selected it as a top 5 risk to growth for their economies.



Source: IMF World Economic Outlook

Source: WTO Secretariat

Concerns over slowing trade are similarly long-standing in a region where growth has been driven by trade for many years. Although trade momentum is returning, the differential between trade and overall growth in aggregate demand is significantly less than what it was during the 1990s and 2000s when growth in global value chains and unbundling was a significant driver for the region. (Figure 10)

Global merchandise trade recovered during the 4<sup>th</sup> quarter of 2020 growing by 2.9 percent (Figure 11). The WTO Secretariat is expecting it to grow by 8 percent this year and about 4 percent in 2022. Trade in commercial services continues to lag behind, and trade in travel services, which make up 11 percent of commercial services trade was down by 63 percent and not expected to recover for some time.

While the WTO does see recovery in some services sectors especially in financial transactions, others lag far behind<sup>11</sup>. This further compounds the imbalanced nature of the recovery. While some sectors have been able to digitize and deliver services directly via Mode 1 (a service supply from one territory into the territory of another). Others such as tourism and restaurants that depend on face-to-face interactions cannot. The WTO

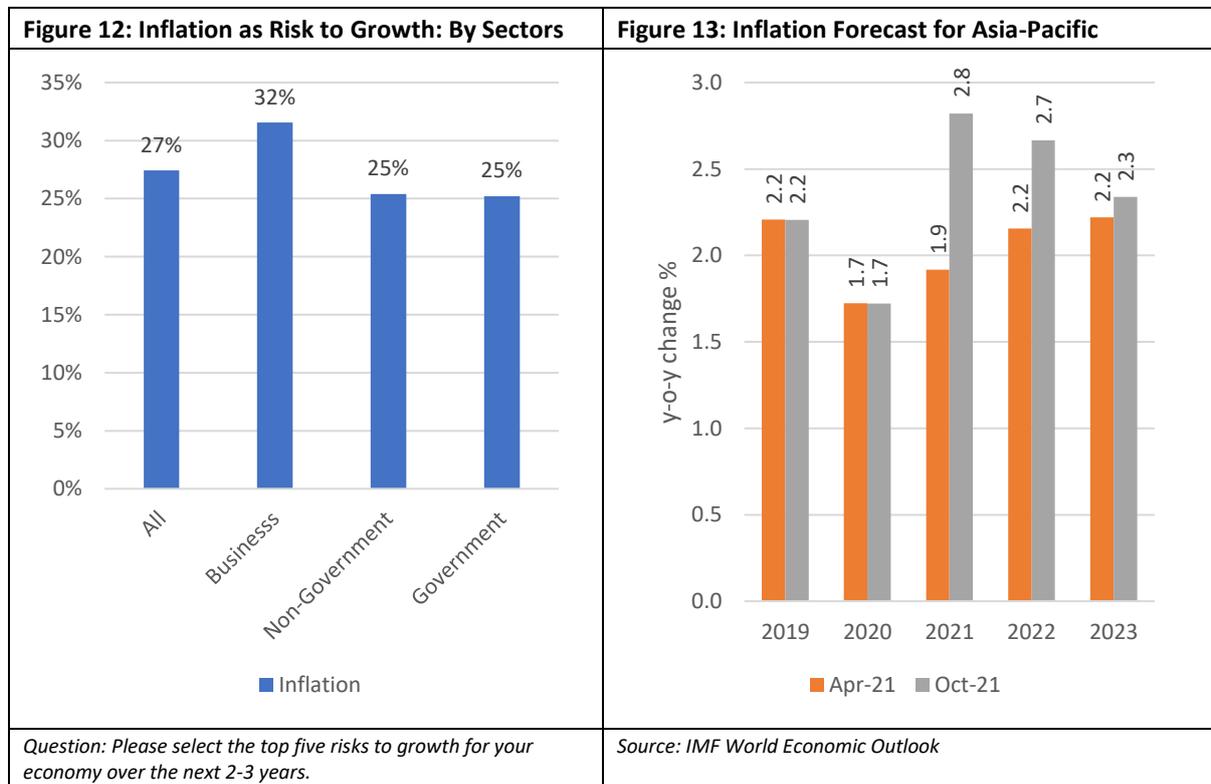
<sup>11</sup> [https://www.wto.org/english/news\\_e/news21\\_e/wtoi\\_23sep21\\_e.pdf](https://www.wto.org/english/news_e/news21_e/wtoi_23sep21_e.pdf)

notes this situation differs from the recovery from the Global Financial Crisis when services trade was more resilient than goods trade.

Analysis by the WTO finds that ‘trade policy restraint by WTO Members has prevented a destructive acceleration of trade restrictions that would have further harmed the world economy’; 35 percent of the measures taken by its members since the crisis could be considered restrictive of goods trade. Of great concern is that over time, about 9 percent of world goods imports has become subject to some form of trade restrictions. On services, WTO members introduced 122 measures unrelated to the pandemic affecting trade in services during the review period, targeting different modes of supply across various sectors – some of which were trade restricting.<sup>12</sup> In other words, respondents are rightly concerned about rising protectionism.

**Inflation as a Risk to Growth**

A significant number of survey respondents refer to inflation as a risk to growth (Figure 12). Overall, inflation was the 7<sup>th</sup> highest risk in survey, but for business respondents it was the 5<sup>th</sup> highest risk to growth. It may well be that the businesses are feeling the impact of price increases before the rest of community. There is some debate over the nature of the current inflationary pressures – whether there is a risk of ‘jumping at shadows’. Underlying the difficulty in reaching any conclusion is that there remains significant capacity in the economy with the solution coming from fixing supply and relaxing restrictions on the movement of people as and when health circumstances permit.



Central banks are carefully watching price increases and debating whether they are a transitory phenomenon caused by exceptional circumstances that will fade as conditions normalize or are the result of more fundamental changes in supply-demand conditions.

Some of the underlying factors complicating the picture are base effects of the considerable decreases in economic activity last year<sup>13</sup>; the surge in demand for some consumer durable products during the; bottlenecks in the production of intermediate goods, the impact of weather on food staples; and the constraints in the transportation system.

<sup>12</sup> [https://www.wto.org/english/news\\_e/news21\\_e/factsheed29721\\_e.pdf](https://www.wto.org/english/news_e/news21_e/factsheed29721_e.pdf)  
<sup>13</sup> <https://www.dallasfed.org/research/economics/2021/0513.aspx>

Chile, Korea, Mexico, New Zealand, Russia, and Singapore’s central banks have raised interest rates in the face of differing pressures. Figure 13 shows both the April forecasts for inflation as well the most those made in October. These demonstrate almost 1 percentage point increase in inflation expectations for the region.

While circumstances differ enormously within individual economies hence making it difficult to make any generalized conclusions, it is worth keeping front of mind the tremendous supply shocks that the region has and continues to suffer largely as a result of the pandemic. Raising the cost of money is not going to fix supply, produce more semi-conductors, nor will it bring people back to work, it does however potentially risk stalling what is really needed – investments in people and plants. The critique provided by Goodhart *“In the post-Global Crisis period, central banks injected money into the financial system. Financial institutions, needing to strengthen their balance sheets, found buying financial assets a far more reliable route to achieving that protection than lending to the private sector”*<sup>14</sup>. As a result, those injections found their way into the monetary base rather than broad money or credit. As discussed elsewhere in this report capex was perennially disappointed prior to Covid, but the signs are that this is shifting with the corporate sector now feeling ‘optimistic’ and willing to invest. If the velocity of money has collapsed there may well be structural if not misaligned incentives that need to be addressed through structural reforms.

### What’s Driving Higher Prices?

The underlying factors of the price increases need to be broken down into various components:

- Demand surges amidst factory closures due to Covid-19
- Temporary closures of ports due to Covid-19 infections in ports
- Shortage of workers due to Covid-19
- The temporary Suez Canal blockage
- Policy restrictions

### Demand Surge

As economies went into lockdowns in the second quarter of 2020 it changed the pattern of domestic consumption in many economies. There was an initial surge in demand for information technology products for home-based school and work – laptops and computers. This came exactly at the time when key manufacturing hubs in Asia had to temporarily shut down due to the pandemic or faced labor constraints due to policy shut-downs.

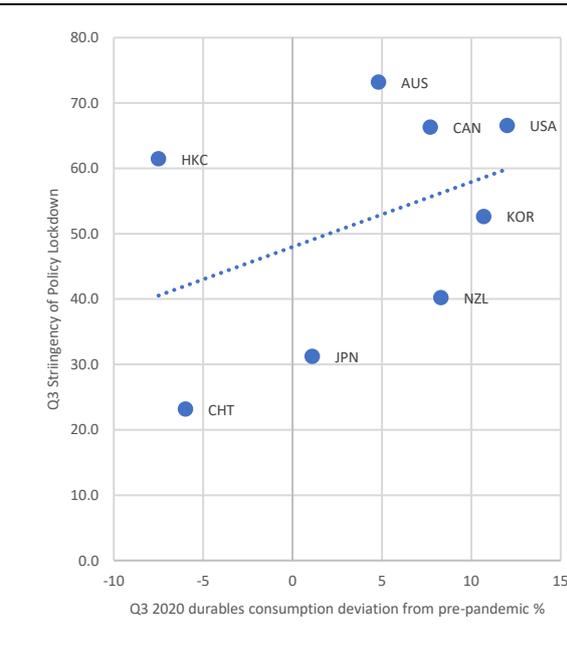
Average consumption of consumer durables was on average 9 percent higher among the region’s advanced economies during the 3<sup>rd</sup> quarter of 2020 but higher for some economies – for example 12 percent in the United States. (See Figure 14). During his speech at the Jackson Hole Symposium, Federal Reserve Chair Jerome Powell said that *“Spending on durable goods has boomed since the start of the recovery and is now running about 20 percent above the pre-pandemic level.”*<sup>15</sup> The data in Figure 14 shows only the data up to the end of the third quarter of 2020.

While not common to all economies, the more stringent the lockdown, the consumption of consumer durables has tended to run above pre-crisis baselines. With the exception of Hong Kong, China and Chinese Taipei, consumer durable consumption in the region’s high-income economies was above the pre-trend average and more so depending on the stringency of the lockdown measures.

<sup>14</sup> <https://voxeu.org/article/friedman-vs-phillips-historic-divide>

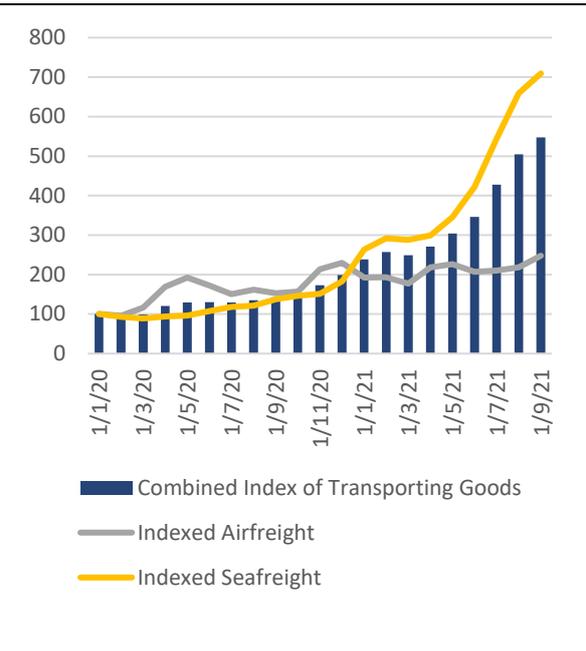
<sup>15</sup> <https://www.federalreserve.gov/newsevents/speech/powell20210827a.htm>

**Figure 14: Change in Consumer Durable Consumption Above Baseline**



Source: IMF World Economic Outlook April 2021 and COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford.

**Figure 15: International Cost of Transporting Goods**



Source: Baltic Exchange Air Freight Index and Freightos Baltic Index (FBX): Global Container Freight Index

Analysis by the European Central Bank based on the rise in shipping costs (Figure 15) over the course of the pandemic have not been the result of a single factor. The initial rise at the beginning of 2020 came as a result of the supply sharp curtailing of transport systems (eg limits on crew changes and port operations) then, as these began to be addressed, the surge in demand became the primary cause especially at the end of 2020.<sup>16</sup> They argued that “However, as supply adjusts to increased demand, these bottlenecks should delay but not derail the global recovery.”

However, since the end of 2020, global trade has been hit by a series of incidents that have further constrained capacity. In March 2021, the container ship the Ever Given was blocked the Suez Canal for 6 days causing an estimated US\$230 billion cost to international trade. In May, Yantian Port temporarily suspended operations due to the discovery of Covid-19 cases.<sup>17</sup> In August, Ningbo also suspended one of its terminals due to a Covid-19 case.<sup>18</sup> In the United States Los Angeles and Long Beach Ports report long queues of ships waiting to unload.<sup>19</sup>As of July 2021 over 116 ports around the world reported congestion, with 328 ships waiting to unload their cargo.<sup>20</sup>

The initial policy restrictions and grounding of air travel caused a 98 percent drop in international air passengers and with it an 80 percent drop in ‘belly capacity’ due to the decline in overall flights. Since then, air freight has been filling an urgent need to transport medical supplies and e-commerce fulfilment with commercial airlines using passenger aircraft for cargo-only flights.<sup>21</sup>

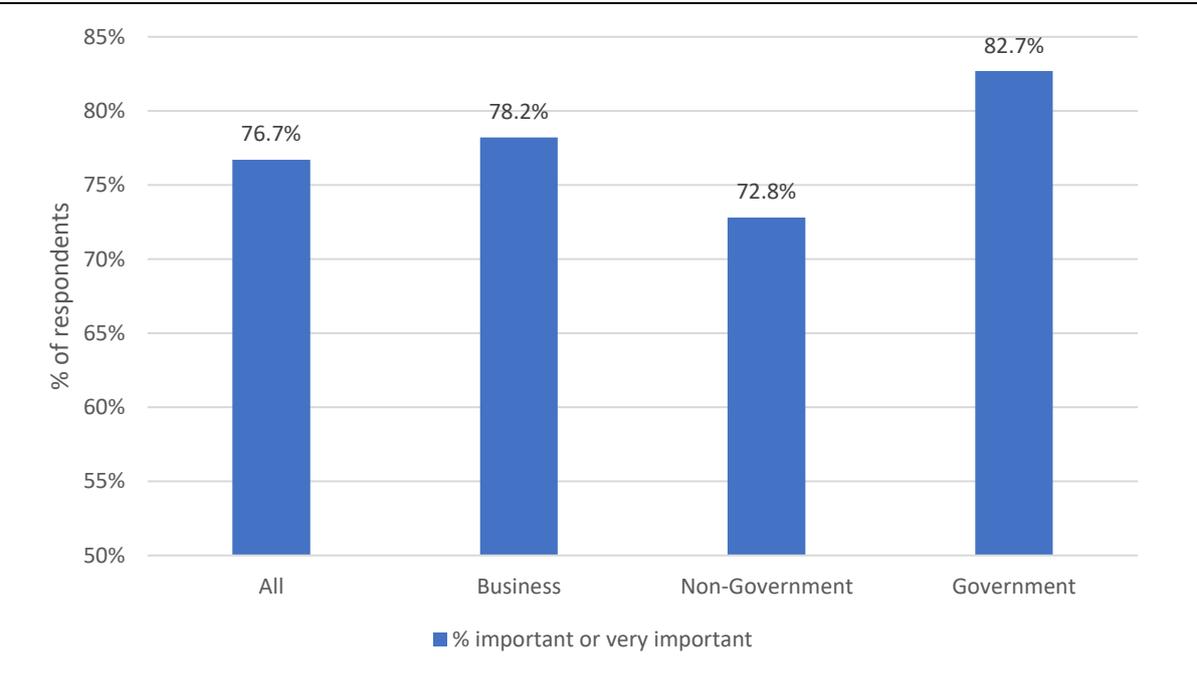
Pre-crisis prices of air freight per kilo were about US\$3, since then they have spiked to above US\$8.<sup>22</sup> The picture is even worse for maritime, the Freightos index of container shipping prices shows an increase from US\$1,500 to above US\$11,000. A combined index of air and maritime freight prices at a 35-65 ratio, shows an enormous average increase in the cost of transporting goods over the period of the crisis. Taking both air and sea freight costs into account the average cost of transporting goods across the world has increased by 500 percent over

<sup>16</sup> What is driving the recent surge in shipping costs?  
[https://www.ecb.europa.eu/pub/economic-bulletin/focus/2021/html/ecb.ebbox202103\\_01~8ecbf2b17c.en.html](https://www.ecb.europa.eu/pub/economic-bulletin/focus/2021/html/ecb.ebbox202103_01~8ecbf2b17c.en.html)  
<sup>17</sup> <https://www.globaltimes.cn/page/202105/1224600.shtml>  
<sup>18</sup> <https://www.globaltimes.cn/page/202108/1231858.shtml>  
<sup>19</sup> <https://www.wsj.com/articles/cargo-ships-are-again-idling-off-jammed-southern-california-ports-11629229285>  
<sup>20</sup> <https://splash247.com/global-port-congestion-worsens-116-ports-report-disruption/>  
<sup>21</sup> Keeping trade moving: The COVID-19 impact on sea and air cargo, HSBC Research  
<sup>22</sup> <https://www.aircargonews.net/data-hub/airfreight-rates-tac-index/>

the course of the pandemic. The most recent prices as the beginning of October show a decline in the average price of containers from US\$9,949. It is not just price but availability and delays, some large retailers, in order to meet demand for the Christmas season have chartered their own cargo ships.<sup>23</sup>

Since the onset of the pandemic, APEC Ministers and Leaders have continually emphasized the need to facilitate the flow of goods and services – this must include addressing how goods actually move across the world – by road; rail; sea; and air. Options available to APEC in this respect are discussed in the next part of this chapter. The second highest priority for dealing with pandemic and its economic consequences (discussed in the following section) was “protocols to facilitate the safe international movement of people starting with those involved in logistics and supply chains – aircrew and seacrew”. This was second only to the scope and pace of vaccination with 77 percent of respondents ranking it as important to very important. This issue was seen as important by all stakeholder groups, but especially so by government officials with 83 percent of them selecting it as an important or very important issue to deal with.

**Figure 16: Protocols for Air and Sea Crew as a Priority**



Question: How important do you think the following are for dealing with the ongoing pandemic and its economic consequences? Please use a scale of 1-5, with 1 being not important and 5 very important.

Views are divided on whether this is a temporary phenomenon or whether it will have lasting ramifications for how the corporate sector reshape global value chains. The rise in shipping costs was also found to be a central issue in supply challenges in analysis earlier this year by Goldman Sachs which came to the conclusion that ‘because supply challenges are largely driven by transportation and not production constraints—unlike last spring when supplier delays spiked due to factory shutdowns that halted the supply of intermediate goods—we expect that supply constraints will put upward pressure on prices but have less of an impact on real economic activity.’<sup>24</sup> Their estimate back in March was that total shipping costs make up about 3 percent of the final cost of manufacturing output and international shipping costs less than 1 percent in the United States.

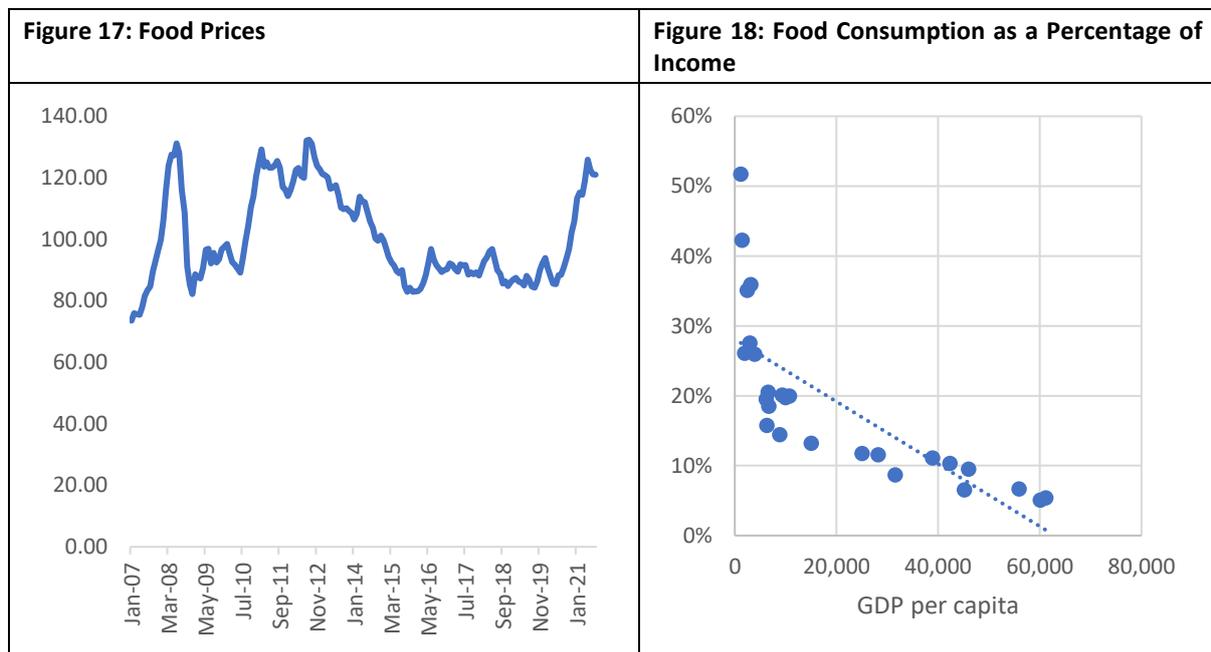
However, HSBC estimates that a 205 percent rise in container shipping costs over the past year could raise producer prices by up to 2 percent in the Eurozone.<sup>25</sup> UPS which sees large volumes of air cargo warns that there will be lasting scars. “There’s an understanding that reliance on stretched supply chains puts you at risk,” Scott Price, president of UPS International told the Financial Times.<sup>26</sup>

<sup>23</sup> <https://www.wsj.com/articles/biggest-u-s-retailers-charter-private-cargo-ships-to-sail-around-port-delays-11633858380>  
<sup>24</sup> <https://www.gspublishing.com/content/research/en/reports/2021/03/16/5c14bc84-c0bc-4c99-8a3c-ad6a5e15efb1.html>  
<sup>25</sup> <https://www.gbm.hsbc.com/insights/global-research/shipping-trade-disruption>  
<sup>26</sup> <https://www.ft.com/content/6c127633-9825-4921-9a11-71518591e2f3>

The boom in demand for consumer durables came at the same time as a series of events impacted the ability of supply chains to respond to them. On top of new waves of Covid-19 induced factory shutdowns in manufacturing locations such as Malaysia and Vietnam, a fire at a plant in Tokyo<sup>27</sup> and droughts in Chinese Taipei<sup>28</sup> have been cascaded through supply chains impacting car manufacturing. Leading car manufacturers, Ford, General Motors and Toyota have all announced reductions to their global productions due to shortages in key components.<sup>29</sup> Auto makers are not the only ones facing problems – Sony and Microsoft launched their new products in December 2020, but they have faced supply chain issues and have been unable to keep up with demand – these shortages are expected to continue into 2022.<sup>30</sup>

**Impact on Inclusive Growth Goals**

The rise in prices has not been limited to consumer durables. A worrisome dimension has been rising food prices. Food prices have consistently trended higher over the pandemic period, as of August 2021, they were 28 percent higher than at the start of 2020 (Figure 17). The reasons behind this are complex. Weather conditions in key cereal producers have resulted in poor supply for some commodities pushing prices higher but also underlying the higher food prices has been the surge in shipping costs.<sup>31</sup>



Source: World Bank <https://www.worldbank.org/en/research/commodity-markets>

Source: World Bank International Comparison Program

The impact of rising food prices will be felt very differently across as well as within economies with food consumption as a percentage of income considerably higher for low-income families. At income levels above US\$40,000 food expenditure is less than 8 percent of household consumption expenditure, but at income level less than US\$10,000, it is on average 27 percent of annual consumption. (Figure 18)

Fertilizer has seen a very significant rise in price. On average the price of fertilizers has risen by 85 percent since the start of the crisis. Underlying this are the same issues as in other goods – constrained production capacity due to Covid-19 restrictions affecting the supply chain but also surges in demand as well as trade policy issues<sup>32</sup>.

Very timely this year APEC adopted “Food Security Roadmap Towards 2030” which focuses on identifying actions and targets which APEC economies will pursue together to achieve food security in the region. While taking an inclusive and sustainable approach to food security, the roadmap includes among its action areas the promotion

<sup>27</sup> [https://www.wsj.com/articles/the-chip-shortage-is-bad-taiwans-drought-threatens-to-make-it-worse-11618565400?mod=article\\_inline](https://www.wsj.com/articles/the-chip-shortage-is-bad-taiwans-drought-threatens-to-make-it-worse-11618565400?mod=article_inline)  
<sup>28</sup> [https://www.wsj.com/articles/the-chip-shortage-is-bad-taiwans-drought-threatens-to-make-it-worse-11618565400?mod=article\\_inline](https://www.wsj.com/articles/the-chip-shortage-is-bad-taiwans-drought-threatens-to-make-it-worse-11618565400?mod=article_inline)  
<sup>29</sup> <https://www.wsj.com/articles/covid-19-surge-in-malaysia-threatens-to-prolong-global-chip-shortage-11630234802> and <https://asia.nikkei.com/Business/Automobiles/Toyota-to-cut-global-output-40-in-September-on-ASEAN-outbreaks>  
<sup>30</sup> <https://www.independent.co.uk/extras/indybest/gadgets-tech/video-games-consoles/xbox-series-x-preorder-uk-b1836406.html>  
<sup>31</sup> <https://www.businessinsider.com/why-are-food-prices-rising-grocery-restaurants-inflation-more-expensive-2021-6>  
<sup>32</sup> <https://blogs.worldbank.org/opendata/fertilizer-prices-expected-stay-high-over-remainder-2021>

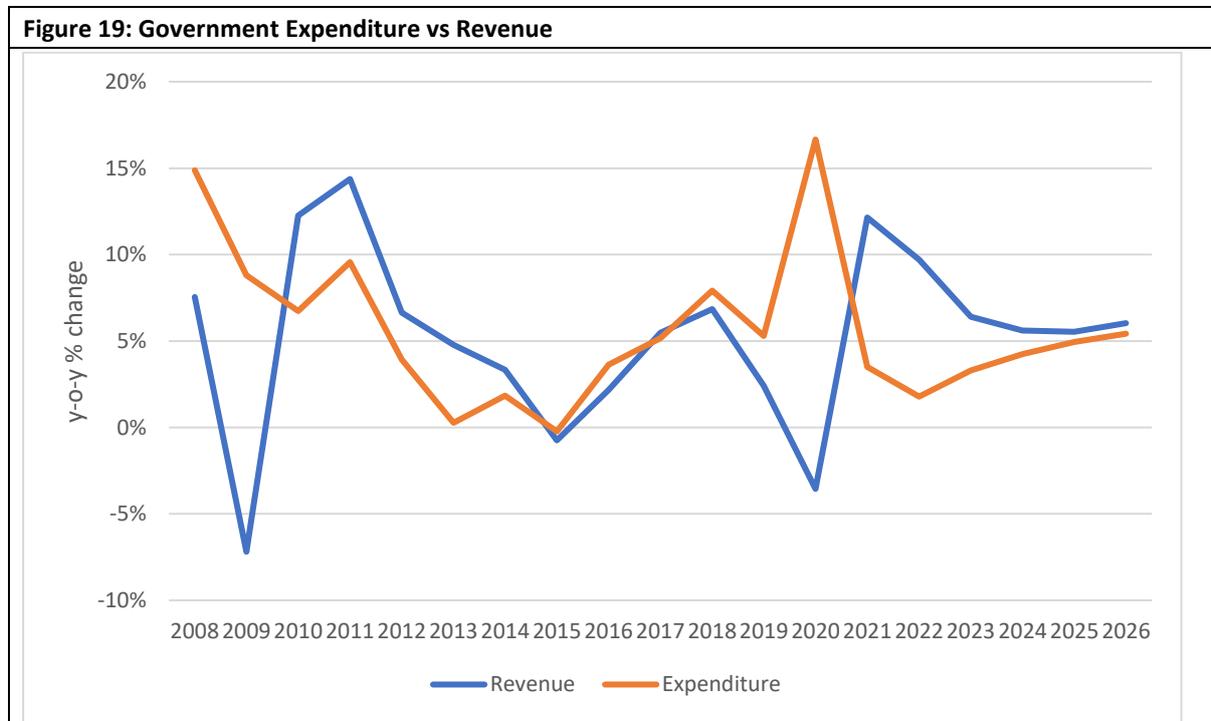
of public-private investment in infrastructure and cold chain to reduce the current levels of food loss and waste. Progress will be periodically reviewed.

While the language of the roadmap was focused on looking at food loss and waste along the food supply chain, it is timely to establish baselines and to explore the reasons why food prices have increased significantly during the pandemic. This is an especially important to ensuring that future growth is indeed inclusive given the relatively high proportions of income that the less-well-off spend on food.

**Debt Dynamics**

In order to support overall aggregate demand, total government expenditure increased by 16.7 percent year-on-year in 2020 while at the same time revenues dropped by 3.6 percent. In 2020 government expenditure stood at 39.6 percent of regional GDP but is expected to drop down to 37 percent this year.

As economies begin to recover government revenues are expected to recover as shown in Figure 19 but they remain at around 29 percent of GDP and expenditures will fall back to historical norms of around 35 percent of GDP by 2022. Rising inflation may see debts rolled over during a higher interest rate environment stressing economies with higher debt servicing obligations.



Source: IMF World Economic Outlook

Several initiatives are in place to support emerging and low-income economies responses to Covid-19, these include for example the Debt Service Suspension Initiative, cited earlier, that allows eligible economies to focus their resources on fighting the pandemic that has been in place since May 2020<sup>33</sup>. Under the terms of the initiative, 73 economies are eligible for a temporary suspension of debt-service payments owed to their official bilateral creditors, the G20 has also called on private creditors to participate in the initiative on comparable terms.

Other initiatives include the allocation of the equivalent of US\$650 billion of special drawing rights at the IMF to bolster international liquidity. Regional initiatives such as the Chiang Mai Initiative Multilateralization (CMIM) has also been bolstered with a financing capacity of USD240 billion<sup>34</sup> while the US Federal Reserve has entered into bilateral U.S. dollar liquidity swap lines with nine central banks.<sup>35</sup> Dialogue on these efforts provides not only a useful understanding of the technicalities behind them but also a strong signal of the commitment of

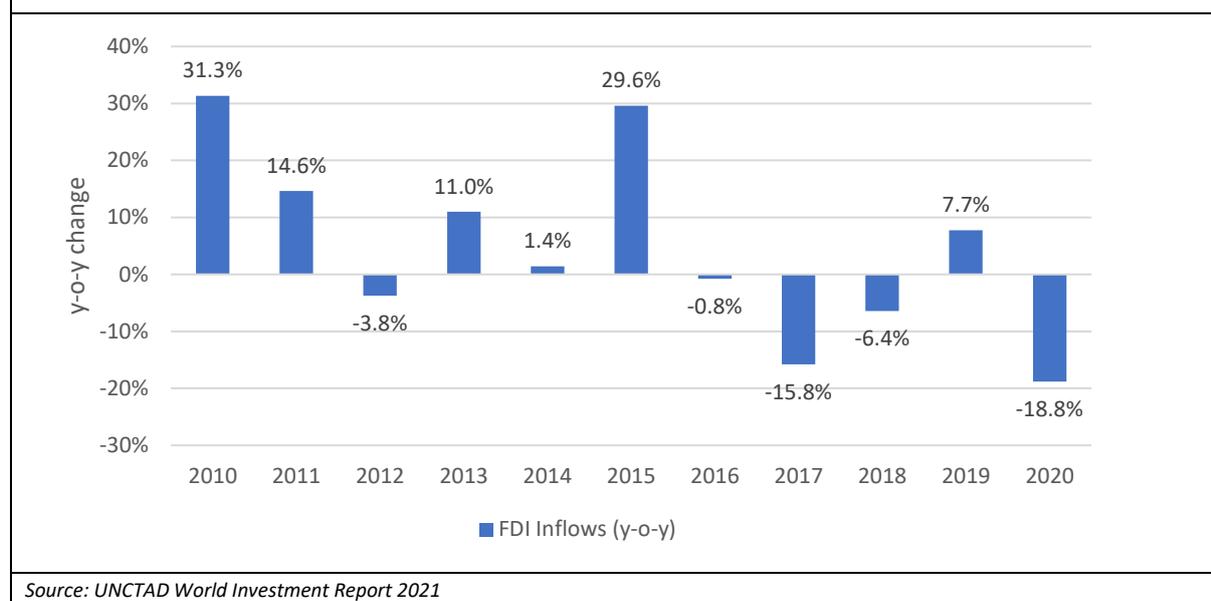
<sup>33</sup> <https://www.worldbank.org/en/topic/debt/brief/covid-19-debt-service-suspension-initiative>  
<sup>34</sup> <https://www.amro-asia.org/synergizing-asean3s-regional-and-bilateral-swap-arrangements-for-greater-emergency-financing/>  
<sup>35</sup> <https://www.federalreserve.gov/newsevents/pressreleases/monetary20210616c.htm>

governments to cooperation. G20 Finance Ministers have supported the DSSI and the expansion of the IMF's allocation of SDRs. As APEC works through the implementation plan for its post-2020 agenda, the link between global initiatives and regional mechanisms is an item that needs further consideration.

Foreign direct investment flows to the region fell by 19 percent year-on-year in 2020 (Figure 20), though it was significantly less than the drop in fall in global FDI flows.

A key issue for the recovery is if and when investor confidence will return. While governments have been able to help sustain demand over the crisis, a sign of the turning point will be when businesses are ready to start investing in jobs and capital.

**Figure 20: FDI Inflows to Asia-Pacific**



While equity markets have been bullish, has this translated to increased investments from business in capital expenditure? Before Covid struck, the outlook for non-financial capital expenditure over 2020 and 2021 was negative, with G20 Finance Ministers and Central Bank Governors criticizing what they described as 'excessive saving' in the corporate sector. Some firms have needed that liquidity (and more) to survive the crisis but estimates show that the corporate sector continues to hold large cash balances, for example, Moody's estimates that at the end of 2020 the US corporate cash pile increased to US\$2.15 trillion, up 32 percent from the end of 2019.

The signs are very positive, and it appears that the cash will be spent not just on share buybacks and acquisitions but on productivity enhancing capital investment. Moody's expects this to be between US\$1.8 to US\$1.9 trillion up from US\$1.7 trillion in 2020.<sup>36</sup> Globally, capital expenditure is expected to increase during 2021 from US\$3.3 trillion to US\$3.7 trillion<sup>37</sup>

The expectation is that the cycle of expenditure will be driven largely by investments in technology and sustainability with capital expenditure above 2019 baselines. However, not surprisingly there are some sectors where investment expectations remain negative – hotels, restaurants, and leisure stand out. This should be cause for concern given how many people these sectors employ in several regional economies.

<sup>36</sup> Moodys Investor Services Cash pile increases 32.3% to \$2.15 trillion; Tech still dominant over other sectors

<sup>37</sup> Global Corporate Capex Survey 2021: Surge Investing, S&P Global Ratings

### Need for Balance

Some of the pressures in the global system arise from the continued policy-driven lock downs. The surge in demand for consumer durables, the continued closure and lack of certainty that hangs over a number of services sectors; and the lack of capacity in the transport sector.

The bounce back from 2020 has been unbalanced among sectors and economies, and will continue to be so unless specific policy actions are taken to rectify the situation. Careful consideration and analysis of the underlying causes is needed.

The worst-case scenario of stagflation is one that cannot be wished away. In the case that inflation is caused by a supply crunch – rises in interest rates will not increase the supply of semi-conductors or wheat. As argued here, the imbalance in demand has come from a temporary surge for specific products as a result of the pandemic. As economies open up, this will change, and the sooner governments find ways to open up, inflationary pressure will ease. Some central banks are carefully watching wages, Christine Lagarde of the ECB, for example said *“we will pay close attention to wage developments and inflation expectations to ensure that inflation expectations are anchored at 2%.”*<sup>38</sup>. Problematic again is the K-shape of the recovery, historically wage increases have not kept up with productivity<sup>39</sup>. Wage increases for lower deciles would be welcome and overdue – and resolve some of the problems with inclusive growth.

The focus should therefore be on dealing with the structural inefficiencies that the pandemic has laid bare as well the longer-term issues that the region has identified as its priorities. For example, this year APEC adopted an Enhanced APEC Agenda for Structural Reform (EAASR). This outlines four pillars of work:

- Creating an enabling environment for open, transparent, and competitive markets;
- Boosting business recovery and resilience against future shocks;
- Ensuring that all groups in society have equal access to opportunities for more inclusive, sustainable growth, and greater well-being; and
- Harnessing innovation, new technology, and skills development to boost productivity and digitalization.

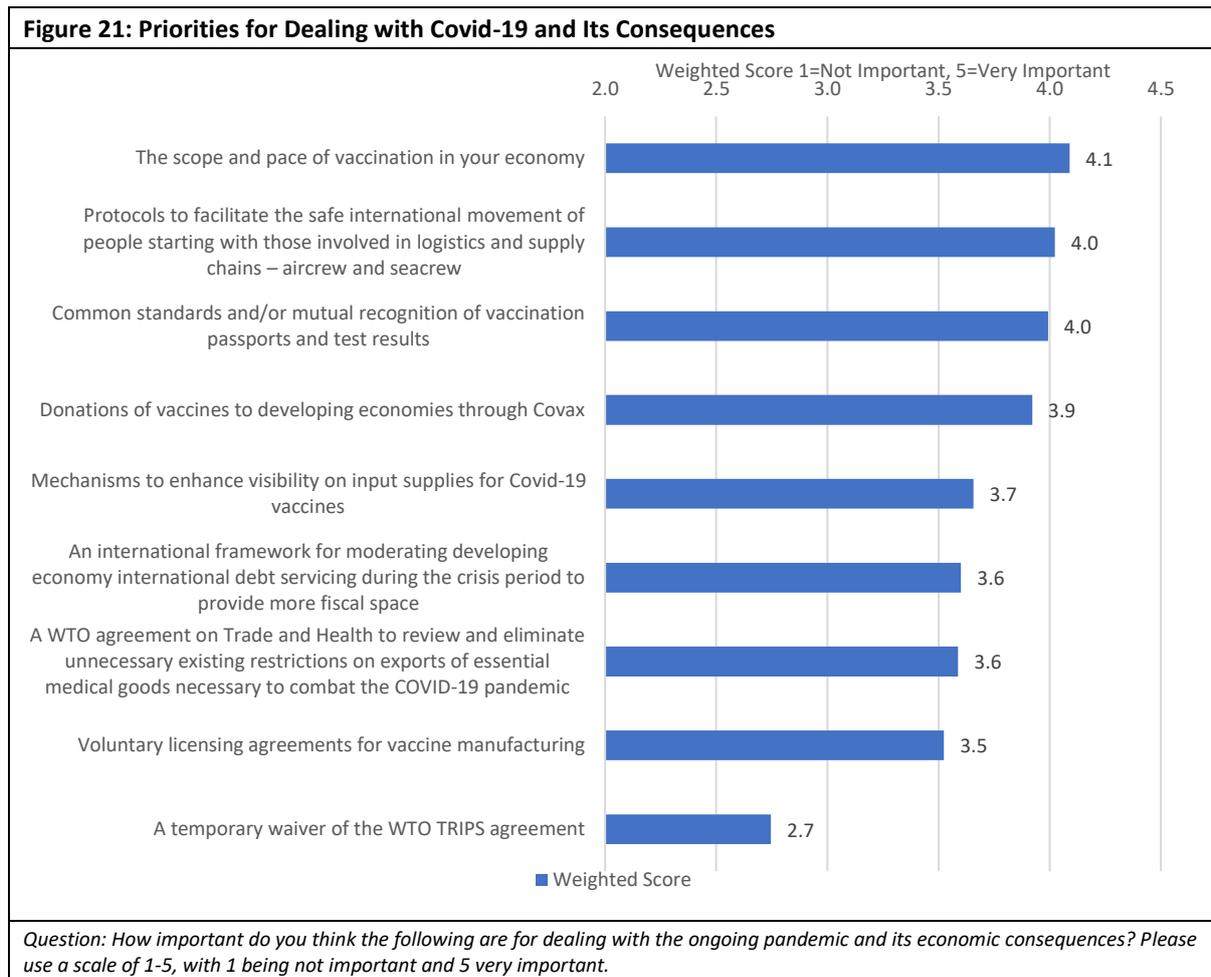
Over the medium term these provide an ideal framework for developing the policy tools for dealing with the supply side issues at the heart of the problem. Each of these are large set of issues, but the value of the APEC approach is that enables its members to focus on one or two areas of particular concern, and report back to the community on the progress they are making. Some of these are done collectively through exercises such as the APEC Conferences on Good Regulatory Practices and the APEC Economic Policy Reports. Greater coordination and synergy between the Economic Committee and Finance Ministers track is necessary. For example, work on corporate governance and ESG standards would be an area of common interest.

Proximate concerns of the pandemic will occupy policy-makers but decisions being taken now are having longer-term consequence. Globalization has been a moderating force on inflation for the past few decades and its reversal will have exactly the opposite effect.

<sup>38</sup> <https://www.reuters.com/world/europe/ecb-zoom-inflation-expectations-wages-lagarde-2021-10-05/>

<sup>39</sup> <https://www.oecd.org/economy/outlook/Decoupling-of-wages-from-productivity-november-2018-OECD-economic-outlook-chapter.pdf>

Priorities for Dealing with Covid-19 and Its Consequences



PECC’s survey of the policy community sought their views on the priorities for dealing with the pandemic. Results are reported in Figure 21.

Overall, the most important issue among survey respondents was the scope and pace of vaccination, which had a weighted score of 4.1 on a scale of 1 to 5 or with 78 percent of respondents (see Annex for detailed survey results) selecting it as important or very important for dealing with the pandemic and its economic consequences. This was followed by issues related to the movement of people: protocols for the safe movement of those involved in logistics – aircrew and seacrew and then common standards for and/or mutual recognition of vaccination passports and test results.

However, there were some differences in priorities between emerging and advanced economies. Donations to Covax was the second highest priority for emerging economy respondents, common standards and/or mutual recognition of vaccination passports and test results was the top priority for respondents from advanced economies.

This did not mean that it was ‘unimportant’, just relatively less important, for example, on the issue of donations to Covax, 67 percent of advanced economy respondents selected it as important or very important, whereas 73 percent of them selected protocols for the safe international movement of people as important or very important.

Issues that have been or are currently being debated such as a temporary waiver of the WTO TRIPS agreement, a WTO agreement on Trade and Health, or international frameworks for moderating developing economy international debt servicing during the crisis which has been discussed by the G20 came further down in the list of priorities.

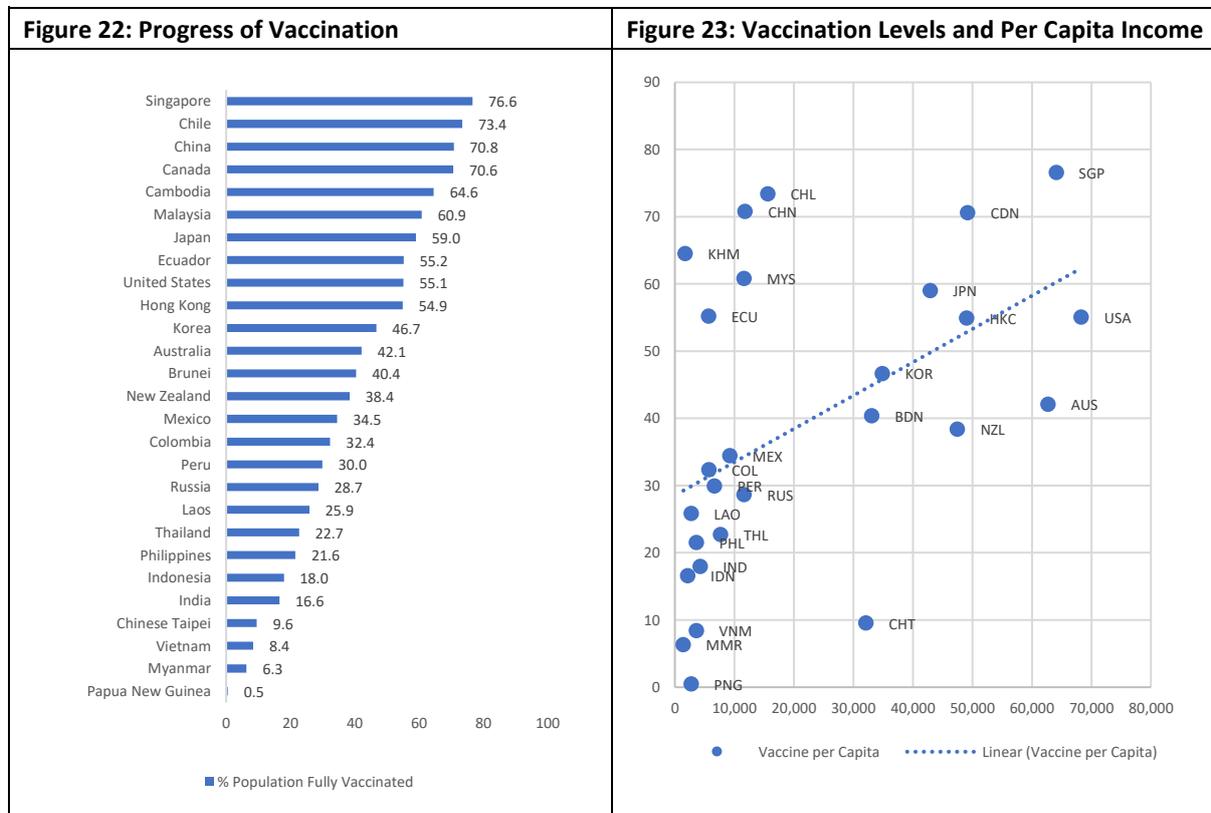
Other than vaccination, the priorities that emerged were issues where there has been little international cooperation or rather little progress thus far.

On the other hand, business respondents did not see a temporary waiver of the WTO TRIPS agreements as important as government or non-government respondents. There was much less of a gap between business and government views on the importance of voluntary licensing agreements for vaccine manufacturing, underscoring the complexity of the landscape of policy issues.

**The Scope and Pace of Vaccination**

When APEC Leaders met at the end of 2020, they highlighted the importance of “facilitating equitable access to safe, quality, effective and affordable vaccines” and acknowledged that “the role of extensive immunization against COVID-19 is critical in order to bring the pandemic to an end. Since then considerable progress has been made with now approximately 40 percent of the region’s population fully vaccinated.

However, the process has been far from even with some economies managing to achieve vaccination rates of over 70 percent to date with many others well below 40 percent (Figure 22). While the global discourse has focused on the differences between high and low income economies, the story in the Asia-Pacific is mixed.



Source: Our World in Data, as of 1 October 2021

Source: Our World in Data and IMF World Economic Outlook

Some middle-income economies such as Chile have moved very quickly to vaccinate over 70 percent of their population, much faster than higher income economies (Figure 23). Chile was not only an early mover but took a portfolio approach to its effort, entering into deals with Sinovac, Pfizer, and Astra Zeneca, Johnson and Johnson in late 2020 as well as CanSino in the first quarter of 2021. Higher income economies that relied on a smaller set of vaccines have had to wait for deliveries.

The number of vaccines approved, speed of domestic regulatory approval, the nature of the contract with the manufacturer, domestic systems delivery system, the availability of cold chain facilities, the size of population as well as vaccine hesitancy have all played a role in the ability of economies’ ability to quickly deliver Covid-19 vaccines to their populations.

In recent months, the Asia-Pacific has been vaccinating around 12 million people a day. To reach the goal of 70 percent vaccination, that would take another 100 or so days at current rates – assuming vaccines are available. The rate of vaccination will inevitably slow as the easier to access and more willing population have been received shots. A paper by World Bank experts analyzing vaccination trends in Asia contends that “as vaccination coverage increases, distribution to remote areas is likely to vary and vaccine hesitancy to become a binding constraint... Therefore, the attainment of these goals cannot be taken for granted and will continue to require a special effort to acquire vaccines, distribute them, and persuade people to get vaccinated.”<sup>40</sup> Two key points emerge from their analysis:

- Sustained emphasis on non-pharmaceutical interventions, especially testing, tracing, and isolation.
- Since zero COVID-19 may not be an affordable option, health systems need to be adapted to live with long COVID.

Our definition of Asia-Pacific here is broad, taking in the members of APEC, ASEAN, the East Asia Summit and PECC – a region of 4.5 billion people. Broad as it is, it is also the most useful given how the pandemic has evolved and spread across borders. Just as conceptually the Free Trade Area of the Asia-Pacific needs to take into account the reality that its pathways such as the RCEP includes non-APEC ASEAN members, APEC’s concept of open regionalism can serve it well in dealing with what are complex issues such as pandemics and connectivity.

Thus far APEC leaders have agreed to laudable language on equitable access to safe, effective, quality-assured, and affordable COVID-19 vaccines but without any specific targets on what equitable might mean within the regional context. The headline number of 41 percent might be reassuring but underlying these are very low vaccination rates in some economies that leaves them extremely vulnerable and belies the spirit of community that APEC is intended to engender. Moreover, it is in these contexts that new variants emerge – according to the WHO “*when a virus is widely circulating in a population and causing many infections, the likelihood of the virus mutating increases. The more opportunities a virus has to spread, the more it replicates – and the more opportunities it has to undergo changes.*”<sup>41</sup>

A further issue is ‘booster shots’ especially for vulnerable members of society in economies with relatively high vaccination rates and the issue of global equity. Here global coordination and science-based approaches will be critical. While the medical advice on boosters is hotly debated. The European Centre for Disease Prevention and Control has stated that “*Special consideration should be given to the current global shortage of COVID-19 vaccines, which could be further worsened by the administration of booster COVID-19 vaccine doses.*”<sup>42</sup> While others, including the U.S. president and his chief infectious disease expert, contend that both boosters for the vulnerable and vaccine equity can be done.

The reality is that large swathes of the global population are yet to receive a single dose of vaccine including in the Asia-Pacific. This not only affects their own vulnerability, but increases the risk of the emergence of new, more virulent strains of the virus affecting others. While most vaccines also protected those vaccinated against severe disease in the case of the Delta variant, this may not be the case with future variants.

APEC Leaders can make it a clear and unambiguous goal to have 40 percent of the Asia-Pacific population vaccinated in every economy by the end of 2021 with 70 percent vaccinated by the first half of 2022. In doing so this would begin a conversation on where in the region help needs to be given and resources directed whether bilaterally, or through multilateral development banks.

The examples in the region demonstrate that highest income levels are not a necessary pre-determinant of successful vaccination campaign and are worth of further analysis.

### **Protocols to Facilitate the Safe Movement of Supply Chain Workers**

Protocols to facilitate the safe movement of people – starting with those involved in logistics and supply chains was second highest in the list of priorities. While regional and global leaders see the movement of goods as a priority, little has been said about the people that make international trade happen. The patchwork of rules has reached such a crisis point that the International Air Transport Association, the International Chamber of

<sup>40</sup> <https://documents1.worldbank.org/curated/en/179981633527816046/pdf/Managing-Long-COVID-in-East-Asia-and-the-Pacific.pdf>

<sup>41</sup> <https://www.who.int/news-room/feature-stories/detail/the-effects-of-virus-variants-on-covid-19-vaccines>

<sup>42</sup> [https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(21\)00574-0/fulltext](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(21)00574-0/fulltext)

Shipping, and the International Transport Workers' Federation have called on world governments to deal with these issues. They argue that:

- transport workers be given priority to receive WHO recognized vaccines; and
- heads of government work together to create globally harmonized, digital, mutually recognized vaccination certificate and processes for demonstrating health credentials (including vaccination status and COVID-19 test results), which are paramount to ensure transport workers can cross international borders.

The fragmented system of restrictions is bringing the world trading system to a breaking point and severely impacted global supply chain and put at risk the health and wellbeing of the international transport workforce.

The International Maritime Organization and the International Civil Aviation Organization have issued sets of recommendations and protocols that would address specific concerns of authorities for these network industries. While those in the aviation sector are likely to cross borders more often than those in the maritime sector, they both require international frameworks given the nature of the industries. The problems facing the sectors are different but both require international cooperation to solve them.

The cumulative impact of the Suez Canal blockage, Covid-19 related shutdowns means that global transport and trade systems need to be adjusted to ensure the smooth flow of goods and services required for this.

Although the congestion in global shipping cannot be traced to a single cause as discussed earlier, one key issue that must be addressed is the workers in its eco-system. The United Nations has described it as a humanitarian crisis; at the high point as many as 400,000 workers were stranded at sea due to flight cancellations and border closures. But it is also a trade and economic issue with 90 percent of global trade by volume carried at sea and only 15.3 percent of seafarers vaccinated as of August.<sup>43</sup>

Around 63 percent of seafarers come from the Asia-Pacific, many of these come from emerging economies that depend on Covax for vaccines. The United States and Singapore are among APEC economies have recognized this and have taken the initiative to provide vaccinations for foreign sea-crew.<sup>44</sup> Regional processes that have committed to keeping goods flowing such as APEC, ASEAN and the East Asia Summit could support this by putting into practice the IMO's recommendation to:

- Designate professional seafarers and marine personnel as key workers providing an essential service working on vessels are designated as essential workers

The International Chamber of Shipping says that only 55 economies have done so, and this needs to change to keep supply chains running safely and securely. The WHO has named seafarers as one of the groups of transportation workers to be prioritized for COVID-19 vaccination in instances of limited supplies. This would help to prevent the spread of the virus and help to limit closures of ports as discussed above.

While the number of seafarers impacted by travel bans has decreased from 400,000 last year, the emergence of new Covid-19 variants again threatens to leave workers stranded on vessels working beyond 11 months.<sup>45</sup>

APEC needs to respond to this call for action. The agenda is critical to core APEC business – trade. The following items need to be considered:

- Designation of those working in supply chains as essential workers
- Mutual recognition of tests/vaccine certification for transport workers
- Identification of capacity building needs and gaps in implementation of ICAO transport corridors and IMO framework protocols
- Making vaccines available to foreign transport workers by all APEC economies

<sup>43</sup> <https://www.globalmaritimeforum.org/content/2021/08/The-Neptune-Declaration-Crew-Change-Indicator-August-2021.pdf>

<sup>44</sup> <https://www.stb.gov.sg/content/stb/en/media-centre/media-releases/COVID-19-Vaccinations-for-Eligible-Groups-of-Foreign-Sea-Crew-in-Singapore.html>

<sup>45</sup> <https://www.straitstimes.com/world/sos-seafarers-stranded-by-covid-19-threaten-global-supply-lines>

APEC's tried and tested public-private dialogues can help to shed light on specific issues economies, businesses, and stakeholders are facing during these times to minimize frictions in the running of supply chains.

### Common Standards for Travel

Common standards and/or mutual recognition of vaccination passports and test results ranked third in the list of issues for dealing with the ongoing pandemic and its economic consequences.

The standards that authorities are following differ, sometimes tests need to be done 48 hours before departure, sometimes 72 hours. For vaccinated travelers there are questions on whether their vaccine is 'recognized' – even if that recognized and indeed widely used in the destination, it may be that the destination simply does not recognize the authority that has administered the traveler's vaccine.

In short, there is a spaghetti bowl of regulations that travelers face. Even as and when the WHO declares the pandemic officially ended, the likelihood is high that those regulations will still be in place.

Increasingly travel is becoming contingent on proof of status of test results and/or vaccination. Solutions are available, IATA, for example has a travel pass initiative that airlines can join to allow passengers to present proof of health status.<sup>46</sup> The International Chamber of Commerce has developed AOKPass using blockchain technology<sup>47</sup>. The European Union is now using a Digital COVID Certificate.<sup>48</sup>

The risk for the recovery is that sets of regulation become unnecessarily burdensome and lack interoperability. The cost to jobs and the economy is likely to be high, an estimated 62 million jobs in the travel and tourism industry were lost during the pandemic. While economies are beginning to open, unless efforts are made to reduce frictions in the system, significant scarring will occur and those job losses will become permanent.

In the Asia-Pacific individual economies are launching individual initiatives but there is no coherent approach. ASEAN is reported to be discussing a digital vaccine certificate.<sup>49</sup> APEC members have discussed facilitating safe passage and the APEC Business Advisory Council (ABAC) has called for a regionally consistent framework to minimize the cost and complexity of resuming business travel when the Covid-19 situation allows.

### Travel and Tourism

Prior to the pandemic the travel and tourism sector employed 334 million people globally and accounted for around 10 percent of global GDP. In the Asia-Pacific the sector employed 208 million people, in 2020 some 40 million or 20 percent of those jobs were lost according to estimates by the World Trade and Tourism Council.<sup>50</sup> The impact of the of the jobs losses has been uneven across the region with job losses above 30 percent in some economies.

<sup>46</sup> <https://www.iata.org/en/programs/passenger/travel-pass/>

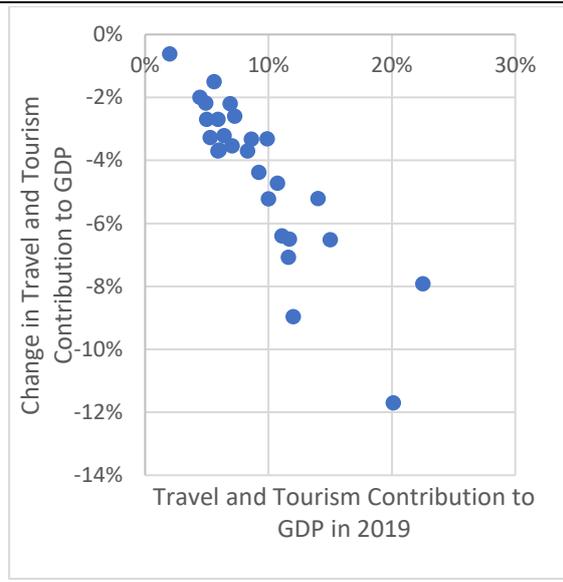
<sup>47</sup> <https://www.aokpass.com/>

<sup>48</sup> [https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/safe-covid-19-vaccines-europeans/eu-digital-covid-certificate\\_en](https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/safe-covid-19-vaccines-europeans/eu-digital-covid-certificate_en)

<sup>49</sup> <https://thediplomat.com/2021/03/asean-readies-regional-covid-19-vaccine-certificate/>

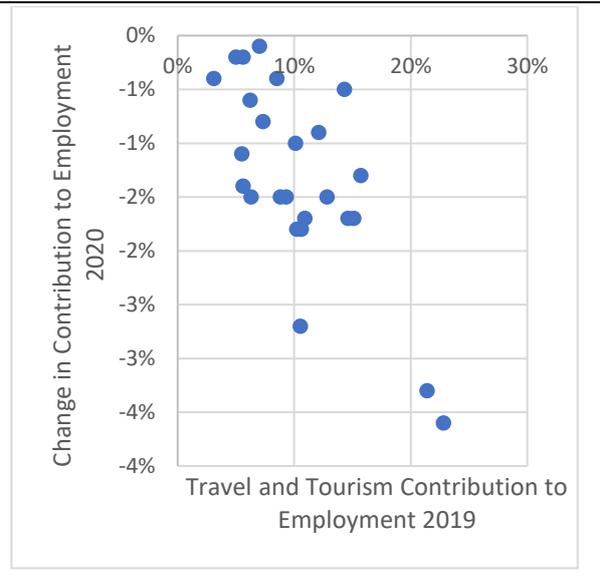
<sup>50</sup> <https://wtcc.org/Research/Economic-Impact>

**Figure 24: Impact of the Pandemic on Travel and Tourism’s Contribution to GDP**



Source: World Travel and Tourism Council

**Figure 25: Impact of the Pandemic on Travel and Tourism’s Contribution to Employment**



Source: World Travel and Tourism Council

The travel and tourism sector contributed around 9 percent to the region’s GDP in 2019, in 2020 this fell to under 5 percent. In 2019 the sector had contributed US\$5.4 trillion to the region’s economic output but in 2020, this fell to US\$2.7 trillion. Figure 24 shows the change in the travel and tourism sector’s contribution to regional economies’ GDP in 2019 and the change in that contribution from 2019 to 2020. Generally speaking the larger the sector the bigger the fall has been among regional economies although there have been significant differences. This may be due to larger for example, domestic tourism. Figure 25 shows a similar story for the sector’s contribution to employment although the relationship between the size of the sector and the change is not as large.

The airline sector itself showed some improvement around the second quarter of 2021, with domestic travel rebounding somewhat as some economies began to re-open, however, as with other sectors of the economy, concerns about the spread of the Delta variant have affected the airline sector.<sup>51</sup> The International Air Transport Association expects the sector to continue to make losses through 2021 in spite of the economic recovery through 2021.

More than 40 airlines have filed for bankruptcy including regional airlines such as Virgin Australia, Philippine Airlines, LatAm, Avianca and Aeromexico. While governments have come to the assistance of the airline sector as a result of the crisis, the OECD finds that the type of assistance has varied, but is not likely to change the landscape of ownership immediately. However, governments may find themselves unintended owners of bankrupt air transport companies.<sup>52</sup> Furthermore, consideration needs to be given to the ultimate changes taking place in the competitive landscape of air cargo services that are being driven by technological as well as business model changes.<sup>53</sup>

However, while industry has been able to respond by increasing capacity, finding it is a challenge

*“it also highlights the need for clarity on government plans for a safe industry restart. Understanding how passenger demand could recover will indicate how much belly capacity will be available for air cargo. Being able to efficiently plan that into air cargo operations will be a key element for overall recovery,”*<sup>54</sup>

<sup>51</sup> <https://www.iata.org/en/iata-repository/publications/economic-reports/airlines-financial-monitor-july---august-2021/>

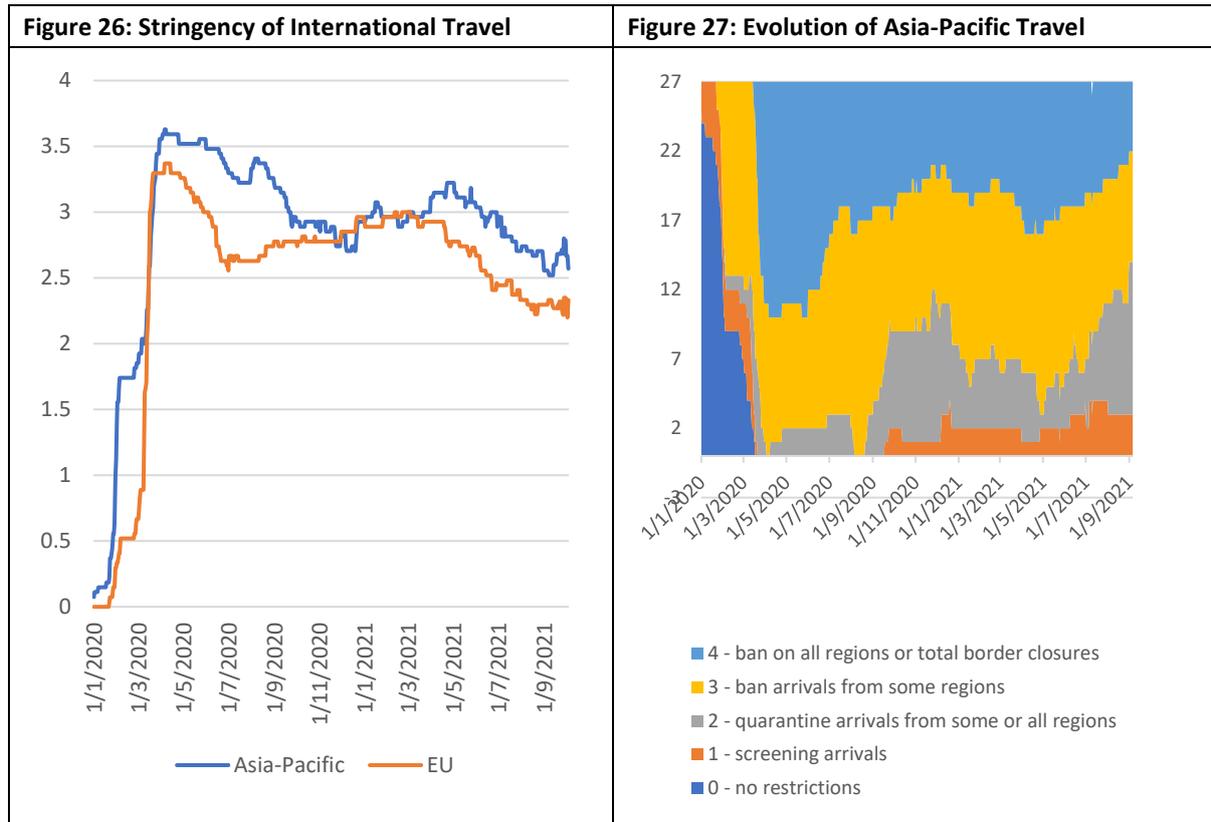
<sup>52</sup> <https://www.oecd.org/corporate/State-Support-to-the-Air-Transport-Sector-Monitoring-Developments-Related-to-the-COVID-19-Crisis.pdf>

<sup>53</sup> Feeling the Pulse of Global Value Chains: Air Cargo and COVID-19, Christopher Findlay, Australian National University, Hein Roelfsema, Utrecht University, Niall Van de Wouw, CLIVE Data Services, the Netherlands

<https://www.eria.org/publications/feeling-the-pulse-of-global-value-chains-air-cargo-and-covid-19/>

<sup>54</sup> According to Willie Walsh, IATA’s Director General <https://www.iata.org/en/pressroom/pr/2021-04-07-01/>

The APEC Policy Support Unit estimates that the GDP losses for the region from lost cross-border movement and unrealised economic activity at US\$1.2 trillion.<sup>55</sup>



Source: Oxford COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford.

Source: Oxford COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford.

Governments across the world are taking different approaches to international policy. The EU is significantly more open in its approach to travel than the Asia-Pacific (Figure 65). Within the region, there are large differences with 40 percent of economies opting to quarantine arrivals from some or all regions, while around 30 percent maintain bans from some regions; and another 20 percent have total border closures. (Figure 27) The rationale for continued restrictions is also questionable, analysis of the impact of closures finds that

*“stringent travel restrictions might have little impact on epidemic dynamics except in countries with low COVID-19 incidence and large numbers of arrivals from other countries, or where epidemics are close to tipping points for exponential growth.”<sup>56</sup>*

On 2 July 2021 the WTO issued “Policy considerations for implementing a risk-based approach to international travel in the context of COVID-19”

- not require proof of COVID-19 vaccination as a mandatory condition for entry to or exit
- consider a risk-based approach to the facilitation of international travel by lifting measures, such as testing and/or quarantine requirements, to individual travellers who:
  - 1) were fully vaccinated, at least two weeks prior to travelling, with COVID-19 vaccines listed by WHO for emergency use or approved by a stringent regulatory authority or
  - 2) have had previous SARS-CoV-2 infection as confirmed by real time RT-PCR (rRTPCR) within the 6 months prior to travelling and are no longer infectious as per WHO’s criteria for releasing COVID-19 patients from isolation. The use of serologic assays is not recommended to prove recovery status given the limitations that are outlined in the scientific brief “COVID-19 natural immunity”.

<sup>55</sup> <https://www.apec.org/Publications/2021/08/Passports-Tickets-and-Face-Masks>  
<sup>56</sup> [https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667\(20\)30263-2/fulltext](https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(20)30263-2/fulltext)

- if testing and/or quarantine requirements are lifted for travellers who meet the abovementioned criteria, offer alternatives to travel for individuals who are unvaccinated or do not have proof of past infection, such as through the use of negative rRT-PCR tests, or antigen detection rapid diagnostic tests (Ag-RDTs) that are listed by WHO for emergency use or approved by other stringent regulatory authorities
- consider recording proof of COVID-19 vaccination in the International Certificate of Vaccination or Prophylaxis (ICVP), as stated in the WHO interim position paper: considerations regarding proof of COVID-19 vaccination for international travellers. Authorities may also use other certificates of COVID-19 health status, some in digital format, as recommended by regional or global intergovernmental bodies. Where digital certificates of “COVID-19 status” are used, interoperable solutions should be sought to allow for cross-border verification

A review of those economies that are opening up shows that governments are however, asking for proof of vaccination as a condition for entry.<sup>57</sup>

The World Committee on Tourism Ethics, an independent advisory body of the General Assembly of the UN World Tourism Organization has issued recommendations for COVID-19 Certificates for International Travel which state that:

1. The certificate should be a unique document, containing information on the vaccination status, and/or diagnostic (molecular, PCR and antigen) and/or information about recovery status;
2. The certificate should be limited in duration and its use should be discontinued as soon as the World Health Organization no longer considers COVID-19 a Public Health Emergency of International Concern (PHEIC);
3. The certificate should be used primarily for international mobility;
4. For a maximum accessibility, the certificate should be available both in digital and paper format;
5. The certificate must ensure, in both formats, data protection and security, as well as the privacy of the holder. Said certificate must also provide a guarantee of authenticity to avoid fraud and misuses;
6. The certificate should be free of charge; international cooperation and governments should ensure the population’s wide access to free vaccines and affordable tests;
7. The provision of vaccines and related certificates at destination countries should not form part of package tours or other similar products nor should such initiatives be supported by governments

Even within those groupings there are differences, for example, some require proof of vaccination and/or test results, the duration of quarantine varies from 7-14 days, and the justification for travel varies – ie business travel is sometimes permitted. This begs the question of what types of test or vaccination proof would be accepted by immigration authorities and then which vaccinations would be recognized?

This is leading to substantial difficulties for authorities that have begun the process of opening up. For example, some economies have opened to vaccinated travellers from some economies but not to others who have received substantially the same vaccines. While the EU has developed its Digital Covid Certificate, the African Union has developed an online portal as well as a mobile application to facilitate cross-border travel and inform the public on regulation changes with several members joining the initiative.<sup>58</sup>

The Covid-19 experience underscores the need for a holistic understanding of the connectivity eco-system that underpins global trade. While UNCTAD produces an annual review of the Maritime Transport, no organization provides such a review of the air cargo sector.

The mid-term review of the APEC Connectivity Blueprint showed that the region’s average score for the perceived quality of air transport infrastructure showed a decline over the 2014-2017 period, while research by IATA estimates that a 1% improvement in air cargo connectivity translates to a 6.3% increase in trade.<sup>59</sup> Given the likely long-term trend towards high-volume low-value shipments via air, and as well as considerations of at least a medium-term term towards higher prices in shipment due to less belly capacity due to fewer tourists, the sector is likely in for a shakeout. These have been limited to Europe and North America but fast-growing

<sup>57</sup> <https://www.iatatravelcentre.com/world.php>

<sup>58</sup> <https://www.covidpasscertificate.com/africa-covid-passports/>

<sup>59</sup> <https://www.apec.org/Publications/2020/11/APEC-Connectivity-Blueprint---The-2020-Mid-Term-Review>

consumer markets in Asia and South America where growth of digital trade alternatives is rapid are not likely to be far behind. Amazon Air flights increased from just 85 daily flights in May 2020 to 140 a day in February 2021.<sup>60</sup>

Echoing the connection between travel restrictions and trade costs, the OECD estimates average increase in trade costs of services is 12 percent. However, these vary by economy and sector. Repealing the restrictive measures introduced to address the current sanitary crisis, as conditions permit, will therefore be an important consideration in promoting sustainable economic recovery. They find that remote work can reduce costs by 3.5 percent in some sectors – but it has no impact in sectors that require travel such as the transport sectors.

While some regions have begun to restore flights, the Asia-Pacific largely lags behind lacking any mechanism for mutual recognition of test results or vaccinations. This leaves it extremely costly as well as confusing for travellers who confront ever changing sets of rules for international travel.

APEC's long experience in regulatory cooperation, working on standards to facilitate interoperability between different regimes must be mobilised. While economies are at different stages with respect to the pandemic, the risk is that divergent policies will introduce an entirely new set of barriers to connectivity and trade. The region risks an imbalanced recovery if these issues are not dealt with. Unless APEC members work together to ensure that new regulatory systems are interoperable, new costs will be added to trade and people movement undoing decades of work.

#### **Donations of vaccines to developing economies through Covax**

Donations of vaccines to developing economies through the Covid-19 Vaccines Global Access (Covax) was 4<sup>th</sup> in the list of priorities. Although it ranked 2<sup>nd</sup> in the list of priorities for respondents from emerging economies. Coordinated by Gavi, the Vaccine Alliance, the Coalition for Epidemic Preparedness Innovations (CEPI), and the World Health Organization (WHO), Covax was intended to provide a mechanism to reduce the cost of vaccines for all. The system (and governments) have come under considerable criticisms with many economies bypassing Covax entering bilateral deals.<sup>61</sup> That said, it still provides millions of vaccines to those who cannot afford and provides a clearing mechanism for assistance.

#### **Mechanisms to enhance visibility on input supplies for Covid-19 vaccines**

Overall 64 percent of respondents thought that it was either important or very important to have mechanisms that enhance visibility on input supplies for Covid-19 vaccines. PECC's Special Report on Covid-19 last year had recommended a system modelled on the G20 Agricultural Market Information System to create greater visibility on the medical supply chains.<sup>62</sup> Earlier this year, Covax established a Manufacturing Task Force to address bottlenecks in supply chains, one of its immediate goals (1-3 months) is to create partnership to enhance visibility on input supplies.

#### **WTO Agreement on Trade and Health**

A group of members have tabled an initiative at the WTO that would commit members to:

- review and promptly eliminate unnecessary existing restrictions on exports of essential medical goods necessary to combat the COVID-19 pandemic; and
- exercise restraint in the imposition of any new export restrictions, including export taxes, on essential medical goods and on any prospective vaccine or vaccine materials.<sup>63</sup>

Some argue that such an initiative should go beyond trade and include investment to subsidize the full vaccine manufacturing supply chain and especially coordinate expansion of input production capacity.<sup>64</sup> APEC members substantively agreed to the first component and more in their Statement on COVID-19 Vaccine Supply Chains.

<sup>60</sup> <https://las.depaul.edu/centers-and-institutes/chaddick-institute-for-metropolitan-development/research-and-publications/Documents/Amazon%20Air%20Primed%20and%20Positioned%20final.pdf>

<sup>61</sup> [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(21\)01367-2/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)01367-2/fulltext)

<sup>62</sup> <https://www.pecc.org/resources/covid-19/2659-state-of-the-region-report-impact-of-the-covid-19-crisis/file>

<sup>63</sup> <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/Jobs/GC/251R2.pdf&Open=True>

<sup>64</sup> <https://www.piie.com/blogs/trade-and-investment-policy-watch/heres-how-get-billions-covid-19-vaccine-doses-world>

**TRIPS Waiver & Voluntary Licensing Agreements**

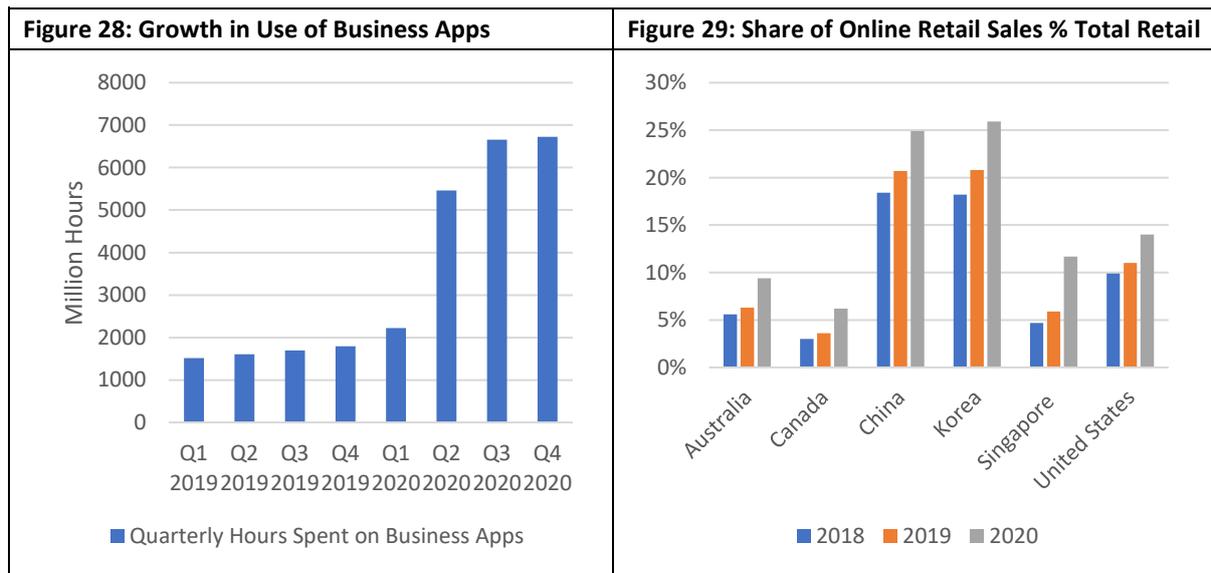
WTO members have been discussing a proposal to waive certain patent obligations under the WTO TRIPS agreement to scale up production of Covid-19 vaccines.<sup>65</sup> There is debate on how meaningful this would be in producing vaccine in new locations.

Another way of scaling up production is through voluntary licensing agreements in which the patent holder voluntarily grants to manufacturing facilities in lower cost manufacturing facilities or through pooling such as the WHO initiative the Covid-19 Technology Access Pool (C-TAP).<sup>66</sup>

Interestingly, voluntary licensing was preferred by respondents from both emerging and advanced economies from the Asia-Pacific, 68 percent of emerging economies respondents thought that voluntary licensing was important or very important compared to 41 percent for the temporary TRIPS waiver. While 49 percent of respondents from advanced economies thought that voluntary licensing agreements were important or very important compared to 28 percent for a temporary TRIPS waiver.

**Digital Economy**

As economies have implemented social distancing policies to stem the spread of the pandemic businesses, schools and governments have accelerated digital adoption plans with estimates showing a 5-8 years’ worth of transformation in the first 2 months of the pandemic. As shown in Figure 28, the number of hours spent on business apps increased exponentially during 2020. In 2019 mobile users were spending an estimated 1.8 billion hours on these apps per quarter, this rose to over 5.5 billion hours during the second quarter of 2020 and by the end of 2020 was at around 6.7 billion hours.



Source: <https://www.appannie.com/en/go/state-of-mobile-2021/>

Source: <https://news.un.org/en/story/2021/05/1091182>

This change in the way people work is expected to be one of the lasting features of the post-Covid reality.<sup>67</sup> Another change to the landscape has been the rapid digitalization of the retail sector. UNCTAD estimates that online retail sales share of total retail jumped in 2020 across all economies from 16 to 19 percent. As seen in Figure 28 the online share is uneven across a select few regional economies where data was available and there is still significant growth to be had.

One of the big benefits of firms going digital is that it opens up global markets to them, analysis of US small businesses on the eBay platform shows that 97 percent of them export compared to only 1 percent of traditional businesses reaching an average of 17 different markets.<sup>68</sup>

<sup>65</sup> <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/IP/C/W669.pdf&Open=True>

<sup>66</sup> <https://www.who.int/initiatives/covid-19-technology-access-pool#:~:text=C%2DTAP%20was%20launched,Technology%20Bank%20and%20Unitaid.>

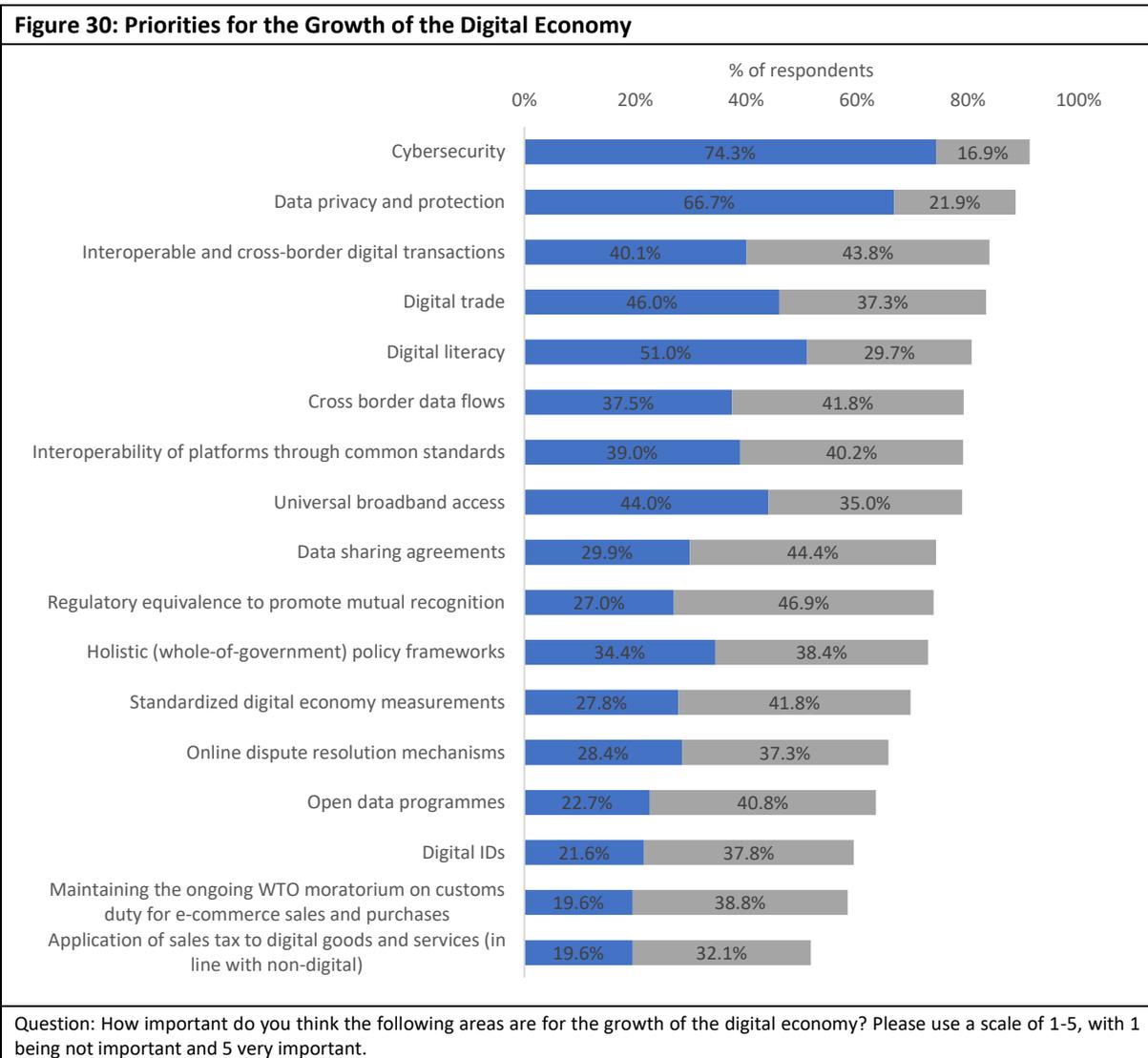
<sup>67</sup> <https://www.apec.org/Publications/2021/05/Managing-the-Long-term-Economic-Effects-of-the-Flexible-Work-Arrangements>

<sup>68</sup> <https://www.ebaymainstreet.com/issues/global-trade>

Estimates of the size of the digital economy range from a low of 4.5 to 15.5 percent of world GDP, while the share of digitally delivered services in total services exports has risen from 45 percent to 52 percent between 2005 and 2019.<sup>69</sup> That share is likely now much higher given the massive increase in digital onboarding that has taken place over the pandemic.

Well before the crisis struck, regional leaders had adopted an Internet and Digital Economy Roadmap to promote cooperation on developing the internet economy and facilitate technological and policy exchanges to bridge the digital divide. The digital economy was recognized as one of the 3 drivers to achieve the Putrajaya Vision.

To get a sense of what the policy community’s priorities were for the growth of the digital we asked respondents for their views on the importance of a range of issues to the growth of the digital economy (Figure 30).



The top issue as measured by the percentage of respondents who thought the issue was either important or very important were:

- Cybersecurity
- Data privacy and protection
- Interoperable and cross-border digital transactions
- Digital trade
- Digital literacy

<sup>69</sup> [https://unctad.org/system/files/official-document/dtstict2020d13\\_en\\_0.pdf](https://unctad.org/system/files/official-document/dtstict2020d13_en_0.pdf)

In a recent report by UNCTAD, UN Secretary General António Guterres said that *“The current fragmented data landscape risks us failing to capture value that could accrue from digital technologies and it may create more space for substantial harms related to privacy breaches, cyberattacks and other risks.”*<sup>70</sup>.

APEC’s Roadmap on the Internet and Digital Economy covers all of these issues, however, there are challenges in making progress on them.

Access issues remain a concern with 79 percent of respondents selecting universal broadband access as important to very important. While broadband access has improved significantly over the years especially in mobile, fixed broadband penetration remains relatively limited at about 19 percent of the population. According to GSMA, a telecoms industry grouping, significant growth in the sector is expected especially with the development of 5G technology. They expect to spend US\$900 billion from 2021-2025 in capital expenditure globally and the internet of things to grow significantly from 13.1 billion connected devices to 24 billion devices.<sup>71</sup> The pace of 5G adoption is expected to vary across with region, in parts of Southeast Asia and Oceania over the next 5 years, 5G is expected to increase from just 1 percent to 12 percent of mobile traffic, while in China, Hong Kong (China), Chinese Taipei and North America around 50 percent.

The Covid-19 crisis has clearly underscored the use case for 5G with users looking to use it to replace fixed broadband, and for video-calling, tv and video services, remote health, shopping and other services. The shift to online activities – including learning, work, shopping, entertainment and social interactions – is evidenced by the sharp growth in internet usage with mobile network traffic up 50% year-on-year during the peak of the pandemic.

In Southeast Asia online consumer expenditure has grown by 60 percent to reach US\$238 and is expected to reach US\$671 by 2026 according to a report by Facebook and Bain and Company. The pattern of online consumption is shifting from streaming and ride-hailing to healthcare, food delivery and grocery shipping. According to the same report, e-wallets are now the preferred payment option for 37 percent of consumers compared to 28 percent who said they still prefer to use cash.

Importantly, security concerns were the top reason why people were reluctant to shift to using online. A rising concern during the pandemic has been escalating cybercrimes -highlighted by the fact that cybersecurity was the top issue for respondents for the growth of the digital economy. While one of the biggest benefits of the digital economy has been its ability to increase inclusion and reduce transactions costs, the downside is cybercrime.

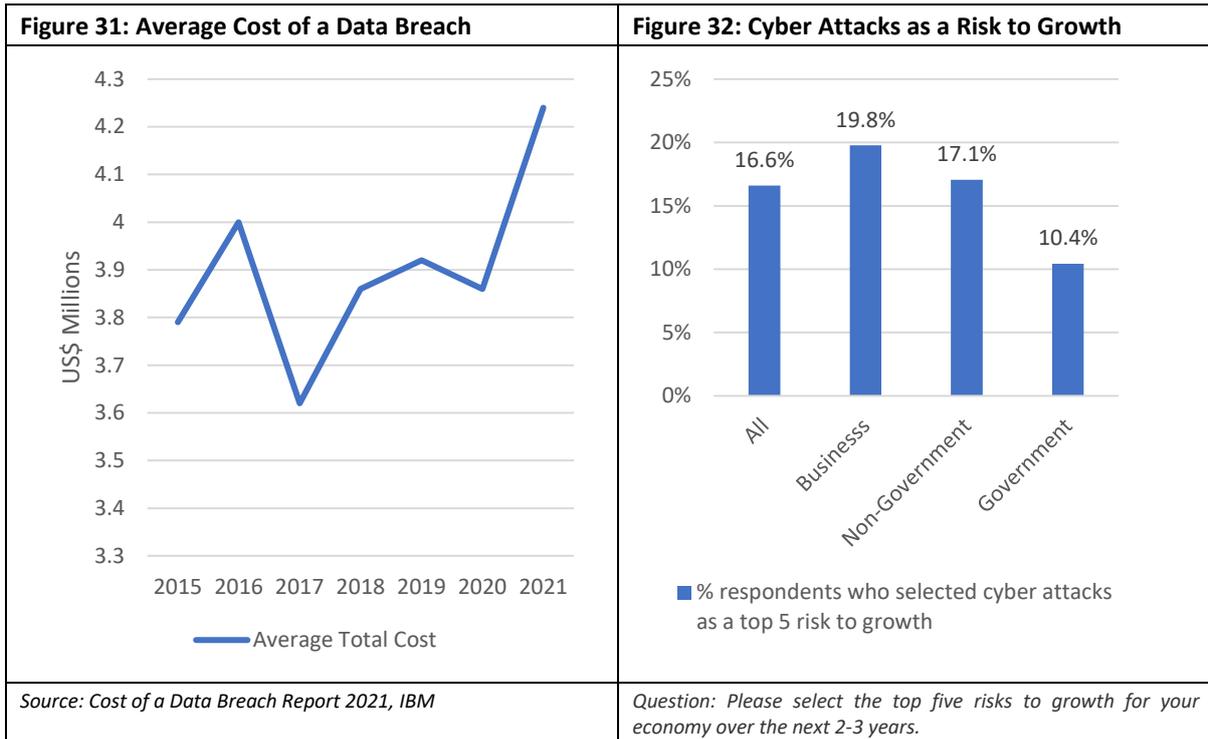
Although it is not a top 5 risk to growth, there were considerable differences among stakeholders on this issue, with 20 percent of business respondents selecting cyber-attacks as a risk to growth compared to just 10 percent of government respondents (Figure 29). This indicates the need for public-private dialogue on this issue to bridge the difference and build a better understanding of how this issue impacts business. Interpol believes that that the trend in cyber-crimes is likely to rise exponentially over the coming years, just as businesses and societies go online so will crime. Cybersecurity experts project the total net cost of cybercrime to grow by 15 percent per year over the next five years, reaching USD 10.5 trillion annually.

Cybercriminals have also taken advantage of the fact that more people accessed the Internet with mobile devices (that are often left unprotected) to enable remote working, shopping and transactions in the wake of COVID-19. This made users vulnerable to becoming targeted because attackers were taking a more customized approach and targeting specific geographical areas, industries and businesses and were also taking advantage of the desire for more COVID-related information.<sup>72</sup>

<sup>70</sup> [https://unctad.org/system/files/official-document/der2021\\_overview\\_en\\_0.pdf](https://unctad.org/system/files/official-document/der2021_overview_en_0.pdf)

<sup>71</sup> [https://www.gsma.com/mobileeconomy/wp-content/uploads/2021/07/GSMA\\_MobileEconomy2021\\_3.pdf](https://www.gsma.com/mobileeconomy/wp-content/uploads/2021/07/GSMA_MobileEconomy2021_3.pdf)

<sup>72</sup> ASEAN CYBERTHREAT ASSESSMENT 2021: KEY CYBERTHREAT TRENDS OUTLOOK, INTERPOL, <https://www.interpol.int/en/News-and-Events/News/2021/INTERPOL-report-charts-top-cyberthreats-in-Southeast-Asia>



IBM estimates that the average cost of a data breach is around US\$4.2 million, however, this varies considerably by industry with costs greater for more regulated sectors like healthcare, energy and financial services. Around 52 percent of data breaches are caused by malicious attacks. (Figure 31)

There have been significant developments in the Asia-Pacific with the entry into force of the Digital Economy Partnership Agreement (DEPA) among Chile, Singapore and New Zealand. The first ‘digital only’ economic agreement among economies that cover a wide set of issues such as SMEs, digital identities, cross border data flows, paperless trade and emerging technologies such as artificial intelligence.

Interestingly the parties to the agreement chose to describe each section as ‘modules’ rather than as chapters unlike traditional trade agreements marking a break from past practice. Article 16.4 of the agreement specifies terms of accession which make it an open agreement – with only agreement of the parties required. On 12 September Korea formally announced its intention to join the agreement,<sup>73</sup> while Canada has been undertaking public consultations on its accession.<sup>74</sup> These moves add considerable weight and momentum to what was initially a small agreement.

ASEAN Economic Ministers at their meeting on 8-9 September endorsed the Bandar Seri Begawan Roadmap: An ASEAN Digital Transformation Agenda to Accelerate ASEAN’s Economic Recovery which includes agreement to study the establishment of an ASEAN Digital Economy Framework Agreement (DEFA) by 2023 and to commence negotiations on the DEFA by 2025.

The Pacific Alliance has also set out a roadmap for its digital agenda with the goal of creating a regional digital market with four pillars: (i) digital economy; (ii) digital connectivity; (iii) digital governments; (iv) digital ecosystems.

With DEPA in place, a potential ASEAN DEFA negotiation, and a Pacific Alliance Digital Market, the question is where APEC can go with its work on the digital economy? PECC’s earlier recommendation was for APEC to prioritise “the urgent development of understandings and consensus leading to development of a unified Asia-Pacific digital market by 2030”<sup>75</sup> as part of its post 2020 work. Such work would prevent the fragmentation of the digital economy one of the key concerns of stakeholders in the region.

<sup>73</sup> <http://www.koreaherald.com/view.php?ud=20210912000089>  
<sup>74</sup> <https://www.international.gc.ca/trade-commerce/consultations/depa-apen/index.aspx?lang=eng>  
<sup>75</sup> <https://pecc.org/resources/publications/regional-cooperation-1/2608-pecc-apec-2020-vision/file>

The cost of the fragmentation of the digital economy are likely to be extremely high. As demonstrated by our survey results, stakeholders are deeply concerned that the growth of the digital economy will be constrained by the lack of interoperability. While initiatives are under way in the Asia-Pacific to develop rules for the digital economy that address issues such as cybersecurity, digital trade, and privacy, they remain largely fragmented – APEC could play a substantial role to bring greater understanding of the different regulatory approaches to this rapidly growing part of the economy and ensure that they adhere to generally accepted principles for trade – transparent, non-discriminatory and least trade restrictive.

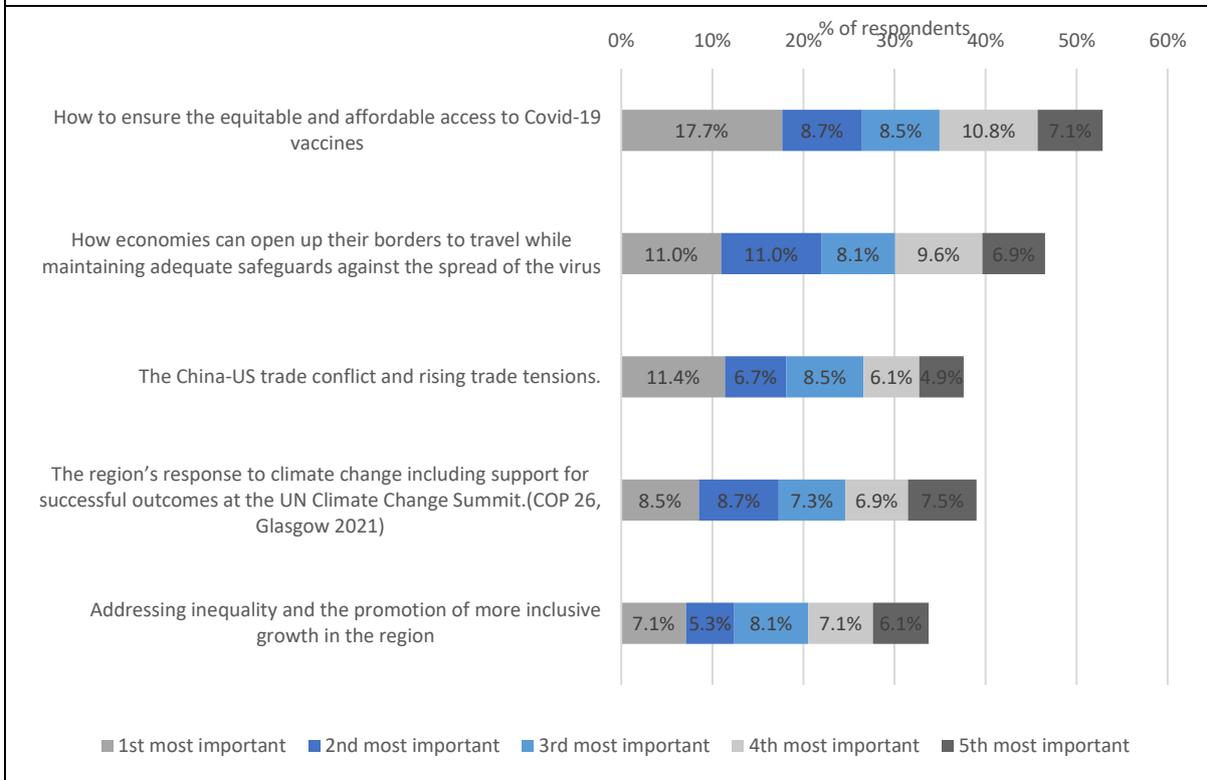
**Priorities for APEC Leaders’ Meeting**

When APEC Leaders gather in November, in addition to dealing with an ongoing pandemic, they will be meeting during a sequence of high-profile international events: the G20 Summit, the UN Climate Change Conference – COP 26, the East Asia Summit and the 12<sup>th</sup> WTO Ministerial Conference.

Pressure will be high for this summitry to deliver meaningful outcomes. For APEC, out of a list of 19 issues and initiatives that included both global issues such as the pandemic, climate change as well as issues specific to the APEC agenda such as an implementation plan of APEC’s post-2020 vision and progress on a Free Trade Area of the Asia-Pacific, the top 5 were (Figure 33):

- How to ensure the equitable and affordable access to Covid-19 vaccines
- How economies can open up their borders to travel while maintaining adequate safeguards against the spread of the virus
- The region’s response to climate change including support for successful outcomes at the UN Climate Change Summit. (COP 26, Glasgow 2021)
- The China-US trade conflict and rising trade tensions.
- Addressing inequality and the promotion of more inclusive growth in the region

**Figure 33: Top 5 Priorities for the APEC Leaders’ Meeting**



Question: What do you think should be the top 5 priorities for APEC Leaders to address at their upcoming meeting in November? Please select ONLY five (5) issues, using a scale of 1-5, please write 1 for the issue you think is most important, 2 for the next most important issue, 3 for the third most important, 4 for the fourth most important and 5 for the fifth most important.

Clearly stakeholders expect leaders to focus on Covid-19 issues – both how to deal with the problem of vaccine inequality as well as how economies can safely open their borders to travel. At the same time there is a strong hope that the Asia-Pacific can deliver meaningful input to global climate change discussions while addressing problems of inclusive growth. Equally there is a view that progress requires cooperation between the region’s two biggest economies the United States and China.

Core APEC issues such as the WTO and multilateral trading system came further down the list of priorities this year, with 20 percent selecting it as a top 5 issue for APEC Leaders to discuss. This underscores the importance of the WTO addressing issues of contemporary importance through an initiative on trade and health. Earlier this year, APEC members agreed to a Statement on COVID-19 Vaccine Supply Chains<sup>76</sup>, at their retreat in July, APEC Leaders agreed to *‘redouble our efforts to expand vaccine manufacture and supply’* and committed to working together to facilitate the flow of goods and services, especially those that most support our health and economic response. While APEC can undertake initiatives such as its Covid-19 Vaccine Supply Chains, working together in the WTO context would undoubtedly solidify APEC’s voluntary initiatives and bring on board the rest of the world.

It would also provide a critical boost to the WTO and multilateral trading system at this important time when its credibility has been severely challenged. The dispute settlement system remains dysfunctional with the lack of an appeals process. Indeed, for many years, the Asia-Pacific policy community had been focused on regional trade agreements as a priority until it became apparent that the WTO was under a severe threat. The lack of an appeals process at the WTO remains a critical issue for the multilateral trade system that requires resolution if a rules-based system is to work effectively. APEC members need to support efforts to find resolutions to these issues as discussed in last year’s report.<sup>77</sup>

While much work has been done this year by APEC officials to formulate an implementation plan for APEC’s post 2020 vision of *‘an open, dynamic, resilient and peaceful Asia-Pacific community by 2040’*, a relatively low 15 percent of respondents thought it should be something discussed by APEC leaders. But the fundamental issues that the plan addresses – the achievement of an Asia-Pacific Community, inclusion and climate change were very much high on the list of priorities. In short, the expectation seems to be that Leaders should discuss the underlying issues rather than the plan itself.

**Diverging Views of Stakeholders**

An important part of the Putrajaya Vision is the continuous improvement of APEC as an institution through good governance and stakeholder engagements. PECC’s State of the Region survey is a multistakeholder survey. While we see relatively strong alignment of priorities on the regional agenda there were some significant differences that point to areas where there needs to be greater dialogue.

GOVERNMENT	BUSINESS	NON-GOVERNMENT
How to ensure the equitable and affordable access to Covid-19 vaccines	The China-US trade conflict and rising trade tensions.	How to ensure the equitable and affordable access to Covid-19 vaccines
How economies can open up their borders to travel while maintaining adequate safeguards against the spread of the virus	How economies can open up their borders to travel while maintaining adequate safeguards against the spread of the virus	How economies can open up their borders to travel while maintaining adequate safeguards against the spread of the virus
Addressing inequality and the promotion of more inclusive growth in the region	How to ensure the equitable and affordable access to Covid-19 vaccines	The region’s response to climate change including support for successful outcomes at the UN Climate Change Summit. (COP 26, Glasgow 2021)
The region’s response to climate change including support for successful outcomes at the UN Climate Change Summit. (COP 26, Glasgow 2021)	The region’s response to climate change including support for successful outcomes at the UN Climate Change Summit. (COP 26, Glasgow 2021)	Addressing inequality and the promotion of more inclusive growth in the region
The China-US trade conflict and rising trade tensions.	The region’s progress towards its goals on freer trade and investment and a Free Trade Area of the Asia-Pacific (FTAAP)	The China-US trade conflict and rising trade tensions.

<sup>76</sup> [https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Trade/2021\\_MRT/Annex-1](https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Trade/2021_MRT/Annex-1)  
<sup>77</sup> <https://www.pecc.org/resources/regional-cooperation/2661-state-of-the-region-report-2020/file>

For example, government and non-government stakeholders had the equitable and affordable access to Covid-19 vaccines as the top priority but businesses were most concerned about the US-China trade conflict and rising trade tensions.

Interestingly, stakeholders converged on what the 2<sup>nd</sup> most important priority for APEC priority leaders' discussions should be - how economies can safely open up their borders to travel. This echoed earlier findings in the survey on actions to take in response to Covid-19. This seems to be an issue of major concern to the Asia-Pacific policy community.

The only issue that was not a common priority between business stakeholders and government and non-government stakeholders was '*addressing inequality and the promotion of more inclusive growth in the region.*' Instead, businesses had the region's progress on freer trade and progress on the Free Trade Area of the Asia-Pacific as a top 5 priority. Progress on the freer trade for the region was the 7<sup>th</sup> highest priority for both government and non-government respondents alike.

Conversely addressing inequality was only the 9<sup>th</sup> highest priority for business stakeholders. While APEC has long had inclusive growth as part of its objectives, and adopted an Action Agenda on Advancing Economic, Financial and Social Inclusion in 2017, there needs to be a greater alignment and engagement with stakeholders on this issue for substantial progress to be made. For example, PECC's post-2020 task force report highlighted the falling labor share of aggregate income and that wages and living standards of low-skilled and lower middle-class workers have been lagging behind productivity increases. These are issues that can only be addressed in dialogue with businesses and other stakeholders.

#### **Progress on a Free Trade Area of the Asia-Pacific**

While looking ahead to business concerns on freer trade and investment and a Free Trade Area of the Asia-Pacific, significant progress is being made in the identified pathways including the CPTPP and the RCEP. While expansion of the CPTPP will be an issue for its members to decide, APEC can provide a useful platform for further dialogue on issues related to the expansion and indeed updating of the agreements.

#### **Regional Comprehensive Economic Partnership**

The world's largest economic trade agreement by GDP was agreed at the end of 2020 will enter into force once at least 6 ASEAN members have deposited their instruments of ratification and 3 non-ASEAN members. Of the non-ASEAN members, China and Japan have already ratified, from ASEAN, Singapore and Thailand have ratified. Once the agreement enters into force, it will be open to accession 18 months after. Hong Kong, China has already indicated its interest in joining RCEP, India which had been a party to the negotiations before withdrawing might be another possible candidate.

#### **Comprehensive and Progressive Agreement for Trans-Pacific Partnership**

The CPTPP was agreed in 2018 and entered into force on 30 December 2018 among 7 of its 11 members: Australia; Canada; Japan; Mexico; New Zealand; Singapore and Vietnam. Peru ratified the agreement on 14 July 2021, becoming the 8th member. Brunei Darussalam, Chile, Malaysia are yet to ratify.

The CPTPP members agreed to start negotiations with the United Kingdom to join the agreement. In addition, several other regional economies have indicated their interest in joining, Colombia, Indonesia, Korea, and the Philippines have all indicated their interest at some point, while Chinese Taipei and China have applied to join.

The Australian Parliament has been holding hearings on the expansion of the CPTPP which provides an interesting insight into various perspectives on how the grouping might expand. For example, the UK's submission said that its admission would transform the CPTPP into a "truly global framework". While the China's submission emphasized the reforms it has been undertaking as well as the evolution in its regional trade agreements that have begun to include competition; environment; ecommerce chapters for example. China's membership of the CPTPP would be a significant step towards an eventual FTAAP given it is also a member of RCEP as well as its weight in the regional economy.

Another question remains whether the United States might chose to re-engage in the CPTPP after it withdrew in 2017. If the United States and China were to engage in discussions to part of the CPTPP it might address the top concern of businesses in the region over rising US-China trade conflicts. While risking placing the relationship

in a trade negotiation context which are adversarial by nature, modern trade agreements are supposed to be more ‘partnerships’ and may provide space for working through issues that have proven otherwise thorny. APEC provides a venue for initiating dialogue on issues in a non-binding venue.

### **US-China Trade Relations**

That business respondents had the US-China trade conflict as their top priority and it was the 3<sup>rd</sup> highest priority overall was a significant finding. As a process, APEC allows member economies to move beyond their bilateral issues and work on issues of common interest. Many of these have been broadly identified in statements such as the Putrajaya Vision. China’s application to the CPTPP should be seen in a positive light given that the trade agreement covers many of the issues that have been issues in the relationship, has a well-defined accession process and dispute settlement mechanism.<sup>78</sup> Furthermore, estimates suggest that the economic cost to the world of the US-China trade conflict would be reduction in global welfare of around US\$500 billion to baseline global GDP – costs that the world can ill afford as it tries to find ways of recovering from the worst recession in 75 years.<sup>79</sup>

### **Pacific Alliance**

The Pacific Alliance among Mexico, Chile, Colombia and Peru is another grouping gaining momentum. Celebrating its 10<sup>th</sup> anniversary, has a broad agenda for cooperation with ASEAN but has also been negotiating ‘associate membership’ – effectively trade agreements with Australia, Canada, New Zealand and Singapore. Last July the negotiations with Singapore were concluded.<sup>80</sup>

How all of these trade deals might evolve into an eventual Free Trade Area of the Asia-Pacific is an issue that the regional policy community has grappled with for almost 20 years. At first it was seen as a Plan B to the ongoing WTO Doha Round negotiations as well as a way to minimize the trade costs emerging from the spaghetti bowl of bilateral trade deals in the region. Some progress has been made through consolidation in the RCEP and CPTPP. The RCEP in particular covered important relationships among China, Japan and Korea – an achievement that it is often not given credit for.

### ***Towards Inclusive and Sustainable Strong, Balanced, Secure, Sustainable and Inclusive Growth***

Moving ahead to keep the vision of an Asia-Pacific community, the engagement of all APEC members in the process will be critical. The current state of the region remains contingent on how economies deal with the ongoing Covid-19 pandemic. It is interesting, perhaps revealing that stakeholders chose to focus on conceptual issues as priorities for APEC leaders to address during their upcoming discussions rather than instrumentalities. Focusing on the ‘end’ rather than on the means to the end is the most useful way to think about the agenda for Asia-Pacific cooperation.

Clearly the priority at this moment is dealing with the ongoing pandemic – as stakeholders see a balanced and inclusive recovery needs to involve the safe opening of borders. There may be several reasons for this – the contribution that the travel and tourism sector makes to jobs and the economy; and the connections between the travel eco-system and efficient supply chains and rising prices. The pre-requisite is the equitable and affordable distribution of vaccines.

Looking beyond these immediate issues the expectation from stakeholders that growth moving ahead must be different and the Asia-Pacific should be taking a lead when it comes to global issues. That the region is expected to make a contribution to successful outcomes at the UN Climate Change Summit and addressing inequality is indicates a need for coherence, one cannot be achieved at the expense of the other.

<sup>78</sup> <https://www.piie.com/research/piie-charts/joining-cptpp-long-process-and-needs-consensus-among-existing-members>

<sup>79</sup> [https://www.eaerweb.org/selectArticleInfo.do?article\\_a\\_no=JE0001\\_2021\\_v25n3\\_233&ano=JE0001\\_2021\\_v25n3\\_233#none](https://www.eaerweb.org/selectArticleInfo.do?article_a_no=JE0001_2021_v25n3_233&ano=JE0001_2021_v25n3_233#none)

<sup>80</sup> <https://www.mti.gov.sg/-/media/MTI/Newsroom/Press-Releases/2021/07/Negotiations-for-the-Pacific-Alliance-Singapore-Free-Trade-Agreement-Concludes.pdf>

# CHAPTER 2

## CLIMATE CHANGE: FROM AMBITION TO ACTION



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# CHAPTER 2:

## CLIMATE CHANGE: FROM AMBITION TO ACTION

*Contributed by Dr Tilak K. Doshi, Managing Director, Doshi Consulting*

### 1. Executive Summary

Under the Paris Agreement, the 194 Parties to the United Nations Framework Convention on Climate Change (UNFCCC) committed to shifting the world's course towards “sustainable development” and “holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.”

Parties to the upcoming UNFCCC COP26 summit in November have committed to a range of GHG emission reduction targets. National Determined Commitments (NDCs) presented by Parties included absolute reductions of emissions from a base year, reductions from a hypothetical “business as usual” (BAU) trajectory over the 2020 – 2030 period or reductions in emissions intensity per unit of GDP and “other policies and measures”. The most common emission reduction target (43%) was that expressed as a planned reduction from a projected “business as usual” outcome. Absolute emission reductions relative to a base or reference year or absolute quantified reductions without reference to any base year was the next most popular (35%). Just over a fifth of all NDCs chose other types of targets including reductions in emission intensity, target dates for planned peak emissions, and a range of other policies and measures or a combination of these.

Promoting renewable energy generation were most frequently mentioned by Parties, followed by measures for energy efficiency improvement. Almost all Parties outlined mitigation targets in specific priority areas, such as energy supply, transport, buildings, industry, agriculture, LULUCF and waste. In comparison with previous NDCs, new or updated NDCs communicated an increased focus on adaptation planning. Adaptation priorities for most Parties, according to the NDCs, focus on food security and production; terrestrial and wetland ecosystems; human health; freshwater resources; key economic sectors and services; disaster risk management and early warning; human habitats and urban areas; coastal areas and sea level rise; ocean ecosystems; and livelihoods and poverty.

Most NDCs indicated support for renewable sources, particularly for solar and wind technologies, in the electricity sector; promotion of electric vehicles in the road transport sector; and enhancement of energy efficiency across the industry, residential and other sectors. NDCs commonly identified markets and market-based incentives (MBIs) such as emission taxes or “cap-and-trade” of emission certificates as a means of efficient decarbonization by putting a price on emissions.

Turning to actual government climate-related expenditures over the past several years (2011 – 2018), the most striking feature is the overwhelming amount spent on just two renewable technologies -- solar and wind energy. The other striking feature of the spending pattern is that climate adaptation only accounts for 5% of total government climate-related expenditure. Empirical evidence suggests that by overemphasizing climate mitigation efforts, the UNFCCC and COP agreements such as the Kyoto Protocol and the Paris Agreement have led to a bias against investment in climate adaptation. This suggests the importance of policy cooperation among APEC member economies designed to bring about greater attention to climate adaptation efforts.

Advanced APEC member economies such as Australia, Japan, New Zealand and the US have had relatively rapid growth in renewable energy as a share of total power generation which is in excess of the world average in 2020. Some developing APEC members such as Mexico, Chile, Malaysia, Thailand, and Vietnam exhibited extremely high rates of growth in both wind and solar power generation, significantly in excess of the global average growth rate in 2019 due mainly to the small base that renewable energy had in total power demand in 2018. Over the decade, despite the high percentage increase in renewable power generation in the developing APEC member economies, incremental power demand was overwhelmingly met by fossil fuels (in excess of 80%). Meeting the development and poverty alleviation objectives of these economies - where per capita electricity consumption

rates are low and universal access to grid electricity is still lacking -- are policy priorities that are not likely to be compromised at the negotiations at COP26.

In formulating and implementing regulations to promote energy efficiency initiatives, it is critical that all such new regulations meet the tests of unbiased cost-benefit analysis. The guiding principle to policy interventions is that they must improve societal welfare. Many economies and multilateral organizations such as the Organization for Economic Co-operation and Development (OECD) and APEC have developed best practice regulatory guides. These guides highlight similar key themes: the need to clearly define the policy problem and the rationale for government intervention; consideration of a range of policy options, including a do-nothing approach; and assessing the full range of social costs and benefits of the proposed policy options.

Many APEC member economies have adopted policies such as subsidies for electric vehicles (EVs), higher taxes for fuels such as gasoline and diesel, taxes on internal combustion engine (ICE) vehicles, tax-payer funded charging stations and other policies to encourage electric vehicles (EVs). There is currently much optimism about the prospects for EVs to replace ICE vehicles in passenger transport. However, there are also more skeptical views that suggest the disadvantages of EVs such as limited driving range, long charging times and high costs will limit the uptake of EVs. If EVs constituted a significant percentage of the global vehicle fleet from its very low levels now (less than 1%), research suggests that the demand for the many mineral commodities and rare earths would reach untenable levels. Cooperation among APEC member economies to ensure transparent and adequate standards for human and labor rights and local environmental pollution controls to handle the mining and processing of such minerals and rare earths will be crucial.

The implementation of carbon capture and storage or sequestration (CCS) technology to mitigate CO<sub>2</sub> emissions has much appeal. However, the technology for CCS is far from demonstrated commercially and there exist few projects in the world today. While the technology to achieve carbon capture and storage exists, the economics are proving prohibitive. The key hurdle is the 15–30% of energy that is consumed to capture CO<sub>2</sub> from the power plants. Best practice methods from economies such as the US which has extensive experience in enhanced oil recovery using injected CO<sub>2</sub> may well prove beneficial to other oil and gas producers in APEC who have the requisite geology and upstream oil and gas activity.

International enthusiasm for the “hydrogen economy” to mitigate CO<sub>2</sub> emissions is very high and APEC member economies such as Japan and the US are leaders in R&D investments in this area. However, extracting, transporting, and using hydrogen to reduce carbon emissions costs more than the human welfare benefits predicted to accrue in the long run future. Early projects carried out by Japan to import blue and green hydrogen from the Middle East will provide its fellow APEC member economies data on the safety and economic viability of utilizing hydrogen in various end-use sectors to replace fossil fuels.

Increased ambition expected of Parties under the Paris Agreement at COP26 lies in the implementation of Article 6 of the agreement which calls for “voluntary cooperation” among Parties. Article 6 could also establish a policy foundation for international emissions trading systems, which could help lead to regional and global prices on carbon. Joint implementation of projects between advanced and emerging economies would offer the benefits of lowering costs of emission reduction since it is typically cheaper to curb emissions in emerging. It would also lead to technology transfer and financing opportunities for the developing economies that lag behind on decarbonization. Carbon market mechanisms can allow businesses to trade both carbon credits and carbon offsets within economies and across borders.

It is well established that market-based instruments have more positive effects on firm productivity than discretionary “command-and-control” mechanisms. MBIs to promote carbon pricing in the transition to low-carbon energy systems provide firms with more flexibility in meeting low-carbon goals than non-MBI approaches. Climate change policies via MBIs promote productivity gains across the economy as least productive firms drop out. The conventional role for government in skills development and re-deployment, providing information on newer technologies as a public good, improving access to finance for SMEs based on durable and credible carbon-pricing policies cannot be over-emphasized.

As of early 2021, there were 64 carbon pricing initiatives. The share of global emissions under carbon pricing is 21.5%. The carbon prices in these different initiatives range widely, from less than \$1/tCO<sub>2</sub>e to over \$130/tCO<sub>2</sub>e although in most cases carbon prices are relatively modest. Less than 4% of global emissions are covered by a

carbon price at or above the range US\$40 - 80/tCO<sub>2</sub>e – the range which the World Bank suggests is needed in 2020 and \$50 – 100/tCO<sub>2</sub>e by 2030 to meet the 2°C temperature goal of the Paris Agreement. There is evidence of a growing engagement by private businesses in carbon pricing. The corporate sector is increasingly using internal benchmark carbon prices as a tool for business decision making and to identify low-carbon investment opportunities.

While participation by the private sector in using internal carbon prices to guide investments is important to promote low-carbon energy transitions, the context in which private sector participation is successful depends on government policy stability and long-term credibility. APEC member economies could play a lead role in carbon pricing by establishing region-wide carbon markets to promote emission mitigation in a market-friendly manner. Indeed, the group could do much to advocate market-based instruments over discretionary regulations and policies to achieve emission mitigation objectives in a more cost-effective manner.

There are two other dimensions regarding private sector investments in carbon emission commitments. First, many firms have made public commitments to account for their emission profiles, including those from “scopes 1, 2 and (partially) 3” which is discussed in Section 3c. Secondly, firms are under increasing oversight and pressure by financial intermediaries such as private banks and hedge funds but also by Central Banks and multilateral development and financial institutions such as the World Bank and the IMF (discussed in Section 4d and 4e).

APEC member economies could do well to liaise and adopt compatible carbon market initiatives that allow for carbon credits and offsets to support fungibility and liquidity. Aligning different carbon pricing systems once they are operational is difficult. Different carbon pricing systems and governance institutions may become too deeply entrenched for easy harmonization of rules to be achievable. In this context, the concept of carbon emission trading hubs might provide a more promising approach than “top-down” multi-lateral harmonization agreements. Regional markets with a wide range of heterogeneous economies at various stages of development, such as the APEC region, would improve the efficiency and liquidity of trade in carbon certificates. Trading hubs in financial and trading centers such as Hong Kong (China) and Singapore would help in the development of regional voluntary carbon markets. These hubs would traverse the developed economies such as Australia, Canada and Australia as well as the largest developing Asian economies with low per capita emissions such as India, Indonesia and Vietnam.

Among the most important policy concerns challenging the introduction of carbon pricing around the world is the issue of “carbon leakage”. Carbon leakage occurs when differences in emission regulations across jurisdictions can lead to re-location of carbon-intensive industries away from those jurisdictions which have tighter restrictions on carbon emissions and towards those that have either laxer or non-existent emission regulations. Carbon leakage will doubtless also be a central issue at the UN’s 26th Conference of Parties (COP26) when it meets in November. Carbon trade tariffs are being proposed in a number of legislative and political forums as a means to mitigate competitiveness concerns and carbon leakage, and to help encourage jurisdictions with laxer emission regulations to adopt higher mitigation standards for energy-intensive exports. The actual design details of any particular carbon border adjustment mechanism (CBAM) legislation will determine whether such unilateral moves are WTO-compliant. The WTO arbitration and appeals process may not be able to resolve trade complaints promptly and in good order. The threat of tit-for-tat reprisals and the imposition of further trade barriers by those outside any “climate club” holds serious consequences for the outlook of the multilateral rules-based trading system. APEC member economies could constructively strive for a cooperative outcome that avoids such threats to free trade and reciprocity norms under the aegis of the WTO.

Estimates for “green finance” requirements vary widely and the investments required to support “transition” of the global energy system are immense. An agreement on climate change finance is now viewed as critical to the success of the upcoming COP26 conference to be held in Glasgow in November 2021 and the financing gap remains a key obstacle to the success of the talks.

There is a large literature on what has been broadly termed “green finance”, the respective roles and importance of public and private sectors, and the variety of financial instruments deployed. However, there is no precise and commonly accepted definition of the term. Most green finance portfolios tend to emphasize mitigation despite a recognized need to increase adaptation finance. Of the \$78.9 billion in climate finance transferred by

high income economies in 2018, only 21% was spent on adaptation. APEC member economies could play a strong and positive role as a group in supporting adaptation finance at the COP26 summit.

The lack of clear criteria in the classification of the activities underlying green finance and comparability across economic sectors, industries and projects increases the uncertainty associated with financing investment decisions and distorts or obviates clear policy signals. There is a critical need for harmonization of green finance standards to lower transaction costs, enhance the efficiency of financing investments which support seamless investment flows across jurisdictions, and support member economies' climate mitigation and adaptation policies and projects. APEC member economies which overwhelmingly support SDG goals could play a role in promoting harmonized green finance standards and definitions.

The empirical evidence provides little support to suggest that ESG ratings provide adequate measures of "green finance" for climate change mitigation and adaptation efforts. APEC regional economies can play a crucial role in ensuring that ESG investments lead to real initiatives in emission mitigation and climate adaptation efforts.

The publicly articulated positions of key players from both developed and developing economies are widely divergent and fraught with tensions over a host of unresolved issues. Only eight of the G20 members have submitted significantly more ambitious climate targets. Australia, Brazil, China, India, Saudi Arabia, South Africa, and Russia, have yet to do so. The BASIC bloc of leading developing economies which comprise Brazil, South Africa, India, and China, have argued consistently that industrialized economies were able to get wealthy before carbon emission reductions were called for and that developing economies cannot be expected to make sacrifices that would put their legitimate aspirations for economic development at risk.

The largest emitters among the developing economies have signaled that the achievement of their targets has conditional elements which include access to enhanced financial resources, technology transfer and technical cooperation, and capacity-building support. The prospects for trade tariffs being imposed on developing economies' exports of energy-intensive goods by the EU, US and other developed economies are also of great concern to many economies that may be outside of a putative "climate club".

The vast difference in per capita CO2 emissions between developed economies such as Australia, Canada and the US which stand at over 15 tons and those of developing economies such as India, Indonesia, Mexico, the Philippines, Thailand and Vietnam at the other end of the spectrum at less than 3 tons (i.e. lower by a factor of five) suggest that the call for all economies to reduce emissions at COP26 will be received with much reservation regarding equity and historical responsibility. In the wake of debilitating economic lockdowns with the covid pandemic, the key policy challenges for many developing economies lie less with concerns about increasing CO2 emissions caused by economic growth than with re-invigorating economic growth in the first place so that the objectives of poverty alleviation and meeting popular aspirations for better standards of living are not compromised. It would be appropriate for APEC member economies to propose climate mitigation and adaptation policies and measures at COP26 which are consistent with the rapid resumption of economic growth and free trade to meet broadly-shared development and environmental goals.

## 2. Paris Agreement: Nationally Determined Commitments

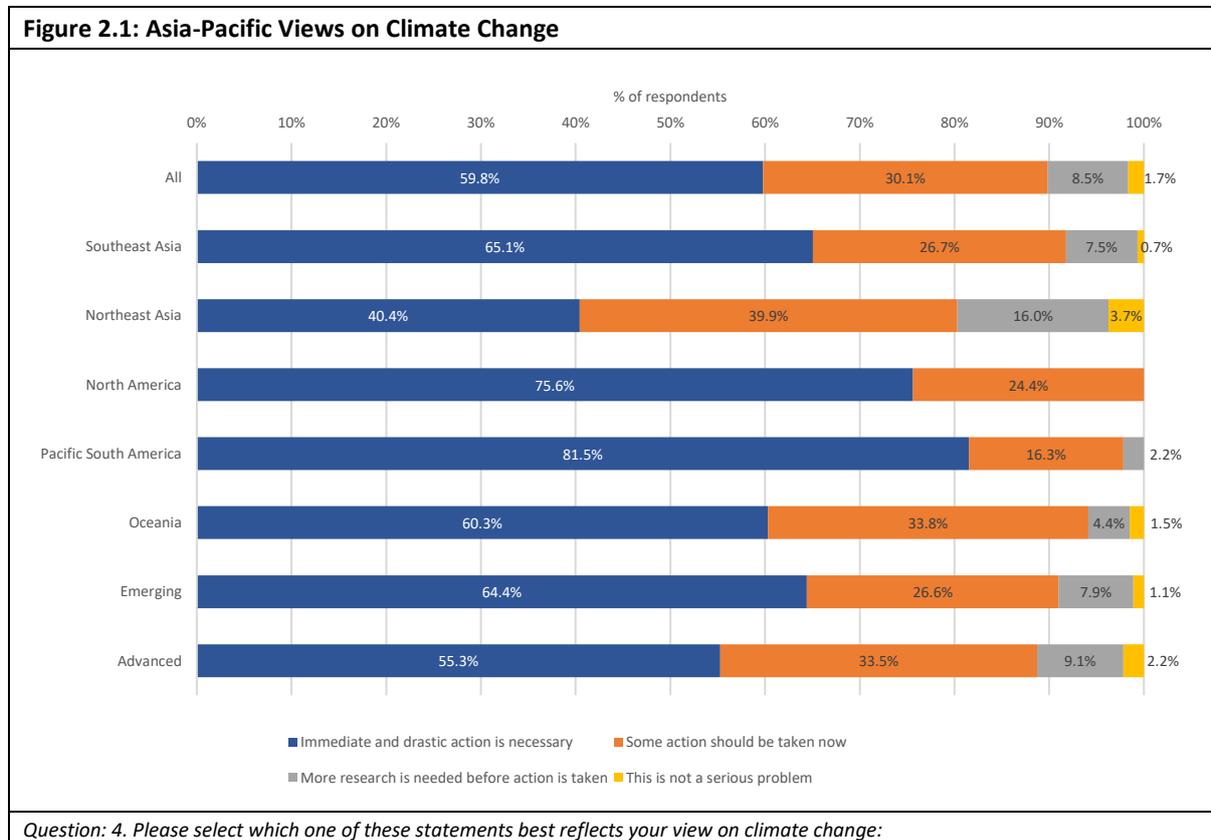
APEC's Putrajaya Vision of an 'open, dynamic, resilient and peaceful Asia-Pacific community by 2040, for the prosperity of all our people and future generations' includes as one of its drivers strong, Balanced, Secure, Sustainable and Inclusive Growth: Central to this is the promotion of *'economic policies, cooperation and growth which support global efforts to comprehensively address all environmental challenges, including climate change, extreme weather and natural disasters, for a sustainable planet.'*

Central to these global efforts is the Paris Agreement on Climate Change. The purpose of this study is to identify key areas for regional cooperation in climate mitigation and adaptation initiatives. Specifically, it will cover three topics:

- Paris Agreement Nationally Determined Commitments (NDCs)
- Carbon Markets, Carbon Prices and Carbon Trade Border Adjustments
- Green Finance

Each of these areas of potential policy and regulatory cooperation for APEC economies are deep subjects in their own right and each carries a voluminous literature. This study will adopt a literature review approach to yield summary conclusions and recommendations accessible to the broad and non-specialist policy and business community.

To complement the analytical work of this study, PECC undertook a survey of business, government, and non-government views on a range of climate change issues.



As is clear from the results shown in Figure 2.1, the view from across the region, with some variation, was that there is a strong expectation that ‘immediate and drastic action is necessary’ to address climate change.

Under the Paris Agreement, all parties are required to set GHG emissions reductions targets defined as nationally determined contributions (NDCs). Parties are expected to pledge increasingly ambitious NDCs every five years.

**a. NDCs: varying ambitions among parties**

The UNFCCC secretariat prepared a synthesis report on NDCs submitted by Parties and published on 17 September 2021.<sup>81</sup> The report collated information from the 164 latest available NDCs, representing all 191 Parties to the Paris Agreement, including the 86 new or updated NDCs communicated by 113 Parties, recorded in the interim NDC registry as at 30 July 2021, covering 93.1 per cent of the total global emissions in 2019. The rest of this section of the report is based on the synthesis report unless referenced otherwise.

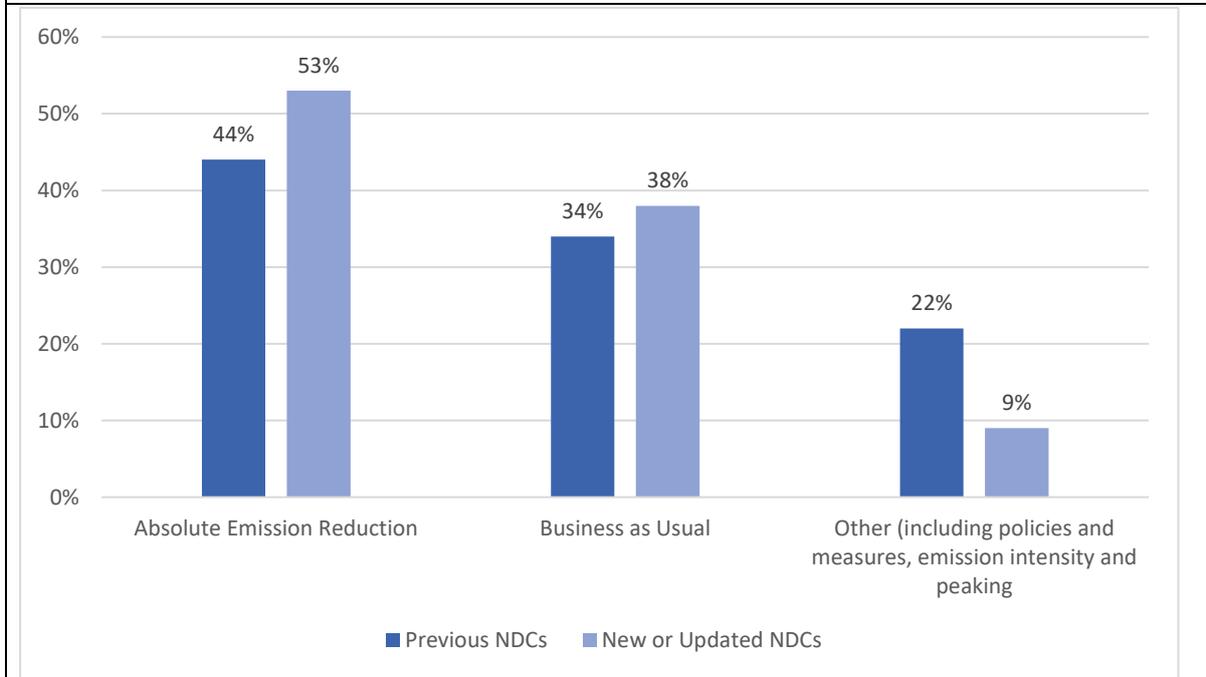
Almost all parties provided information on mitigation targets, in particular for 2025 and/or 2030. The mitigation targets range from economy-wide absolute emission reduction targets to strategies, plans and actions for low-emission development. According to the synthesis report “many Parties” strengthened their commitment to reducing or limiting GHG emissions by 2025 and/or 2030, demonstrating increased ambition to address climate change.<sup>82</sup> More Parties than previously communicated absolute emission reduction targets, with some moving

<sup>81</sup> UNFCCC, “Nationally determined contributions under the Paris Agreement: Synthesis report by the secretariat”, 17 September 2021. Accessed at [https://unfccc.int/sites/default/files/resource/cma2021\\_08\\_adv\\_1.pdf](https://unfccc.int/sites/default/files/resource/cma2021_08_adv_1.pdf)

<sup>82</sup> The synthesis report uses quantitative terms referring to the percentage of Parties whose NDCs mention particular information: “a few” for less than 10 per cent; “some” for 10–40 per cent; “many” for 41–70 per cent; “most” for 71–90 per cent; and “almost all” for more than 90 per cent

to economy-wide targets, resulting in most Parties having economy-wide NDCs. The Parties increased the coverage of sectors and types of GHGs. While new or updated NDCs increased the share of parties adopting absolute emission reduction or emission relative to “business as usual” (BAU) targets,<sup>83</sup> those parties that adopted other means of reducing emissions included a range of policies and measures, emission intensity targets and target dates by which emissions should peak.

**Figure 2.2: Three types of Mitigation Targets and Share of Parties as Reported in NDCs for all UNFCCC parties**



Source: UNFCCC Synthesis Report [https://unfccc.int/sites/default/files/resource/cma2021\\_08\\_adv\\_1.pdf](https://unfccc.int/sites/default/files/resource/cma2021_08_adv_1.pdf)

Notes: “emissions intensity” refers to GHG emissions per unit GDP; “peaking” refers to target date by which emissions should peak.

Many Parties included absolute emission reduction targets expressed as an emission reduction from the level in a specified base year, ranging from 13 to 88 per cent. A few other Parties specified a year or time frame in which their emissions are expected to peak or reach a maximum level of absolute emissions (e.g. by 2030).

Some Parties expressed their target as a carbon budget in addition to the absolute target, establishing an overall limit on GHGs to be emitted over a specified period of time (e.g. between 2021 and 2030). Some Parties included relative targets for reducing emissions below a ‘business as usual’ level by a specified target year, either for the whole economy or for specific sectors, ranging from 11.5 to 53.5 per cent. A few Parties had emission intensity targets for reducing specific GHG emissions per GDP unit relative to a base-year (e.g. 1990) level or listed other policies and measures to reduce emissions. Some Parties included two levels of emission reduction targets, with less ambitious ones being offered unconditionally and more ambitious targets conditional on the availability of international assistance in funding resources, technology transfer and capacity building.

Among all Parties NDCs, the most common emission reduction target (43%) was that expressed as a planned reduction from a projected “business as usual” outcome. Absolute emission reductions relative to a base or reference year or absolute quantified reductions without reference to any base year was the next most popular (35%). Just over a fifth of all NDCs chose other types of targets including reductions in emission intensity, target dates for planned peak emissions, and a range of other policies and measures or a combination of these.

<sup>83</sup> The term “business as usual” is defined by the IEA as the reference scenario which includes the projection of all the adopted and implemented policies and measures, including the policies and measures not fully implemented yet, and deviation from BAU would thus be defined as a scenario which takes into account new policies and measures taken to mitigate emissions as may be described in the NDC by the Party. See EIA (Energy Information Administration), 2010: “International energy outlook 2010. Accessed <http://www.eia.gov/oiaf/archive/aeo10/index.html> .

Table 2.1: Status of APEC NDCs and Targets

Economy	Target	Base Year	Type of Target
<b>Australia</b>	Reduction in GHG emissions by 26% - 28% relative to 2005 by 2030	2005	Absolute reduction
<b>Brunei</b>	Reduction in GHG emissions by 20% relative to BAU by 2030	2015	Reduction relative to BAU
<b>Canada</b>	Reduction in GHG emissions by 40% - 45% relative to 2005 by 2030	2005	Absolute reduction
<b>Chile</b>	GHG emission limit of 1,100 million tons of CO <sub>2</sub> -equivalent for 2020 - 2030	n/a	Absolute reduction
<b>China</b>	To peak CO <sub>2</sub> emissions by 2030 to lower CO <sub>2</sub> emissions by 60% - 65% per unit GDP by 2030 relative to 2005 level; to increase share of non-fossil fuels to "around" 20%; to increase forest stock by "around" 4.5 bn cu. M. above 2005 level	2005 (for CO <sub>2</sub> intensity)	Reduction in Emission Intensity
<b>Indonesia</b>	Reduction in GHG emissions by 29% relative to BAU by 2030; could increase contribution subject to availability of international support (finance, technology, capacity building)	n/a	Reduction relative to BAU
<b>Japan</b>	Reduction in GHG emissions by 26% relative to 2013 by 2030;	2013	Absolute reduction
<b>Korea</b>	Reduction in GHG emissions by 24.4% relative to 2017 by 2030	2017	Absolute reduction
<b>Malaysia</b>	Reduction in GHG emissions intensity by 45% by 2030 relative to 2005	2005	Reduction in Emission Intensity
<b>Mexico</b>	Reduction in GHG emissions by 22% and Black Carbon by 51% by 2030 relative to BAU; may increase ambitions subject to conditions such as increased resources available	n/a	Reduction relative to BAU
<b>New Zealand</b>	Reduction in GHG emissions by 30% by 2030 relative to 2005; excluding land use changing forestry	2005	Absolute reduction
<b>Papua New Guinea</b>	Carbon neutrality within the energy industries sub-sector by 2030; 25% reduction in area of annual deforestation and annual degradation against 2015 levels by 2030; all targets conditional	n/a	Absolute reduction
<b>Peru</b>	30% reduction of GHG emissions by 2030 relative to BAU; 20% reduction unconditional; 10% conditional*	n/a	Reduction relative to BAU
<b>Philippines</b>	Reduction of GHG emissions of 75% by 2030 relative to BAU, of which 2.71% is unconditional and 72.29% is conditional on external assistance	n/a	Reduction relative to BAU
<b>Russia</b>	Reduction of GHG emissions of 30% by 2030 relative to 1990	1990	Absolute reduction
<b>Singapore</b>	Absolute GHG emission level of 65 mn tonnes or less by 2030	n/a	Absolute reduction
<b>Thailand</b>	Reduction of GHG emissions of 20% by 2030 relative to BAU	n/a	Reduction relative to BAU
<b>USA</b>	Reduction of GHG emissions by 50% - 52% by 2030 relative to 2005	2005	Absolute reduction
<b>Vietnam</b>	Reduction of GHG emissions by 8% by 2030 compared to BAU unconditionally; can increase emission reduction by up to 25% if international support is available	n/a	Reduction relative to BAU

Source: UNFCCC NDC Interim Registry, author's analysis. <https://www4.unfccc.int/sites/ndcstaging/Pages/Home.aspx>

In Table 2.1, the APEC members NDC's are listed with their main targets. Under the Biden administration which brought back the U.S. into the Paris Agreement (after President Trump's previous decision for a US exit), the economy now is ranked as having one of most ambitious 2030 targets based on the change in absolute volumes of emissions by 2030. Canada and Japan are among the other economies in the region that have relatively ambitious targets in terms of planned emission reductions. In contrast, key developing economies – most notably India and China – can increase their emissions substantially to 2030, as their targets are related to

emissions intensity per unit GDP. This intensity target allows for rising emissions by improving energy efficiency so as to continue economic growth, albeit with lower associated emissions.

**Table 2.2: Total and Per Capita Emissions for Asia-Pacific Economies**

Economy	Annual Total CO2 Emissions 2010	% of World	Annual Total CO2 Emissions 2019	% of World	Per Capita CO2 Emissions 1990	Per Capita CO2 Emissions 2019	Per Capita CO2 Emissions % CAGR
Australia	405.5	1.2%	411.0	1.1%	16.4	16.3	0.0%
Brunei	8.1	0.0%	9.1	0.0%	23.9	21.0	-0.5%
Cambodia	5.0	0.0%	16.0	0.0%	0.1	1.0	6.9%
Canada	555.5	1.7%	576.7	1.6%	16.8	15.4	-0.3%
Chile	71.3	0.2%	84.3	0.2%	2.5	4.4	2.0%
China	8,500.5	25.7%	10,174.7	27.9%	2.1	7.1	4.4%
Colombia	76.3	0.2%	102.2	0.3%	1.7	2.0	0.6%
Ecuador	34.8	0.1%	40.5	0.1%	1.6	2.3	1.3%
Hong Kong, China	40.1	0.1%	41.5	0.1%	4.7	5.6	0.6%
India	1,678.5	5.1%	2,616.4	7.2%	0.7	1.9	3.7%
Indonesia	428.2	1.3%	617.5	1.7%	0.8	2.3	3.6%
Japan	1,214.1	3.7%	1,106.7	3.0%	9.3	8.7	-0.2%
Korea	566.0	1.7%	611.3	1.7%	5.8	11.9	2.5%
Laos	3.0	0.0%	32.8	0.1%	0.1	4.6	13.4%
Malaysia	216.5	0.7%	250.1	0.7%	3.1	7.8	3.3%
Mexico	463.8	1.4%	438.5	1.2%	3.8	3.4	-0.3%
Myanmar	13.1	0.0%	26.2	0.1%	0.1	0.5	5.5%
New Zealand	35.0	0.1%	36.5	0.1%	7.5	7.6	0.1%
Papua New Guinea	4.7	0.0%	7.1	0.0%	0.5	0.8	1.9%
Peru	57.2	0.2%	54.5	0.1%	1.0	1.7	1.9%
Philippines	83.0	0.3%	144.3	0.4%	0.7	1.3	2.4%
Russia	1,612.9	4.9%	1,678.4	4.6%	17.1	11.5	-1.4%
Singapore	56.6	0.2%	38.9	0.1%	14.7	6.7	-2.7%
Chinese Taipei	264.8	0.8%	262.6	0.7%	5.9	11.0	2.2%
Thailand	256.4	0.8%	288.3	0.8%	1.6	4.1	3.4%
United States	5,698.1	17.2%	5,284.7	14.5%	20.3	16.1	-0.8%
Vietnam	136.1	0.4%	247.7	0.7%	0.3	2.6	7.5%
<b>Asia-Pacific</b>	<b>22,484.9</b>	<b>67.9%</b>	<b>25,198.6</b>	<b>69.1%</b>			
<b>World</b>	<b>33,131.9</b>	<b>1</b>	<b>36,441.4</b>	<b>100.0%</b>	<b>4.3</b>	<b>4.7</b>	<b>0.4%</b>

Source: Our World in Data: Consumption based CO2 emissions. Global Carbon Budget - Global Carbon Project (2020) in million tonnes; per capita emissions in tonnes

Asia-Pacific economies account for approximately 69 percent of global emissions (a broad definition of the region including all APEC members, members of the East Asia Summit and PECC is used here). Measured on the basis of total emissions emerging economies with large populations tend to account for a larger share of global emissions, but measured on a per capita basis their annual emissions are significantly lower than advanced economies (see Table 2.2). The average global per capita emissions in 2019 was 4.7 metric tons, which is less than a third of the metric for the developed economies such as Australia, Canada and the US (in excess of 16 metric tons). Some of the lowest per capita emissions are in Asia among the large developing economies such as India (1.7 metric tons), Indonesia (2.3 metric tons) and Vietnam (2.6 metric tons) In negotiations on emission

reduction commitments at COP26, the issue of per capita emissions and the role of equity and historical responsibility regarding past emissions will play a significant role for developing economies.

#### b. Comparing Emission Reduction Targets

Parties to the UN Convention have adopted different types of emission reduction targets for 2030 in their NDCs for COP26. As mentioned above, NDCs presented by Parties including absolute reductions of emissions from a base year, reductions from a hypothetical “business as usual” (BAU) trajectory over the 2020 – 2030 period or reductions in emissions intensity per unit of GDP and “other policies and measures”. This makes it inherently difficult to compare across various Party NDCs in terms of planned emission reductions compared to what would have happened in the absence of an emission reduction policy scenario. For example, the base year a Party chooses to compare its future target against can make a very significant impact on the Party’s proposed quantum of emission reductions.

Furthermore, the many assumptions involved in constructing a hypothetical BAU emission trajectory over the next decade or longer can be difficult to objectively verify as a fair representation of what can be expected given uncertain long run forecasts economic growth rates, development trajectories of low-emission technologies including renewable energy and electric vehicles and technological progress in energy efficiency performance across various economic sectors.

Promoting renewable energy generation were most frequently mentioned by Parties, followed by measures for energy efficiency improvement. Almost all Parties outlined mitigation targets in specific priority areas, such as energy supply, transport, buildings, industry, agriculture, land use, land use change and forestry (LULUCF) and waste.

Global carbon emissions by sector are reported by the IEA in Table 2.3. Different economies will exhibit varying sectoral emission patterns as a function of their economic configurations. As can be seen, the electricity and heat generation sector is the most emissions-intensive, accounting for over 40% of total emissions. Transport is the next most important one, emitting almost a quarter of all emissions. Industry accounts for over 18%, followed by residential, other energy industries, and commercial and public services in that order. Agriculture and fisheries are minor emitting sectors.

**Table 2.3: Global CO2 Emissions by Sector (2018)**

*(Million tons of CO2)*

	Mt CO2	% of total
<b>Electricity and heat producers</b>	3,978	41.7%
<b>Transport</b>	8,258	24.6%
<b>Industry</b>	6,158	18.4%
<b>Residential</b>	2,033	6.1%
<b>Other energy industries</b>	1,613	4.8%
<b>Commercial and public services</b>	850	2.5%
<b>Agriculture</b>	428	1.3%
<b>Fishing</b>	19	0.1%
<b>Final consumption not elsewhere specified</b>	177	0.5%
<b>Total</b>	33,514	100.0%

Source: IEA Database accessed at

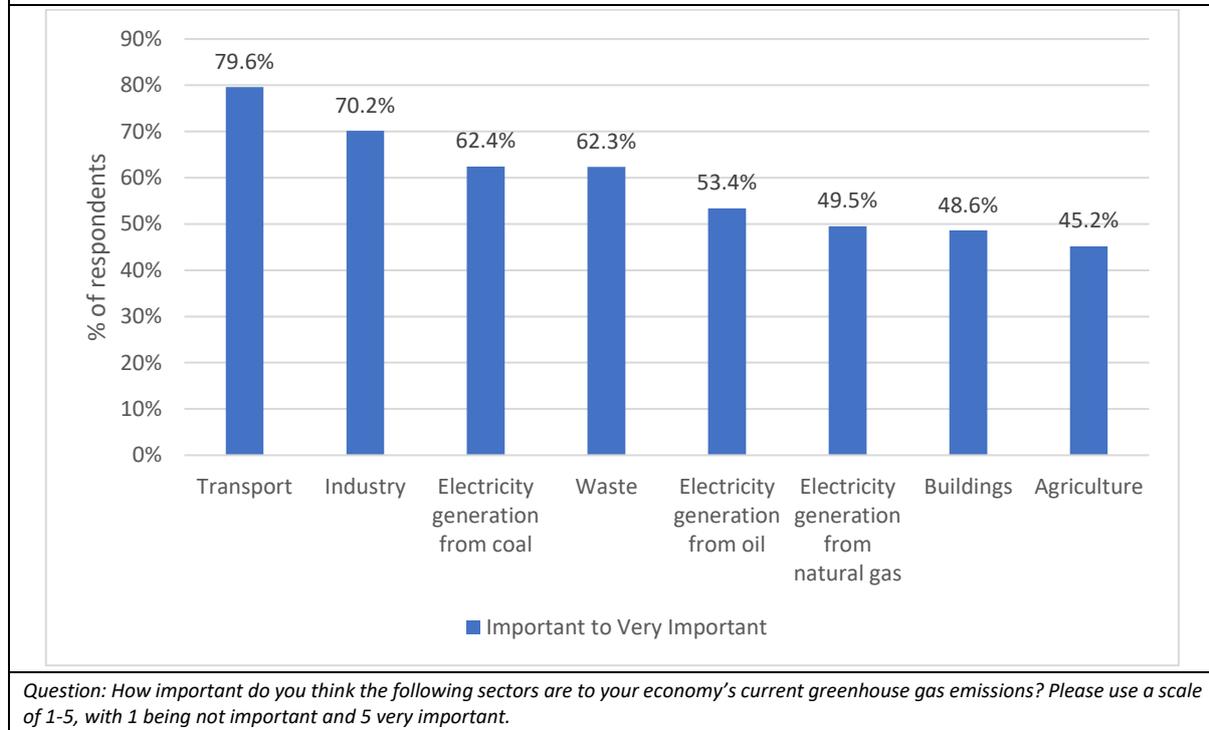
<https://www.iea.org/data-and-statistics/data-browser/?country=WORLD&fuel=CO2%20emissions&indicator=CO2BySource>  
on 15 September 2021.

#### Perceptions of Emissions

Interestingly survey respondents saw transportation as the single most important sector of emissions followed by industry as shown in Figure 2.3. However, the three main current sources of electricity generation which are the single largest emitter were divided in the survey. The survey revealed important results about some disconnects between perceptions and actual emissions, for example, emissions from waste were seen as just as an important emitter as electricity generation from coal.

There were also considerable variations across sub-regions on the relative importance of different sources of emissions, for example 64 percent of respondents from Oceania had agriculture as an important source of emissions compared to 28 percent of Northeast Asians.

**Figure 2.3: Perceptions on Sources of Emissions**



In general, most Parties indicated policy focus for emission reductions in the key sectors of electricity and heat generation, transport and industry which is broadly in line with the IEA data on sectoral emissions.<sup>84</sup> Most NDCs indicated support for renewable sources, particularly for solar and wind technologies, in the electricity sector; promotion of electric vehicles in the road transport sector; and enhancement of energy efficiency across the industry, residential and other sectors.

NDCs commonly identified markets and market-based incentives (MBIs) such as emission taxes or “cap-and-trade” of emission certificates as a means of efficient decarbonization by putting a price on emissions. Among MBIs mentioned in some NDCs, the reduction or complete halt of subsidies in the fossil fuels sector is also mentioned. A few Parties communicated specific discretionary measures, such as phasing out use of coal to produce electricity by 2025; banning new registration of internal combustion engine (diesel and gasoline) vehicles by 2030 or later (see discussion of electric vehicles in Section 1c); and requiring new buildings constructed to consume almost zero energy.

Most Parties where agriculture and forestry are important sectors identified domestic mitigation measures in the LULUCF sector, with some developing economy Parties referring to reducing deforestation (which include REDD+ activities)<sup>85</sup> as a priority with high mitigation potential. In terms of measures for enhancing carbon sequestration in soil or vegetation, afforestation, reforestation and revegetation, sustainable forest management, and reduced deforestation and forest degradation were most frequently indicated. A few Parties communicated quantitative targets for increasing forest cover without competing for land in the agriculture sector. In addition to the medium-term focus (to 2025 and 2030) of most NDCs, many Parties provided information on long-term mitigation visions, strategies, or targets for up to and beyond 2050. Of those Parties, some reported targets of “net zero emissions” by 2050 or beyond.

<sup>84</sup> It should be noted that an efficient approach to decarbonization across sectors would be such that the marginal cost of abatement would be equalized across sectors. Hence, it is not necessary that the largest emitting sectors receive the largest abatement investments.

<sup>85</sup> This refers to reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks.

In comparison with previous NDCs, there was an increased focus on adaptation planning. Adaptation priorities for most Parties, according to the NDCs, focus on food security and production; terrestrial and wetland ecosystems; human health; freshwater resources; key economic sectors and services; disaster risk management and early warning; human habitats and urban areas; coastal areas and sea level rise; ocean ecosystems; and livelihoods and poverty.

For APEC member economies which have significant agricultural sectors, both for export as well as domestic agricultural produce, there is broader momentum in creating missing markets in “natural capital” that is relevant to both the adaptation and mitigation streams of climate change action. The rate of build-up of CO<sub>2</sub> in the atmosphere can be reduced by taking advantage of the fact that atmospheric CO<sub>2</sub> can accumulate as carbon in vegetation and soils in terrestrial ecosystems. Under the UNFCCC any process, activity or mechanism which removes a greenhouse gas from the atmosphere is referred to as a “sink”. Human activities impact terrestrial sinks, through land use, land-use change and forestry (LULUCF) activities.<sup>86</sup>

Land management via LULUCF activities can improve both environmental and economic outcomes of the agricultural sector. Increasing diverse plant and tree shelters on land, for example, can support and protect biodiversity and improve the quality of the soil and crops and cattle. Limiting the access of cattle to rivers and pumping water for cattle to water stations, for example, can support recovery of river ecology and biodiversity, improve soils and reduce parasites in cattle.

There are three steps to creating markets from better land and water management:

1. clear and accurate measurement, reporting and verification (MRV) processes of environment and economic outcomes – there have been a remarkable advances in the application of digital, spatial and remote sensing technology which can be brought to bear
2. the verifiable measurement of economic outcomes means that risk can be accurately measured and used to price financial instruments, like loans, bonds and equity. Governments can assist in scaling up sustainable farm loans, aggregating and securitizing such loans as collateralized debt obligations.
3. identifying the role of government – three aspects are important: governance assuring the quality of environmental and economic data measurement and verification; proof of concept; and extending the maturity profile of loans and finance since some of the economic payoffs can take years to grow (e.g. lifting diverse tree cover on land as a short term cost as land is taken out of use and the benefits to soil, grass and crops takes five years or more to occur). There may be a role for a natural capital finance corporation to spur markets in natural capital and what form it should take.

The benefits of creating markets in agriculture or an economy’s “natural capital” are significant if existing agricultural markets are incomplete or absent. It improves environmental and economic outcomes in the agricultural sector with co-benefits in both mitigation and adaptation efforts. It increases the resilience of agricultural assets such as forests and farms in the face of damaging climate change (i.e. adaptation), It supports carbon abatement through LULUCF activity, and can create a source of income through carbon credits (i.e. mitigation). It provides a way for farmers to show consumers that their products are “sustainable”. Hence this would sustain domestic and international markets in agriculture. It sustains lending to agriculture by reducing risk to that sector.

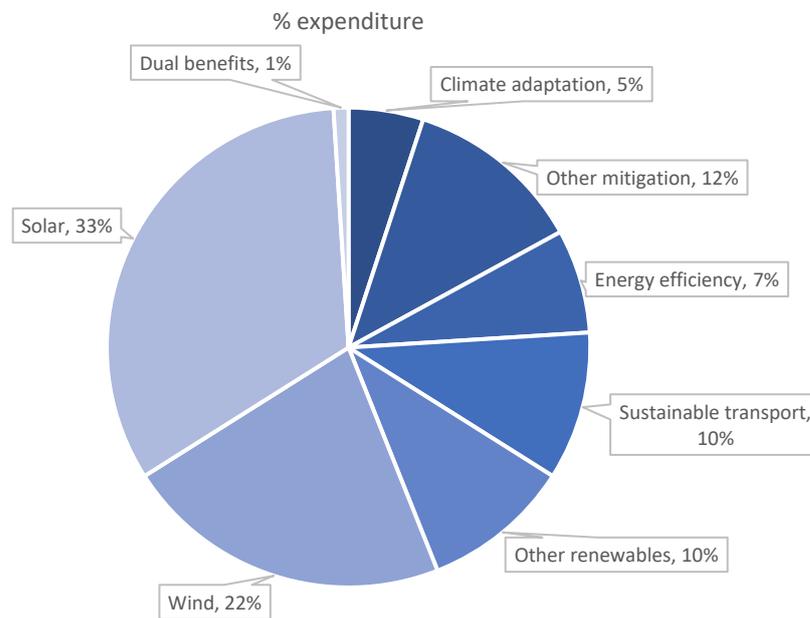
This is an issue that affects all economies and is a natural area to work on with others, including those with whom relations are under pressure. There is cooperative work in Australia, China and the United States, and it is appropriate for on-going policy agendas in forums like APEC and G20. If it can be shown that the risk associated with sustainable natural capital is measurable and lower than otherwise, it should be reflected in the international rules for risk in finance, such as the Bank for International Settlements rules for banks and those for securities. (The role of central banks in assessing climate change risk and regulating reporting standards by private firms across all sectors, agriculture and industry, is discussed further in sections 4e).

<sup>86</sup> <https://unfccc.int/topics/land-use/workstreams/land-use-land-use-change-and-forestry-lulucf>

There was also a greater emphasis in some NDCs on the mitigation co-benefits of adaptation action plans. Adaptation actions with mitigation co-benefits include climate-resilient agriculture, reducing food waste, vertical farming, enhancing coastal ecosystems and moving to the “circular economy” for better waste management. Urban infrastructure management to improve drainage and mitigate flooding are some of the other examples of adaptation planning that would produce co-benefits for mitigating emissions. Among other adaptation measures with co-benefits for emission mitigation mentioned in some of the NDCs is carbon dioxide capture and storage.

While the NDCs indicate priorities of various Parties in mitigation and adaptation activities, what has been the evidence to date regarding actual spending on various sectors? Data gathered by the Climate Policy Initiative (CPI), a climate policy thinktank, offers estimates of global spending on climate change initiatives in its “Global Landscape of Climate Finance” annual reports. According to data gathered by CPI, the public sector constituted between 39% and 46% of total spending, the rest by accounted for by the private sector.<sup>87</sup>

**Figure 2.4: Climate-Related Expenditure by Sector 2011 – 2018**



Source: Climate Policy Initiative, “Global Landscape of Climate Finance” annual reports accessed at <https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2019/>

The most striking feature of expenditure on climate initiatives is the overwhelming amount spent on just two renewable technologies -- solar and wind energy – accounting for 55% of all spending during 2011 – 2018 shown in Figure 2.4. If spending on “other renewables” (biomass and waste, biofuels, hydroelectricity, “others”) is included, then spending on renewables accounts for 65%. The other striking feature of the spending pattern is that climate adaptation only accounts for 5% of total climate-related expenditure.

In emphasizing climate mitigation over climate adaptation to reduce the impacts of future climate change on human welfare, the implicit assumption is that greenhouse gases are the primary driver of climate change and trying to “fight climate change” by reducing greenhouse gas emissions is the overriding priority.<sup>88</sup>

The second approach, climate adaptation, involves developing better infrastructure for dealing with climate change and extreme weather, as has been done throughout human history (eg. by building dykes or levees to handle flooding, weatherizing houses to handle hurricanes or tropical storms, upgrading urban drainage

<sup>87</sup> It should be noted that private sector spending may ultimately be funded by government subsidies and mandates of various sorts, and hence there is a risk of double counting as well as underestimating actual public sector spending on climate change policies. In their reports, CPI explicitly acknowledges that their calculations likely underestimate the annual global expenditure, “due to methodological issues related to data coverage and data limitations, particularly domestic government expenditures on climate finance and private investments in energy efficiency, transport, land use, and adaptation.”

<sup>88</sup> Pielke, R.A. “Misdefining “climate change”: Consequences for science and action.”, Environ. Sci. Policy 2005, 8, 548–561.

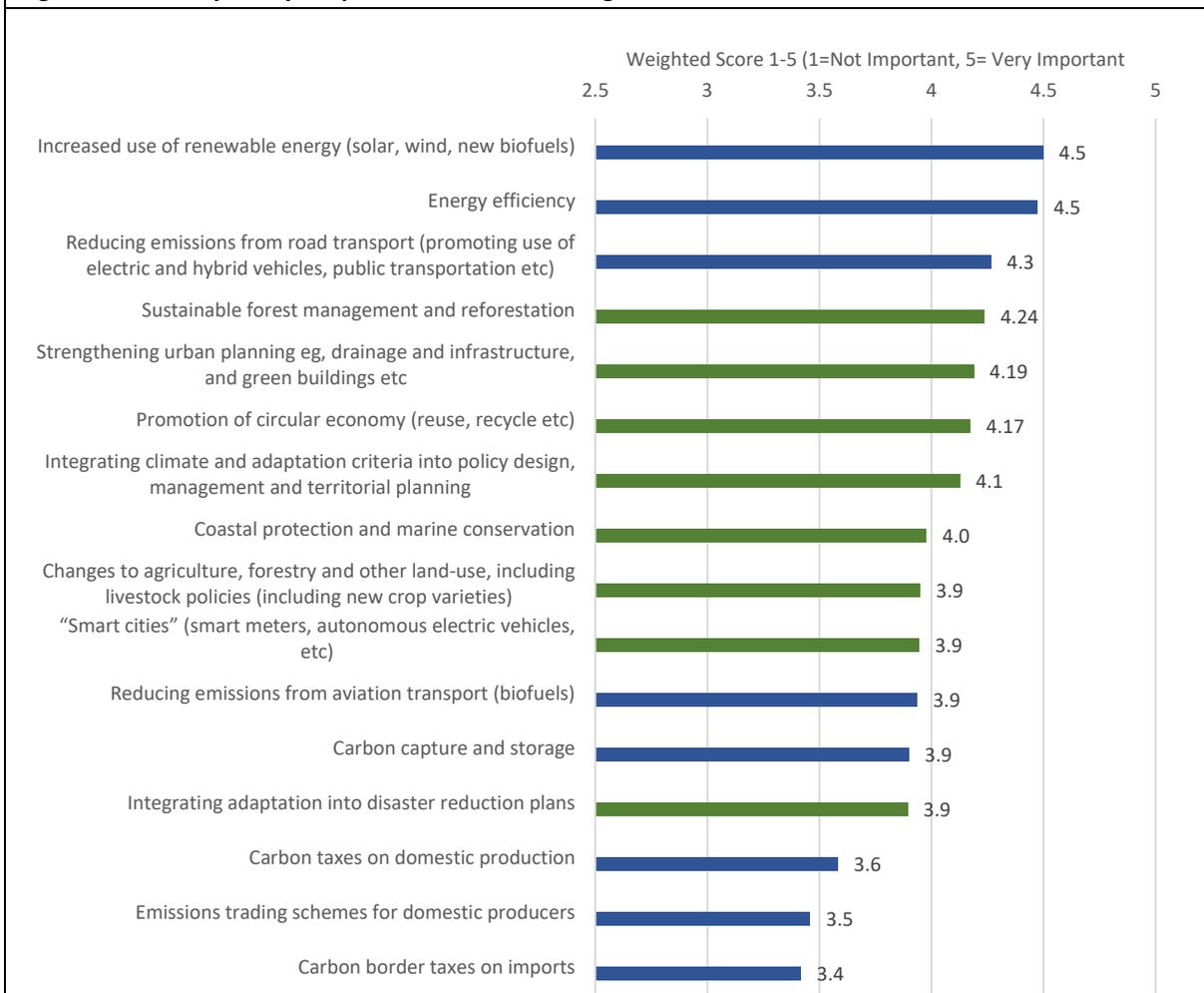
systems, etc.). By overemphasizing climate mitigation efforts, the UNFCCC and COP agreements such as the Kyoto Protocol and the Paris Agreement may have led to a bias against investment in climate adaptation.<sup>89</sup>

According to PECC’s survey, while stakeholders put highest importance on emission reducing measures, adaptation measures closely follow behind (Figure 2.5). The Asia-Pacific view is that:

1. There is an equal need to promote the greater use of renewable energies as well as energy efficiency
2. The next highest priority is to reduce emissions from road transport
3. These are followed by a series of adaptation measures of almost equal importance: sustainable forest management; strengthening urban planning; and promoting the circular economy (reuse, recycle, etc.)

Interestingly, market-based schemes like emissions trading and carbon taxes came far down the list of priorities. This was an important finding given the trends around the world and statements from key institutions on the need for setting a carbon price. There is clearly a gap that needs to be filled.

**Figure 2.5: Priority Policy Responses to Climate Change**



*Question: Please rate each of the following as policy responses to the challenge of perceived climate change. Please use a scale of 1-5, with 1 being not important and 5 very important.*

At the sub-regional level there were no significant differences in priorities. There were some minor differences likely based on relative importance of sectors to economies, for example, “Changes to agriculture, forestry and

<sup>89</sup> Pielke, R.A., op cit.

*other land-use, including livestock policies (including new crop varieties)*” was rated a relatively more important policy by respondents from Oceania and Pacific South America compared to respondents from Northeast Asia.

### c. Assessing the Potential for Achieving NDCs among APEC member economies

It is important to clarify just what is meant by “low carbon energy transitions” prior to looking at how APEC member economies, individually and collectively, can participate in such transitions.<sup>90</sup> A clear distinction that is to be made between what is theoretically or technically possible and what is economically feasible. In assessing the performance to date and the further potential of APEC member economies for achieving communicated NDCs, we first provide an introduction to the nature of energy transitions in a long-term perspective. Set in this context, we follow with brief overviews on renewable energy in the power generation sector, electrification in the transport sector, energy efficiency enhancement across sectors, carbon capture and storage, and hydrogen to replace fossil fuels in heating, power, industry, and transport

#### i. The Nature of Energy Transitions

The shift in dependence among fossil fuels over the past two centuries was marked by the prolonged and gradual nature of energy fuel transitions. From the almost complete dependence on traditional biomass (wood, charcoal, dung, straw) prior to 1800, it took coal a century to account for half of primary global energy consumption. And it took oil about 70 years from its infancy and early use in 1900 before it accounted for about a third of global energy consumption.

Currently, we live in a “fossil-fuel civilization”, as Vaclav Smil terms it.<sup>91</sup> After decades of government mandates and hundreds of billions of dollars in subsidies primarily in Western Europe and North America, renewable energy (RE) technologies such as solar, wind, geothermal and new biomass fuels (such as biodiesel and ethanol) account for just 5.7% of global primary energy consumption. Even for the OECD members, where renewable energy has grown the most, fossil fuels still provide an average 78% of their energy needs.

There is little evidence of an accelerating energy transition at a global scale despite the rapid growth rates of the renewable energy. Given the small existing contributions of these newer technologies and their very low-capacity utilization factors, rapid growth rates in RE capacity make relatively small contributions to the overall distribution of global fuel sources of primary energy expended.

It is instructive to compare two well-known long-run energy forecasts, one by BP and the other by the US Energy Information Administration (EIA) for 2050, using 2018 data as baseline.<sup>92</sup> The US EIA reference forecast assumes that current laws and regulations are implemented, while the BP forecast offers 3 scenarios, “business-as-usual” (BAU), “rapid” and “net zero by 2050”.

The EIA reference forecast is comparable to BP’s BAU scenario. It should be noted that the EIA includes hydro-power in the renewables category while BP includes it in its “nuclear and hydro” category (it excludes hydro from its renewables category). Furthermore, the EIA includes new biofuels such as ethanol and biodiesel in its liquid fuels category. Nevertheless, given the relative small and slow growing shares of hydro and biofuels in total primary energy, the two forecasts are broadly comparable.

BP’s “BAU” scenario is roughly similar to EIA’s reference case with respect to the share of fossil fuels into total primary energy consumption in 2050. BP shows fossil fuels contributing 66.5% while the EIA shows a somewhat higher contribution of 69.8% by 2050 compared to over 80% in 2018.<sup>93</sup> What is remarkable are BP’s very aggressive “rapid” and “net zero (by 2050)” scenarios, which show fossil fuels being reduced to less than 40% of total energy consumption in 2050 under the Rapid scenario and just 20% in its Net Zero scenario.<sup>94</sup> The EIA sees renewables (including hydro) contribution increase to 26.5% by 2050 from 14.8% in 2020 in its reference scenario. BP, in its BAU scenario sees renewables (excluding hydro) grow from 4.7% in 2018 to 22.2% in 2050. What is far more remarkable is BP’s projected share of renewables in 2050, ranging from 44.3% in the Rapid scenario to almost 60% in its Net Zero scenario.

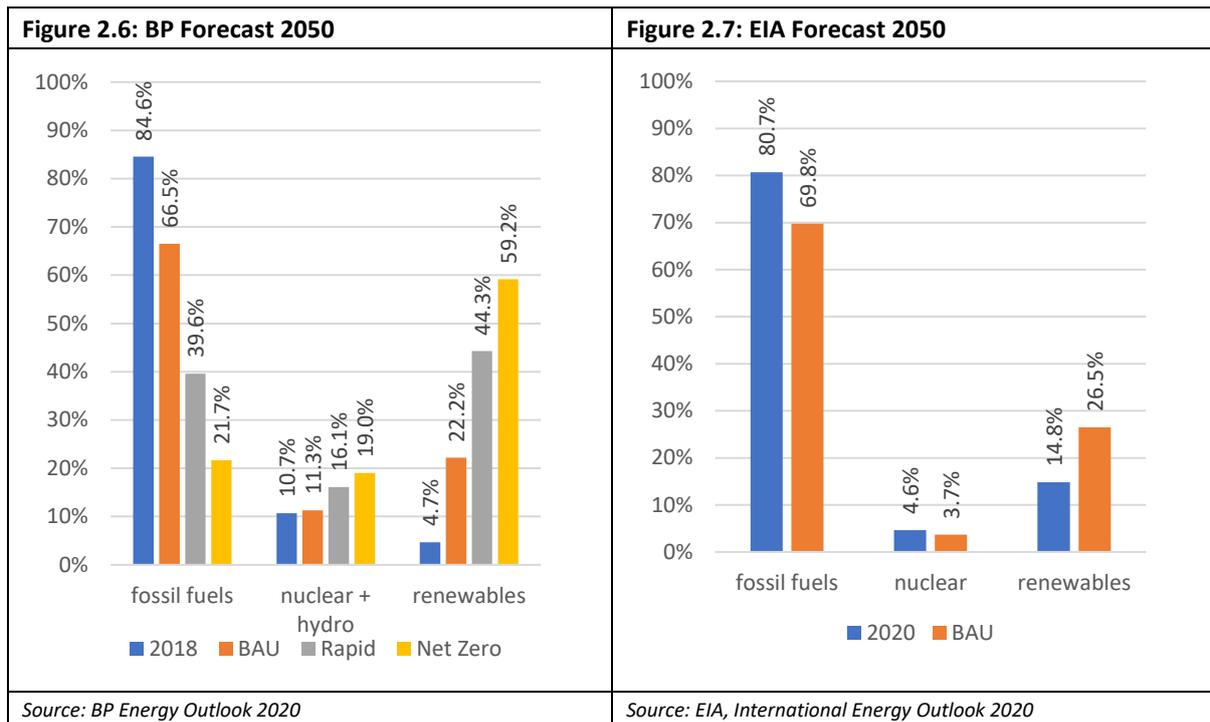
<sup>90</sup> Throughout out this report, the terms “carbon emissions” are used interchangeably with “CO2 emissions”, “CO2-equivalent emissions” and “greenhouse gas (GHG) emissions”.

<sup>91</sup> Vaclav Smil, “Examining energy transitions: a dozen insights based on performance”, Energy Research and Social Science, 22 (2016), 194-197.

<sup>92</sup> BP, “Energy Outlook 2020”, 2020, accessed at <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2020.pdf>; US Energy Information Administration, “International Energy Outlook 2021”, 6 October 2021 accessed at [https://www.eia.gov/outlooks/ieo/pdf/IEO2021\\_ReleasePresentation.pdf](https://www.eia.gov/outlooks/ieo/pdf/IEO2021_ReleasePresentation.pdf)

<sup>93</sup> BP and EIA show somewhat varying estimates for actual composition of primary fuels for 2018 in total consumption, likely because of varying data-sources and methodologies.

<sup>94</sup> The “net zero” scenario includes assumptions of carbon capture and sequestration (CCS) that would allow some continued combustion of fossil fuels.



The underlying differences in the long run outlook between BP and the EIA are made more apparent by looking at the compound annual growth rates of primary energy sources over 2018 - 2050. Unlike EIA’s projection of a total primary energy demand compound annual growth of 1.3%, BP’s projects significantly lower growth in all its scenarios. In its BAU scenario, total primary energy demand grows only by 0.7% each year compounded. In its rapid and net zero scenarios, this growth is more than halved, with total energy demand growing only by 0.3%.

The contrast between the two forecasts is even more dramatic when projections of fossil fuels use is considered. The EIA projects a growth of 0.8%, while BP forecasts zero or negative growth in its scenarios. In BP’s BAU scenario, there is no growth in fossil fuel use during the period, while it falls by 2.1% every year in the Rapid scenario and even more dramatically by 3.9% in its Net Zero scenario.

In sum, BP forecasts for renewable energy are far more optimistic, growing by 5.7% annually in its BAU scenario, in contrast to the EIA’s 3.3%. BP is much more optimistic in its Rapid and Net Zero forecasts, where renewables grown by 7.5% and 8.5% respectively. The projections over 30 years magnify the results exponentially when compounded over 30 years.

The extensive coverage in the media regarding the rapid growth in renewable energy, primarily wind and solar power, lacks sufficient attention to the far more consequential realities in the evolution of global energy use.<sup>95</sup> The continued dominance of fossil fuels and of the role of developing economies – which account for more than 80 per cent of the global population – in the growth of energy demand is a major determinant in the outlook for “decarbonization”. If by “energy transition” is meant the replacement of a class of fuels by another (as shown in the work of Vaclav Smil discussed above), then the EIA forecast does not see any such transition by 2050 but expects a continued and important role for coal, liquid fuels, and natural gas into the middle of this century.

In the decade before the covid pandemic demand shock in energy in 2020 (i.e. 2009 – 2019), while OECD demand for total primary energy grew by 0.4%, non-OECD demand grew by nearly 8 times as fast, by 3.1%. Asia-Pacific primary energy demand grew even faster at 3.3%. World demand grew by 1.9%.

<sup>95</sup> Doshi, T., “Climate change: the West’s energy transition narrative ignores the reality in Asia”, South China Morning Post, 16 July 2021.

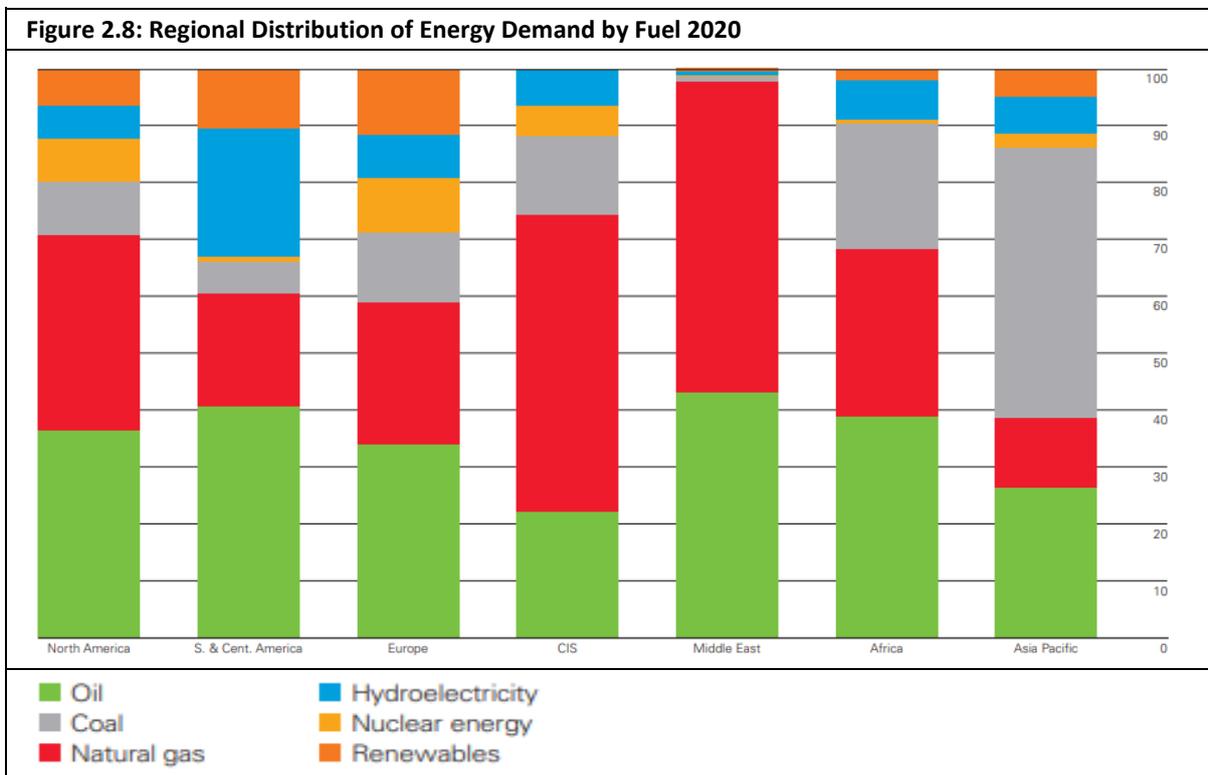
**Table 2.4: Primary Energy Demand Compound Annual Growth by Region, 2009 – 2019**

OECD	0.4%
Non-OECD	3.1%
Asia-Pacific	3.3%
World	1.9%

Source: BP Statistical Review of World Energy 2021

While fossil fuels dominate the energy mix, developing economies, in particular those in Asia, increasingly determine the geographical distribution of energy use. Developing economies accounted for 61% of global energy demand in 2020. The importance of coal to developing economies in Asia is stark (see Figure 2.8 below). Almost 82% of global coal consumption occurred in the developing world and developing Asia accounted for almost all of it.

The dominating role of the developing economies in energy demand growth is better illustrated in incremental terms. In the five years to 2019, developing economies accounted for 88% of global incremental demand for primary energy and OECD for the remaining 12%. The Asia-Pacific region alone accounted for almost three quarters of global incremental demand during 2014-2019.



Source: BP Statistical Review of World Energy 2021.

In assessing the opportunities to de-carbonize on a global scale, in order to meet the goals consistent with the Paris Agreement, the immense scale of the current fossil fuel-based global energy system needs to be kept in mind. It cannot be emphasized enough that attempting to displace the vast existing global infrastructure that constitutes the current global energy system with a mix of intermittent power generation technologies (such as solar and wind power) and liquid biofuels will be a prolonged and gradual process for generations to come, going well past the middle of the current century.

In order to develop a strategy to mitigate global energy use-related GHG emissions, it is critical that the scope of the challenge is well defined and clearly understood. Most analysis of global energy systems recognize the importance of a portfolio of electricity generation technologies including a significant portion of which must be “dispatchable”, i.e. available at any time needed by a changing demand load on the electricity grid. Intermittent renewable energy technologies such as wind and solar can only provide power as a function of solar insolation

and wind speed which are contingent on local conditions such as time of day, cloud cover and varying wind speeds.

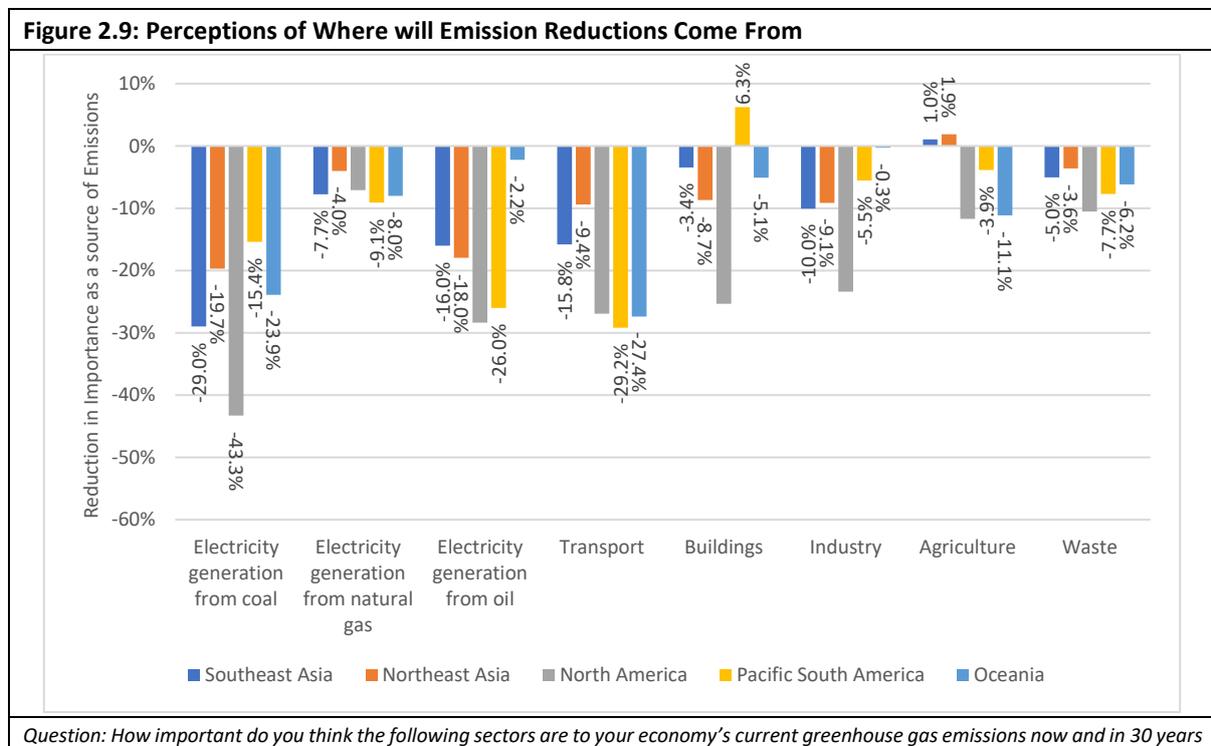
Just how credible is the call for a complete transformation of the global energy system within three decades which today relies on fossil fuels for 85% of its needs? In relation to low-carbon energy transitions, a clear distinction is to be made between what is theoretically possible and what is economically feasible. An objective study of the costs and benefits of decarbonization proposals needs to minimally show at least the following properties:

- Transparent data inputs, plausible assumptions and validated, replicable modelling;
- Technology assumptions that are proven at scale at a cost comparable with existing alternatives;
- Deployment rate assumptions that are plausible in comparison to historical examples of decarbonization in the energy sector; and
- Incorporation of the social and economic costs of existing environmental and permitting process constraints.

Respondents to PECC’s survey were asked to rate the most important sources of emissions to their economies both today as well as in 30 years’ time.

Figure 2.9 shows the fall in the percentage of respondents who thought the sector was an important or very important source of emissions over the next 30 years. As seen in the chart, there was substantial variation across the region on where reductions in emissions will come from. By far, emissions from electricity generation from coal had the largest drop in importance across all sub-regions, although there was some considerable variation. For North Americans it was much larger a drop of 43 percent, while for Pacific South Americans it was a drop of 15 percent.

Emissions from the electricity generation from natural gas, largely seen as a ‘transition’ fuel still saw a drop in importance but less so amongst the traditional fossil fuels.



Interestingly, some sub-regions saw emissions increasing from certain sectors. For example, respondents from Pacific South America expect emissions from buildings to increase, while respondents from Northeast and Southeast Asia expect emissions from agriculture to increase.

ii. *Renewable Energy in the Power Generation Sector of APEC Member Economies*

The pattern for the distribution of commercial primary energy (CPE) consumption by the categories defined in Table 2.5 for the Asia-Pacific regional average is similar to the world pattern. Within the Asia-Pacific, most economies depend more on fossil fuels as a share of total primary energy consumption relative to the world average of just over 83%. Among the exceptions are Canada, Chile, New Zealand, and Peru, all of which are well endowed with hydropower resources. Those that have renewable energy share of total CPE which exceeds the world average are Australia, Chile, New Zealand, the Philippines (mainly geothermal) and the US.

**Table 2.5: Percent share of fuel types in commercial primary energy consumption Asia-Pacific economies and EU, OECD and non-OECD regions, 2020**

% share of fuel types in 2020				
	Fossil Fuels	Hydro & Nuclear	Renewable Energy	Total CPE
<i>Australia</i>	89.6%	2.3%	8.1%	100.0%
<i>Canada</i>	64.6%	31.4%	3.9%	100.0%
<i>Chile</i>	75.5%	11.4%	13.0%	100.0%
<i>China</i>	84.3%	10.3%	5.4%	100.0%
<i>Hong Kong, China</i>	99.9%	0.0%	0.1%	100.0%
<i>Indonesia</i>	92.9%	2.3%	4.8%	100.0%
<i>Japan</i>	87.1%	6.3%	6.6%	100.0%
<i>Korea</i>	84.6%	12.4%	3.0%	100.0%
<i>Malaysia</i>	94.5%	4.4%	1.1%	100.0%
<i>Mexico</i>	89.3%	5.2%	5.5%	100.0%
<i>New Zealand</i>	62.7%	25.6%	11.7%	100.0%
<i>Peru</i>	68.3%	27.2%	4.5%	100.0%
<i>The Philippines</i>	88.5%	3.5%	8.0%	100.0%
<i>Singapore</i>	99.7%	0.0%	0.3%	100.0%
<i>Chinese Taipei</i>	91.7%	6.4%	1.9%	100.0%
<i>Thailand</i>	93.8%	0.8%	5.4%	100.0%
<i>The United States</i>	81.7%	11.3%	7.0%	100.0%
<i>Vietnam</i>	83.0%	15.0%	2.1%	100.0%
<i>Average Asia-Pacific</i>	83.6%	11.1%	5.3%	100.0%
<b>World</b>	83.1%	11.2%	5.7%	100.0%
<b>EU</b>	71.1%	16.4%	12.5%	100.0%
<b>OECD</b>	78.0%	13.7%	8.3%	100.0%
<b>non-OECD</b>	86.4%	9.5%	4.0%	100.0%

Source: BP Statistical Review of World Energy, 2021

Table 2.6 below provides data for 2019 which breaks down renewable energy generation by source among wind, solar and “other” (which includes geothermal, modern biomass fuels such as biodiesel and ethanol and other sources not itemized). At the global level, wind power generation (1,429.6 terawatt hours or twh) was about twice that of solar power generation (724.1 twh) in 2019. Wind power’s dominance over solar is also the case in most economies in the sample of regional economies in Table 2.6. The exceptions are Chile and many Asian economies which lack wind energy resources (Japan, Malaysia, the Philippines, Singapore, Korea, Chinese Taipei, Thailand and Vietnam). The growth of solar power globally was more than double that of wind in 2019 over the previous year.

Some economies exhibited extremely high rates of growth in 2019 over the previous year in both wind and solar power generation due to the small base in 2018. Mexico, Chile, Australia, Japan, Malaysia, Korea, Chinese Taipei and Thailand experienced growth in renewable energy generation in 2019 significantly above the global growth

rate of 13.7%. This reflected the very small base this growth rate is calculated from. For example, Vietnam's remarkable 849.3% growth shows its renewable energy generation increased from 0.5 twh in 2018 to 4.7 twh in 2019. So, by looking at 2019 growth rates in renewable power generation, one might be encouraged at the rapid rates of growth in Asia-Pacific and among most APEC members economies.

**Table 2.6: Solar, Wind and Other Renewables in the Asia Pacific**

Terawatt-hours	2019				2019 y-o-y Growth Rate			
	Wind	Solar	Other renewables	Total	Wind	Solar	Other renewables	Total
Canada	34.2	4.3	10.8	<b>49.3</b>	3.0%	11.9%	7.7%	4.7%
Mexico	17.6	12.4	7.8	<b>37.8</b>	34.5%	291.2%	10.8%	62.4%
US	303.1	108.4	78.3	<b>489.8</b>	10.1%	14.9%	-4.4%	8.5%
Chile	5.3	6.3	10.0	<b>21.6</b>	47.7%	23.1%	9.1%	20.9%
Peru	1.6	0.8	1.6	<b>4.0</b>	9.6%	2.2%	29.7%	15.2%
Russian Federation	0.3	1.0	0.5	<b>1.8</b>	32.7%	57.7%	-0.5%	31.5%
Australia	19.5	18.0	3.6	<b>41.1</b>	19.0%	46.2%	0.6%	27.3%
China	405.7	223.8	102.8	<b>732.3</b>	10.9%	26.5%	9.7%	15.1%
Hong Kong, China	^	^	0.1	<b>0.1</b>	-3.4%	-3.4%	11.2%	10.8%
India	63.3	46.3	25.4	<b>134.9</b>	5.0%	27.3%	-3.2%	9.8%
Indonesia	0.2	0.1	15.7	<b>16.0</b>	-	218.1%	9.3%	9.4%
Japan	8.6	75.3	37.3	<b>121.2</b>	17.2%	14.0%	59.5%	25.2%
Malaysia	-	0.8	0.9	<b>1.7</b>	-	64.6%	8.5%	29.3%
New Zealand	2.3	0.1	8.4	<b>10.8</b>	9.1%	27.7%	0.9%	2.7%
Pakistan	4.8	1.2	0.9	<b>6.9</b>	52.3%	13.7%	-5.2%	33.5%
Philippines	1.2	1.3	11.8	<b>14.3</b>	1.9%	6.6%	2.0%	2.4%
Singapore	-	0.2	0.8	<b>1.0</b>	-	44.0%	-0.8%	5.9%
Korea	2.8	12.1	14.3	<b>29.2</b>	6.6%	25.6%	22.9%	22.2%
Chinese Taipei	1.9	4.1	2.0	<b>8.0</b>	11.0%	51.3%	1.3%	25.3%
Thailand	2.7	5.0	13.7	<b>21.4</b>	36.6%	0.5%	26.4%	20.2%
Vietnam	0.5	4.2	0.1	<b>4.7</b>	58.2%	3583.7%	-	849.3%
<b>Total Asia Pacific</b>	<b>514.3</b>	<b>393.9</b>	<b>238.0</b>	<b>1146.2</b>	10.9%	25.8%	14.1%	16.3%
<b>Total World</b>	<b>1429.6</b>	<b>724.1</b>	<b>651.8</b>	<b>2805.5</b>	<b>12.6%</b>	<b>24.3%</b>	<b>6.0%</b>	<b>13.7%</b>
of which: OECD	841.8	387.2	387.8	<b>1616.8</b>	12.9%	17.4%	5.7%	12.1%
Non-OECD	587.9	336.9	264.0	<b>1188.8</b>	12.0%	33.2%	6.5%	15.9%
European Union	430.7	138.4	199.1	<b>768.2</b>	14.3%	8.5%	1.3%	9.6%

Notes: Other renewables includes electricity generated from geothermal, biomass and other sources of renewable energy not already itemized (i.e. solar and wind). ^ is less than 0.05; data shown for 2018-2019 as 2020 had a power generation drop due to covid pandemic lockdowns.

In assessing the performance of APEC member economies in expanding the role of renewable energy, it is important to note not only the small role of renewable energy in total CPE (Table 2.6) and its rapid annual growth in 2019, typically from a small base. It is more informative to assess the growth of renewable energy in incremental terms: that is, what is the growth of renewable power generation in proportion to the growth of total power generation over a longer period? Table 2.7 gives the data for the global total as well as for the non-OECD, OECD and Asia Pacific regions for the decade 2009 - 2019. The percent share of increase in renewable power generation in total power generation during 2009 – 2019 is far higher in the developed APEC member

economies and other OECD economies than the developing economies. By region, North America, Europe, EU as well as well as OECD members far higher renewable shares in incremental power generation during the period. The ratios for these regions, respectively, are 132%, 585%, 931% and 210%. These ratios are far in excess of the global average of 32%.

This reflects not only the substantial increase in renewable energy generation but also the very slow growth in total power generation (the denominator) during the period. These ratios are also much in excess of the (static) share of renewable energy in total power generation in 2019, hence showing the progressive growth over time that these regions can expect in replacing fossil fuels although how long it will take to completely replace fossil fuels is subject to many factors including the fact that the intermittent nature of renewable technologies and the lack of scalable storage of grid power mean that increase in renewable energy capacity will require back-up dispatchable power (such as natural gas). When the wind does not blow or the sun does not shine, back-up dispatchable power will be necessary to power the grid.

In the Asia Pacific, renewable energy accounted for 19% of the increase in total power generation during 2009 – 2019. Given the very low (static) share of renewable power in total power generation in 2019 (10%), the rate of increase in renewable energy will progressively increase the share of renewables in power generation but very slowly. In other words, 81% of the region's increase in power generation during 2009 – 2019 was met by either fossil fuels (coal, oil and natural gas) or nuclear and hydropower. This was just a little less than the 83.6% share that fossil fuels accounted for in Asia Pacific's primary energy consumption in 2020 (see Table 2.5). That is to say, despite the high percentage increase in renewable power generation, the increase in the use of fossil fuels for power generation in Asia Pacific during the decade 2009 – 2019 accounted for almost as much in incremental demand as their share in total primary demand in 2020. This holds for developing economies, as well as other regions such as the Middle East, Africa, and the CIS states (which includes Russia). In the Asia Pacific, Hong Kong (China) and Japan were exceptional in recording a fall in total power generation during the decade.

In summary, it is apparent that the advanced economies have had relatively rapid growth in renewable energy as a share of total power generation, although the rate of progress shown in the decade 2009 – 2019 may not necessarily hold out in the long run future. Intermittency of renewable generation have a significant impact on electric grid reliability, costs of system operations, and requirements for backup generation capacity. Not only are there technical issues related to the intermittency and low power density of renewable energy and the exorbitant cost of power storage at grid or utility scale,<sup>96</sup> but the increasing costs of renewable energy subsidies to consumers and taxpayers have been noted particularly in the EU,<sup>97</sup> UK<sup>98</sup> and states such California<sup>99</sup> and South Australia<sup>100</sup> which have been leaders in subsidizing the growth of wind and solar power. The costs of intermittency, low power density and large-scale battery storage together with the continued subsidy support that governments need to provide in order to support the growth of renewable energy capacity are considerable and challenging even for the much richer developed economies.

The rate of growth of renewable power generation in the developing economies of Asia Pacific primarily reflect the small base on which these growth rates are calculated. Given the rapid historical increase in power consumption in these economies, most credible forecasts show continued rapid growth in power consumption most of which will be supplied by fossil fuels. It is important to note that renewable energy is still mostly used to generate electricity, and electricity as a share of global final energy consumption is still just 18%. The direct use of fossil fuels is still the primary energy provider for modern economies across the world. Particularly for the developing economies, renewable energy will play a relatively marginal role in meeting rapidly growing needs for grid electricity for decades to come. Meeting the economic development and poverty alleviation objectives

<sup>96</sup> There is a voluminous literature on system costs of intermittent renewable energy and of large scale battery storage (which is often suggested as a solution to intermittency). See for instance, Mills, M., "The 'New Energy Economy': An Exercise in Magical Thinking", Manhattan Institute, March 2019, accessed at <https://media4.manhattan-institute.org/sites/default/files/R-0319-MM.pdf>

<sup>97</sup> Kira Taylor, "Energy price crunch risks derailing UN climate talks, Iberdrola warns", EURACTIV.com, 4 October 2021 accessed at [https://www.euractiv.com/section/energy/news/energy-price-crunch-risks-derailing-un-climate-talks-iberdrola-warns/?mc\\_cid=4611be62d5&mc\\_eid=2206e9995b](https://www.euractiv.com/section/energy/news/energy-price-crunch-risks-derailing-un-climate-talks-iberdrola-warns/?mc_cid=4611be62d5&mc_eid=2206e9995b); EuroNews, "Europe's energy crisis: EU calls for relief funds to help consumers", 6 October 2021, accessed at <https://www.euronews.com/2021/10/06/europe-s-energy-crisis-eu-calls-for-relief-funds-to-help-consumers>

<sup>98</sup> Catherine Neilan, "Energy crisis could erupt into 'biggest political issue of decade', Tories warn", The Telegraph, 20 September 2021 accessed at <https://www.telegraph.co.uk/politics/2021/09/20/boris-johnson-news-joe-biden-usa-climate-change-cabinet/>

<sup>99</sup> Michael Schellenberger, "Why California's Climate Policies Are Causing Electricity Blackouts", Forbes, 15 August 2020.

<sup>100</sup> Australia Energy Regulator, "State of the Energy Market 2021: Retail Energy Market", accessed at <https://www.aer.gov.au/system/files/State%20of%20the%20Energy%20market%202021%20-%20Chapter%206%20-%20Retail%20energy%20markets.pdf>

of these economies -- where per capita electricity consumption rates are low and universal access to grid electricity is still lacking -- are policy priorities that are not likely to be compromised at the negotiations at COP26.

**Table 2.7: Renewables Share of Total Power Generation Growth 2009 – 2019**

(Terawatt-hours)	Absolute Change in Power Generation 2009-19			2019	
	Renewables	Total	increment % share Renewables/Total		% share of Renewable/Total
Canada	31.4	34.8	90.4%		8.0%
Mexico	24.1	54.8	44.0%		12.5%
US	333.8	204.7	163.1%		12.9%
<b>Total North America</b>	<b>389.4</b>	<b>294.3</b>	<b>132.3%</b>		<b>12.2%</b>
Chile	17.3	23.9	72.2%		28.0%
Peru	2.5	24.0	10.4%		6.2%
<b>Total S. &amp; Cent. America</b>	<b>142.3</b>	<b>256.1</b>	<b>55.6%</b>		<b>15.0%</b>
<b>Total Europe</b>	<b>569.6</b>	<b>97.4</b>	<b>584.7%</b>		<b>23.8%</b>
Russian Federation	1.3	125.0	1.1%		0.3%
<b>Total CIS</b>	<b>3.2</b>	<b>202.6</b>	<b>1.6%</b>		<b>0.6%</b>
<b>Total Middle East</b>	<b>13.4</b>	<b>445.7</b>	<b>3.0%</b>		<b>1.5%</b>
<b>Total Africa</b>	<b>32.7</b>	<b>235.9</b>	<b>13.9%</b>		<b>5.0%</b>
Australia	33.7	16.0	210.8%		18.8%
China	693.3	3788.8	18.3%		11.1%
Hong Kong, China	0.1	-1.9	-3.9%		0.3%
India	111.3	724.0	15.4%		9.7%
Indonesia	5.6	122.1	4.5%		6.1%
Japan	84.4	-83.7	-100.8%		12.5%
Malaysia	1.2	55.4	2.2%		2.0%
New Zealand	4.1	1.4	295.7%		25.1%
Philippines	3.6	44.1	8.2%		14.2%
Singapore	0.4	12.3	3.5%		1.8%
Korea	28.7	132.9	21.6%		6.5%
Chinese Taipei	5.3	44.0	12.1%		3.7%
Thailand	19.1	40.6	47.1%		11.6%
Vietnam	4.0	146.8	2.8%		4.0%
<b>Total Asia Pacific</b>	<b>1002.7</b>	<b>5204.1</b>	<b>19.3%</b>		<b>10.2%</b>
<b>Total World</b>	<b>2153.4</b>	<b>6736.1</b>	<b>32.0%</b>		<b>11.7%</b>
OECD	1108.3	528.1	209.9%		16.4%
Non-OECD	1045.1	6207.9	16.8%		8.5%
European Union	417.7	44.9	930.8%		25.6%

Source: BP Statistical Review of World Energy 2021

### iii. Energy Efficiency across Sectors

Energy efficiency improvements have long been held by its proponents as a means of attaining multiple policy objectives – it can help net-energy importing economies in the balance of payments account, reduce costs for households and firms, enhance national security and improve environmental outcomes. Given the widespread policy emphasis on energy efficiency, there is a clear need to assess how well such policies have fared in practice. In this section, “energy efficiency policies” refers to policies such as subsidies, standards, and labeling and information provision that attempt to directly encourage energy efficient investments but do not directly affect energy prices. Policies that adopt market-based incentives (MBIs) such as carbon taxes and cap-and-trade schemes are discussed separately in the section on carbon markets below

The discussion of energy efficiency in this section looks briefly at the background to the widespread adoption of energy efficiency policies around the world, followed by more examples of energy efficiency policies in the Asia-Pacific region. Energy efficiency policies that have been implemented are discussed next, followed by a critical evaluation the effectiveness of energy efficiency policies which include discretionary financial incentives, mandated technology and performance-based standards, and labeling and information programs. Finally, this section concludes with recommendations on how energy efficiency policymaking can be improved.

### Status of energy efficiency efforts in the Asia Pacific region

Improved energy efficiency refers to the reduction in energy consumed in delivering a given level of energy service (heating, lighting, locomotion, etc.).<sup>101</sup> Most economies typically set economy-wide targets in terms of energy intensity ratios. As we have already noted, energy intensity targets are a major component of NDCs. One reason for adopting the energy intensity metric is simply the ease with which these measures can be computed and interpreted.

Over the past two decades, the mounting concerns over global climate change have made the emission mitigation potential of energy efficiency investments a declared core benefit for many policy makers. The IEA predicts that the reduction in global CO<sub>2</sub> emissions needed to achieve the Paris Agreement goals and “net zero by 2050” in the longer term depend critically on energy efficiency measures as a key pillar.<sup>102</sup> It is therefore of no surprise that energy efficiency policies form an increasingly critical dimension to most economies’ overall economic growth agendas.

Most APEC member economies have adopted economy-wide energy efficiency targets. APEC member economies aim to achieve a reduction of 45% in energy intensity for the group by 2035 from the base year in 2005.<sup>103</sup> According to APERC data, energy intensity in the APEC region declined by just over 22% between 2005 – 2017, or as stated in the report, “49% of the way to the goal in 40% of the time”.<sup>104</sup>

At the aggregate economy-wide level, measures of energy intensity, expressed as the unit amount of energy used (in BTUs or kilograms or tonnes of oil equivalent) to produce a unit of GDP, are often the most-widely used metric to assess trends in energy use over time and across economies. While energy intensity has been declining over recent decades, the IEA states that it needs to improve by 4.2% per annum over 2020 – 2030 in order to achieve its sustainable development scenario which meets the goals of the Paris Agreement, and in the longer run, the “net zero by 2050” scenario.<sup>105</sup> The IEA target of 4.2% per annum is over 2.5 times the rate exhibited over the previous decade.

Two broad patterns can be discerned in the way in which energy intensity has evolved since 2000: higher income economies tend to have lower energy intensity levels, and energy intensity levels have fallen across the last 2 decades in most of the economies in the sample with the exceptions of rapidly industrializing middle and lower income economies of Malaysia, Thailand, and Vietnam. Among the OECD economies, Australia, Canada, and the US show progressive declines in the ratio over the period. As major natural resource producers, Australia and Canada are at higher absolute levels than resource-poor Japan but lower than Korea. The US has levels of energy intensity that lie somewhere between Australia and Canada, and somewhat higher levels than the OECD average. Japan has the lowest intensity ratios among the OECD group although, given low or negligible economic growth rates over the past 2 decades, its rate of energy intensity improvement is muted.

Figure 2.10 compares annual average % changes in energy intensities for two periods, 2000-2015 and 2015 – 2019. Global energy intensity improved 0.6% in the earlier period, and almost doubled this rate of improvement in the 4 years before the on-set of the covid pandemic in 2020. The OECD group improved its ratio at the same rate over both periods at 1.5% annual average. Australia, Canada, Japan, Korea, New Zealand, and the US improved at either similar or somewhat higher rates than the OECD average. Among the OECD members, Canada, New Zealand and the US exceeded the OECD average improvement in energy intensity the most during the 2000-2015 period.

<sup>101</sup> This is in distinction from what is strictly meant by “conservation” that is achieved by reducing the consumption of energy services at the cost of some personal comfort or satisfaction (say, driving less or buying small capacity refrigerators). In much of the efficiency literature, the terms are often used interchangeably.

<sup>102</sup> IEA, “Net Zero by 2050: A Roadmap for the Global Energy Sector”, July 2021, accessed at [https://iea.blob.core.windows.net/assets/bec9b956-0dcf-4d73-89fe-1310e3046d68/NetZeroBy2050-ARoadmapfortheGlobalEnergySector\\_CORR.pdf](https://iea.blob.core.windows.net/assets/bec9b956-0dcf-4d73-89fe-1310e3046d68/NetZeroBy2050-ARoadmapfortheGlobalEnergySector_CORR.pdf)

<sup>103</sup> Asia Pacific Energy Research Centre (APERC), “APEC Energy Overview 2019”, 2019, accessed at <https://aperc.or.jp/file/2020/9/14/APEC+Overview+2019.pdf>

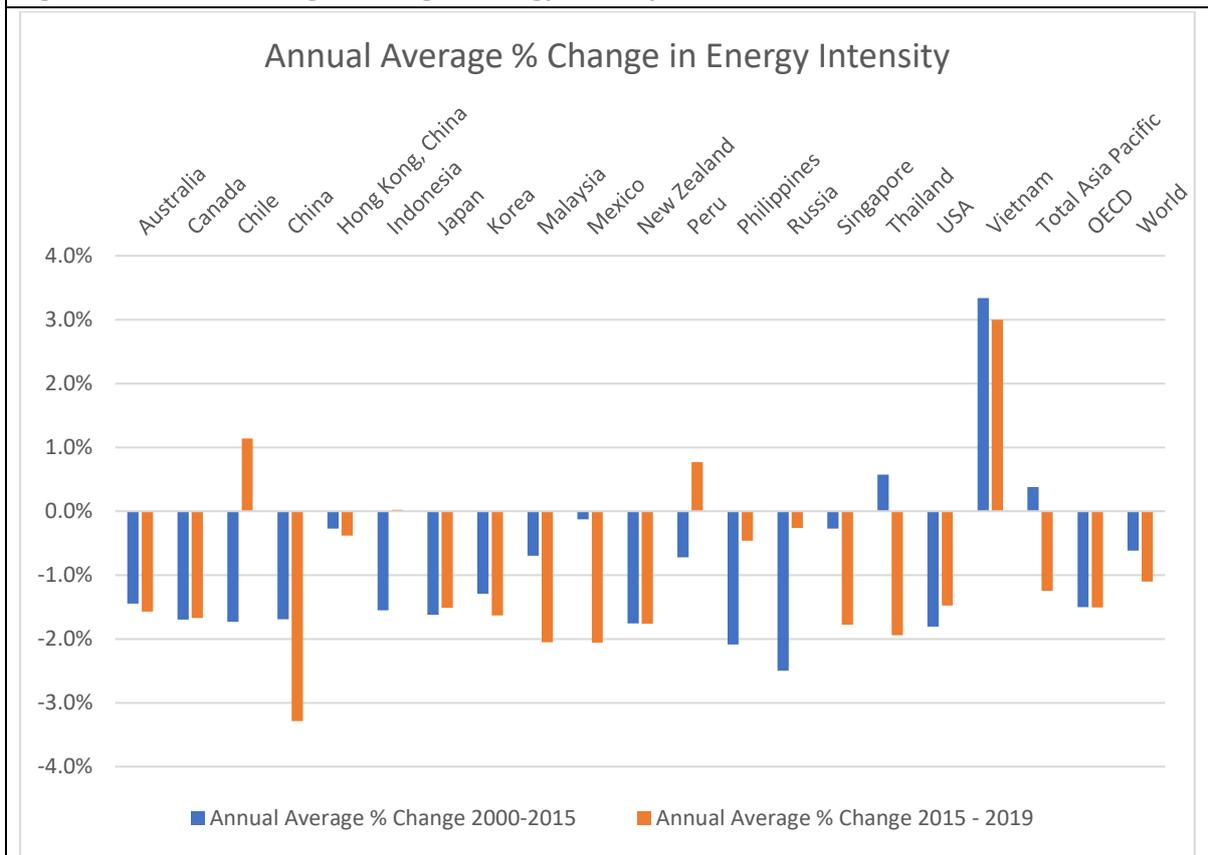
<sup>104</sup> Op. cit., p. iv.

<sup>105</sup> Op. cit., Table 2.3, p. 66.

In the non-OECD group, China, and Indonesia improved their annual average percentage change in energy intensity during 2000 – 2015 by between 1.6% to 1.7%, which is more than double the world’s 0.6% rate. Strikingly, during the same period, the Philippines and Russia improved their ratio by 2.1% and 2.5% respectively, most likely as a result of rapid economic growth (the denominator) and improved manufacturing processes and/or expansion of the services sector relative to manufacturing in their economies.

Hong Kong (China), Malaysia, Mexico and Singapore showed the lowest improvements, with annual rates ranging from 0.1% to 0.3% during 2000 – 2015. Only two economies showed a worsening in the annual average % change in the ratio during this period, with Thailand increasing by 0.6% and Vietnam by a remarkably high 3.3%. This is most likely due to their rapid growth in manufacturing and a sectoral shift from rural agriculture to urban manufacturing for significant proportion of the population.

**Figure 2.10: Annual Average % Change in Energy Intensity**



Source: World Bank Database; BP Statistical Review of World Energy 2021

When we turn to the more recent period from 2015 – 2019, the picture dramatically changes for many of the economies. Two economies, Chile and Peru show an increase in the ratio after the improvement in the previous period, at 1.1% and 0.8% respectively, that is a reversal in trend. Vietnam continued to show a worsening in energy intensity in the later period but at a slightly lower rate (from 3.3% to 3.0%). Some economies however show significant improvement in their performance relative to the earlier period, including China, Malaysia, Mexico and Singapore. Most show broadly similar or somewhat better rates of falling energy intensity in the more recent period relative to the previous: Australia, Canada, Hong Kong, Japan, New Zealand, and the US. The global average showed a significant improvement in annual reduction of energy intensity, from 0.6% to 1.1%.

Given the very broad nature of the measure of energy efficiency implied by the economy-wide energy intensity metric, this heterogeneity of results is no surprise. From the standpoint of reducing greenhouse gas emissions, however, the relevant indicator is energy consumption, or more accurately, fossil fuel combustion, and it does not necessarily matter whether the target is achieved through energy efficiency improvements or through compositional changes in the economy towards less energy-intensive industries.

Using simple energy/GDP ratios to compare even proximally the energy efficiency levels across economies is, however, misleading. Such ratios conflate different effects, including the evolving composition of economies towards less energy-intensive sectors, the impact of price trajectories of various energy fuels and of rising incomes of households and firms in growing economies.

### Energy efficiency policies and measures in the Asia-Pacific

Given the consistent and long running policy emphasis on energy efficiency across the Asia-Pacific region, the descriptive literature on the subject is voluminous.<sup>106</sup> In its dedicated webpage on energy efficiency, the IEA has collated among the most comprehensive databases of energy efficiency initiatives undertaken by governments in both the OECD and non-OECD regions of the world. The IEA's energy efficiency database lists "policies and measures" under 6 categories:

1. economic instruments;
2. policy support;
3. regulatory instruments;
4. information and education;
5. research, development and
6. deployment (RD&D).<sup>107</sup>

The sector targets for such "policies and measures" in the database include buildings, commercial and industrial equipment, energy utilities, industry, lighting, residential appliances, and transport. While sector-focused policies might have some common regulatory features, economies have typically implemented a distinct set of policies for each sector, rather than applying the same set of policies across all sectors.

### Buildings

According to the United Nations Environment Program (UNEP), buildings and their construction together account for 36 percent of global energy use and 39 percent of energy-related carbon dioxide emissions annually.<sup>108</sup> Most OECD members have mandatory codes for new and existing buildings, and such standards are being increasingly implemented in developing economies.

The most significant among such regulations are building energy codes i.e. energy efficiency requirements for new buildings where it is much less costly to integrate energy efficiency design and equipment improvements. Building energy codes can also serve as the efficiency target for refurbishments or other improvements of existing buildings.<sup>109</sup>

Most APEC economies had already long implemented building energy codes, although there are significant differences in coverage (residential vs. commercial buildings) and compliance mechanism (voluntary vs. mandatory codes).<sup>110</sup> In addition, a range of other policies have been used to promote energy efficiency improvements in buildings, including energy performance labeling, financial incentives, energy management and audits, lead-by-example programs (such as government 'test-beds' and demonstration projects), information and awareness programs, and research and development (R&D) programs.<sup>111</sup>

### Appliances

The technical potential for energy efficiency improvements in appliances is considerable according to engineering studies. According to one early report published in 2010, energy efficient standards and labeling programs aimed at improving the energy efficiency of equipment (including both appliances and lighting) can potentially lead to savings of 3,860 TWh of electricity by 2030.<sup>112</sup> To put that in context, the world's total electricity generation in 2010 was 21,325 TWh.<sup>113</sup>

<sup>106</sup>In Asia for instance, major studies that have summarized the region's energy efficiency policies include: "Compendium of Energy Efficiency Policies in APEC Economies", Energy Working Group, Asia Pacific Energy Research Center October 2017; "Energy Efficiency Indicators: A Study of Energy Efficiency Indicators in APEC Economies", Asia-Pacific Energy Research Centre and Institute of Energy Economics, 2001.

<sup>107</sup>The IEA energy efficiency database also includes "voluntary approaches" but since this is not directly a policy variable, it is left out of the list. See <http://www.iea.org/policiesandmeasures/energyefficiency>

<sup>108</sup> UNEP, "Global Status Report 2017", accessed at [https://www.worldgbc.org/sites/default/files/UNEP%20188\\_GABC\\_en%20%28web%29.pdf](https://www.worldgbc.org/sites/default/files/UNEP%20188_GABC_en%20%28web%29.pdf)

<sup>109</sup> International Energy Agency (2008). "Promoting Energy Efficiency Investments, Case Studies in the Residential Sector," IEA-OECD-AFD: Paris.

<sup>110</sup> <http://www.iea.org/textbase/nppdf/free/2008/PromotingEE2008.pdf>

<sup>111</sup> Asia Pacific Energy Research Center (APERC) (2003), op. cit.

<sup>112</sup> Asia Pacific Energy Research Center (2003), op. cit.; Hong et al. (2007), op. cit.

<sup>113</sup> McNeil, Michael A.; Letschert, Virginia E. and de la Rue du Can, Stephane (2008). *Global Potential of Energy Efficiency Standards and Labelling Programs*. Lawrence Berkeley National Laboratory.

<sup>114</sup> BP (2011). *Statistical Review of World Energy June 2011*.

It is not clear whether energy efficiency improvements in appliances in industrialized economies in the past 30 years have been driven primarily by efficiency standards, labeling, and incentive schemes. It is also a function of R&D focused on reducing running costs of such appliances and hence gaining market share among consumers. Nevertheless, government policies and regulations might have had a tangible influence on appliance energy efficiency.<sup>114</sup> There has been a proliferation of energy efficiency standards and labeling programs around the world, rising from only 12 in 1990 (largely concentrated in industrialized economies) to more than 60 by 2005.<sup>115</sup>

### **Transport**

Transportation accounted for approximately almost 25% of global carbon emissions in 2018 (see Table 2.3). All transport modes are projected to show substantial increases in activity and fuel use. In the future the impact of increased sales of electric vehicles in road transport vary widely (this is discussed on the section on electric vehicles). Oil is expected to continue to dominate overall transport energy and oil use to 2050.<sup>116</sup>

The IEA noted previously that policies that help to improve vehicle fuel economy are one of the most cost-effective measures for achieving an overall CO<sub>2</sub> reduction target of 50% below 2005 levels by 2050 across the transport sector, although now it advocates for rapid electrification of transport and banning the use of the internal combustion engine (ICE).<sup>117</sup> Most OECD members, including the EU and Japan, have pursued improvements in fuel efficiency of internal combustion engine vehicles via high levels of indirect taxes on gasoline and diesel sales.

In contrast, the US has very low rates of tax on transport fuels. Whereas the highest fuel taxes and prices tend to be in Europe, the US has both the lowest tax and the lowest fuel price among the OECD members. Instead, the US has pursued energy efficiency improvements primarily through mandated fleet efficiency standards on manufacturers, known as the Corporate Average Fuel Economy (CAFE) standards that were first implemented in 1975.<sup>118</sup> As covered in the discussion on EVs below, the US along with Europe has switched policies in favor of EVs.

APEC member economies have increasingly cut back on subsidies for transport fuels which cause wasteful inefficiencies and a burden on the public. This is in line with the APEC policy position to “Rationalize and phase out inefficient fossil-fuel subsidies that encourage wasteful consumption, while recognizing the importance of providing those in need with essential energy services, and set up a voluntary reporting mechanism on progress, which we will review annually”.<sup>119</sup>

The economic impact had been especially significant given that subsidies amounted to between 1-5% of GDP in most Asia-Pacific economies (such as Indonesia and Malaysia).<sup>120</sup> Subsidies reform have taken place in several APEC member economies over the past several years, as Figure 2.11 shows. The collapse of oil prices after mid-2014, in particular, gave governments an opportunity to cut back on transport fuel subsidies without too much impact on end-user prices.<sup>121</sup>

<sup>114</sup> Geller et al. (2006), op. cit.

<sup>115</sup> McNeil et al. (2008), op. cit.

<sup>116</sup> Salameh, M., “Oil Will Maintain Its Dominance During the 21<sup>st</sup> Century & Beyond”, IAEE Energy Forum, 2<sup>nd</sup> quarter 2018.

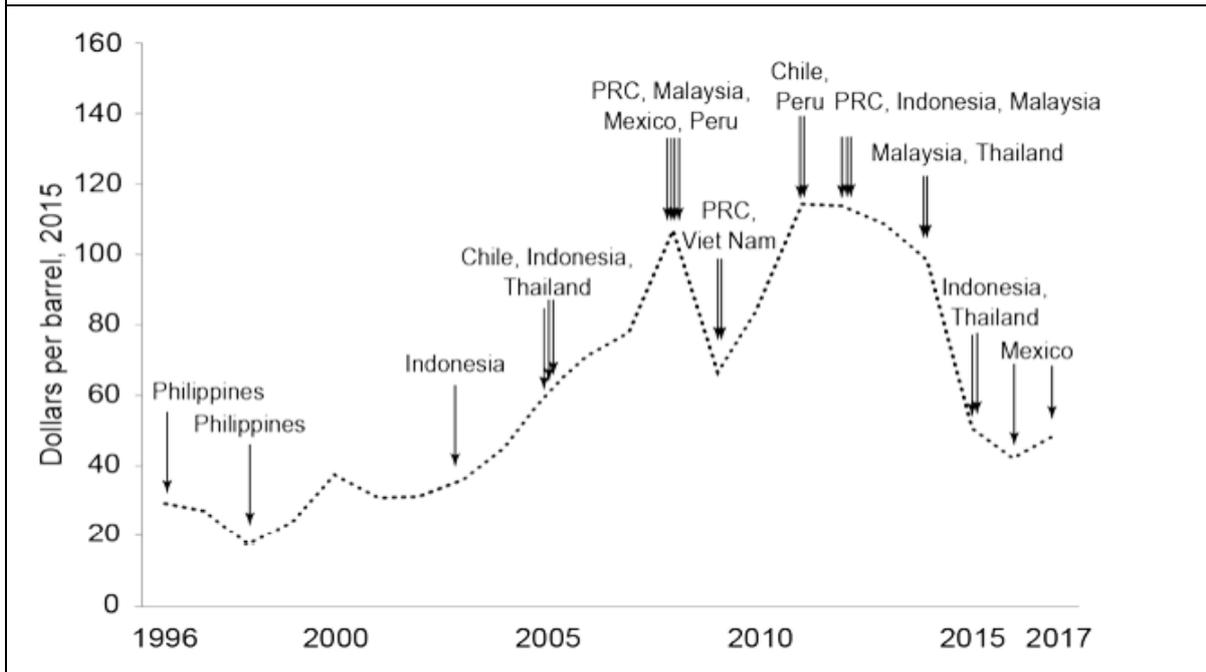
<sup>117</sup> Kojima, K., L. Ryan (2010), op. cit.; for the IEA’s current position on decarbonizing transport, see “Net Zero by 2050”, op. cit.

<sup>118</sup> Ibid.

<sup>119</sup> <https://www.apec.org/about-us/about-apec/fact-sheets/energy>

<sup>120</sup> IEA (2011), *World Energy Outlook 2011*.

<sup>121</sup> <https://www.wsj.com/articles/fuel-subsidy-cuts-threaten-energy-demand-in-asia-1412855366>

**Figure 2.11: Fuel Subsidy Reform in Selected APEC Member Economies**

Source: IEA, "Tracking Fossil Fuel Subsidies in APEC economies Toward a Sustained Subsidy Reform", 2017.

### Industry

In 2018, the industrial sector (excluding the energy transformation sector, such as refineries and power plants) accounted for over 18% of global CO<sub>2</sub> emissions (see Table 2.3). The energy transformation sector, which converts primary energy stored in energy sources (e.g. fossil fuels) into final energy for end-use sectors (in the form of refined fuels, electricity, etc.), is itself a major user of energy, accounting for 31% of the total primary energy consumption in the world in 2010.<sup>122</sup> In spite of this, the bulk of global energy efficiency policy efforts have centered on non-industrial energy use, in part because of the extreme heterogeneity of the industrial sector, ranging from such energy-intensive sectors such as cement and steel plants to energy utilities and other heavy industry sectors.<sup>123</sup>

Several economies have also implemented policies specifically directed towards improving power generation efficiency. This is motivated by the fact that globally, the power and heat generation sector accounts for over 40% of CO<sub>2</sub> emissions (see Table 2.3). These policies include in particular utility demand-side management (DSM) programs. Under these programs, utilities are required to operate energy efficiency programs, for instance by adopting time-of-use pricing to discourage peak demand or by providing cash incentives to consumers to reduce electricity demand when requested.<sup>124</sup> In economies where power generation is based on subsidized tariffs for retail users or subsidized feedstock for the power generators, there may be few incentives for efficiency improvements. The strain on public budgets can be further exacerbated by the lack of cost recovery in regulated power generation markets in many developing APEC member economies.

### Assessing energy efficiency policies in the Asia-Pacific region

Competitive markets help maximize the benefits of resource use across society by providing a mechanism to allocate these resources to the highest value user. But markets can fail to achieve this outcome due to market failures such as public goods, externalities or increasing returns to scale. The rationale for government intervention in a market-based economy rests on evidence of some type of market failure.<sup>125</sup> Two fundamental attributes are necessary for any successful regulatory intervention in market-based economies: (1) administrative and political viability; and (2) economic efficiency. Assuming that the higher-order requirement

<sup>122</sup> International Energy Agency (2012). *Energy Balances of Non-OECD Countries*, op. cit.

<sup>123</sup> UNIDO (2011). *Policies for Promoting Industrial Energy Efficiency in Developing Countries and Transition Economies*.

<sup>124</sup> Gillingham et al. (2006), op. cit.; Geller et al. (2006), op. cit.; Doris et al. (2009), op. cit.

<sup>125</sup> In the public choice literature, market failure provides a necessary but not a sufficient condition for government intervention, as there is always the case that governmental remedy may impose social costs that exceed the costs imposed by the original market failure. See, for instance, Demsetz. "Information and Efficiency, Another Viewpoint" in *The Journal of Law and Economics* p 1-21 (1969)

of viability is met, the focus then is on economic efficiency. The basic test of economic efficiency is cost-benefit analysis (CBA) which is also the basis of conducting what have been termed “regulatory impact assessments”.

### ***The ‘energy efficiency gap’ and government policy***

Despite the vital role energy efficiency plays in cutting fossil fuel use cost-effectively, it is claimed that “only a small part of its economic potential is exploited”.<sup>126</sup> The fact that cost-effective options to improve energy efficiency are not being adopted on a large scale has led to notions of the “energy-efficiency gap”. The ‘efficiency gap’, or the difference between the level of energy-efficiency actually achieved and the level judged to be optimal at prevailing prices, has generated considerable debate in policy circles as well as in the academic literature. This paradox – the non-adoption or slow diffusion of apparently cost-effective energy efficient technologies – has been the basis of a large literature on ‘market barriers’ which discourage investments in such technologies.<sup>127</sup> The notion of “barriers” to energy efficiency choices, understood as market conditions which discourage energy efficiency investments relative to an estimated optimal level, is a staple of many large scale studies of energy efficiency. The primary barrier is insufficient implementation of existing cost-efficient technologies.”<sup>128</sup> The IEA observed that “the existence of a number of barriers that discourage decision makers, such as households and firms, from making the best economic choices”.<sup>129</sup>

As noted in the previous section, APEC members have invested considerable efforts in the promotion of energy efficiency. The wide-range of government energy efficiency policies and initiatives implemented can be broadly classed under three types of policy or regulatory instruments: subsidies, technology or performance-based standards, and information and labeling programs.

### ***Subsidies***

Governments in the region have implemented a range of financial incentives and other subsidies such as cash grants, cheap credit, tax exemptions and co-financing with public-sector funds to encourage a range of energy efficiency initiatives across several sectors. Subsidies for building retro-fit and home insulation, tax exemptions or cash grants for upgrading of industrial machinery, subsidies to households and firms to purchase energy efficient appliances, heating or air-conditioning systems and other equipment are typical examples.

Another rationale for government subsidies and financial incentives for encouraging energy efficiency investments relates to the claim that consumers have high discount rates – that is, they typically put too little weight on future energy savings, and too much on upfront costs, when buying energy efficient appliances. Uncertainty over future energy savings, hidden costs such as costs of searching new products or reductions in other desirable product characteristics, the irreversibility of investments and the associated option value of waiting, are some of the reasons offered by economists to explain high discount rates.

### ***Mandated Standards***

Governments have implemented a vast array of standards based on technology or performance-based criteria to promote energy efficiency. Building codes, minimum energy performance standards for energy-using consumer durables, and standards for fuel efficiency in automobiles in the US are some of the more obvious examples of government-mandated standards. These standards are usually implemented on the basis of cost-benefit analyses which purport to show net benefits which result from restricting private choices by mandatory standards.

### ***Labels and information programs***

There is a class of market failures arising from information asymmetry, where one party to a transaction has more or better information than the other party. The principal–agent problem describes a situation where one party (the agent), a builder or landlord, decides the level of energy efficiency in a building, while a second party (the principal), such as the purchaser or tenant, pays the utility bills.<sup>130</sup> A first-best policy solution for this sort of market failure could be the provision of credible information by a disinterested 3<sup>rd</sup> party (possibly a government agency) about a building’s energy attributes, so that buyers or renters can credibly ascertain the present value of net energy savings (under given fuel price scenarios).

<sup>126</sup> IEA, *World Energy Outlook 2012*, p. 269.

<sup>127</sup> See references cited in Sutherland, R. J., “Market barriers to energy efficiency investments”, *The Energy Journal*, Vol 12, No 3, 1991, pp. 15 – 34.

<sup>128</sup> See Carlsmith, R., Chandler, W., McMahon, J., and Santino, D., 1990. “Energy Efficiency: How far can we go?”, Oak Ridge National Laboratory.

<sup>129</sup> IEA, *World Energy Outlook 2012*, p. 280.

<sup>130</sup> Jaffe, A. and Stavins, R. “The energy paradox and the diffusion of conservation technology”, *Resource and Energy Economics* 16 (1994), pp. 91 – 122.

Perhaps the most fundamental observation on optimal energy efficiency policy is that energy conservation cannot be mandated or imposed centrally, but requires information and incentives to be provided to energy users who make their own choices and adjustments. If households and firms are poorly informed about energy efficiency improvements that can be profitably exploited, an information disclosure policy is appropriate. It thus behooves analysts to assess government energy efficiency policies with a high degree of clarity as to what constitutes costs and benefits as perceived by private decision-makers, and why they could systematically diverge from expert views of costs and benefits.

“Energy efficiency” is strictly an engineering concept, measuring the ratio of output of final or useful energy to a unit of fuel input. In this sense, “maximizing energy efficiency” is different from and not necessarily consistent with what economists mean by *economic efficiency*. Energy efficiency should not be considered a goal in itself, but a means of achieving economically efficient resource allocation.<sup>131</sup> If energy use leads to GHG emissions, then the appropriate policy tool would be to apply a tax or a cap-and-trade scheme on the energy input equivalent to the harm that such emissions are expected to cause (see the discussion on social costs of carbon in the next section). In the analysis of the various behavioral attributes of individual decision making in energy technology choices, it is important to note that there may be instances where no necessary policy or regulatory implications emerge.

#### iv. *Electric Vehicles in Road Transport*

Numerous economies, including some APEC members, have proposed future bans on the sale of ICE vehicles to promote the purchase and use of electric-powered cars. Given that transport accounts for almost a quarter of carbon emissions -- the second most important carbon-emitting sector after the power and heat generation sector -- many have adopted a number of policies such as subsidies for BEVs, higher taxes for fuel and/or ICE vehicles, tax-payer funded charging stations and other policies to encourage BEVs.

**Table 2.8: Economies with Proposed Bans on Diesel and Gasoline Cars**

Economy	Ban Start Date
Norway	2025
Denmark	2030
India	2030
Ireland	2030
Israel	2030
Netherlands	2030
UK (Scotland)	2032
Spain	2040
Chinese Taipei	2040
UK (Except for Scotland)	2040
China	2040
Singapore	2040
France	2040
Germany	2050

Source: various newspapers; World Atlas accessed at <https://www.worldatlas.com/articles/countries-that-will-ban-gasoline-cars.html>

Note: These proposed bans have been announced or discussed by various authorities in the jurisdictions but may not have instituted legislation or legally-sanctioned notices to such proposed bans. The likelihood of these proposed bans being implemented is not ascertainable.

There is currently much optimism about the prospects for EVs to replace the internal combustion engine in passenger transport. There are a range of forecasts for BEVs or Plug-in Hybrid Electric Vehicles (PHEVs), some of which are driven by the expectations of very aggressive emission mitigation policies being adopted worldwide. Nevertheless, there are more skeptical views that suggest the disadvantages of EVs such as limited driving range,

<sup>131</sup> See, for instance, Jaffe A, Newell R, Stavins R. 2004. “The Economics of Energy Efficiency”, *Encyclopaedia of Energy*, ed. C Cleveland, pp. 79–90. Amsterdam: Elsevier

long charging times and high costs will limit the uptake of EVs and suggest a far longer period for its use to become pervasive (see Table 2.9).

**Table 2.9: Comparisons between ICE and EV vehicles for price and range gaps**

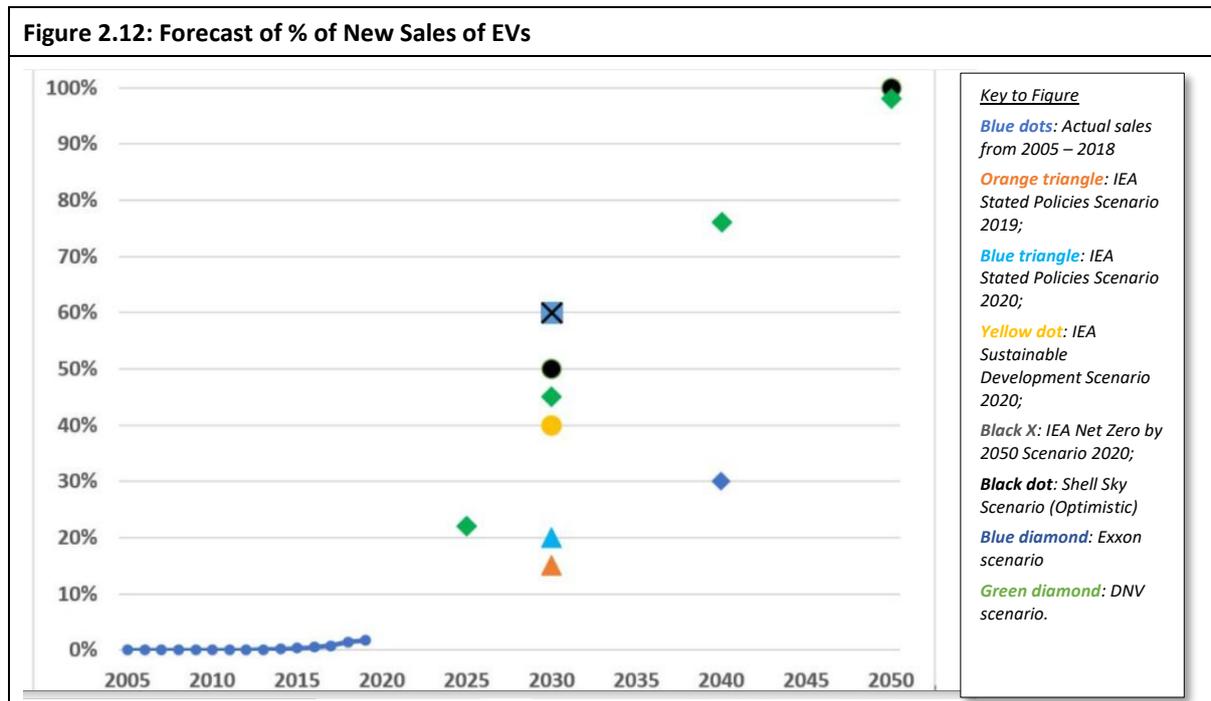
Electric vehicle:	Chevy Bolt	Ford F150 EV	Chevy Silverado EV	Dodge Ram EV	SUV EV Composite	SUV EV Composite
ICE vehicle:	Toyota Camry	Ford F150	Chevy Silverado	Dodge Ram	Toyota RAV4	Honda CRV
EV price (\$, thousands)	\$32.0	\$70.0	\$50.0	\$70.0	\$44.8	\$44.8
ICE price (\$, thousands)	\$26.0	\$30.6	\$29.0	\$30.5	\$27.4	\$26.5
Price gap (\$, thousands)	\$6.0	\$39.4	\$21.0	\$39.5	\$17.4	\$18.3
Price gap (%)	23%	129%	72%	130%	64%	69%
ICE range - EV range (miles)	193	320	208	268	155	134
ICE units sold (2020)	294,000	787,000	593,000	564,000	430,000	324,000

Source: Cembalest, M., "Eye on the Market: 2021 Annual Energy Paper", JP Morgan Asset and Wealth Management, 2021.

Figure 2.12 provides various forecast EV sales as percentage of total vehicle sales. At the more conservative end, Exxon forecasts that EVs will constitute 30% of new vehicle sales by 2040. At the other end, the most optimistic scenario is by the IEA in its "net zero by 2050" scenario which forecasts 60% of all new vehicles by 2030 will be made up of EVs.

There is a significant body of research that suggests that the replacement of conventional fossil-fueled cars with EVs would likely have a relatively small impact on global emissions.<sup>132</sup> There are two aspects to this question. The first relates to the source of electricity used to charge EV batteries and the second relates to "full-cycle costs".

If the electricity used to charge an EV battery is produced by wind, nuclear, solar, or hydro power, then the CO2 emissions will be significantly lower than those from ICE vehicles. However, if the CO2 emissions from electricity production are high, then driving an EV could well increase total CO2 emissions, and would imply that shifting emissions from the tail-pipe of the vehicle to the power station does little for emission mitigation.<sup>133</sup>



Source: Lynch, M. "Electric Vehicles: Fact Vs. Myth", 25 September 2021, accessed at <https://jpt.spe.org/twa/electric-vehicles-fact-vs-myth>

<sup>132</sup> See for instance Mills, M., "The tough calculus of emissions and the future of EVs", 21 September 2021, accessed at <https://techcrunch.com/2021/08/22/the-tough-calculus-of-emissions-and-the-future-of-evs/>

<sup>133</sup> Asaithambi, G.; Treiber, M.; Kanagaraj, V. "Life Cycle Assessment of Conventional and Electric Vehicles". In International Climate Protection; Palocz-Andresen, M., Szalay, D., Gosztom, A., Sipos, L., Taligás, T., Eds.; Springer International Publishing: Cham, Switzerland, 2019; pp. 161–168 (cited in Coilín ÓhAiseadha et al, op cit.)

A further consideration often ignored is that the most important component in the EV is the lithium-ion rechargeable battery which relies on critical mineral commodities such as cobalt, graphite, lithium, and manganese. When tracing the extraction and processing costs of these minerals, in what is called full-cycle economics, it becomes apparent that EVs create heavy demand for mining and processing of minerals upstream. A recent United Nations report warns that the raw materials used in electric car batteries are highly concentrated in a small number of economies where environmental and labor regulations are weak.<sup>134</sup> Thus, battery production for EVs is driving a boom in small-scale or “artisanal” cobalt production, which can account for up to a quarter of its production in some economies (such as in Congo), have been found to be dangerous and employ child labor.<sup>135</sup>

In 2020, there were 7.2 million battery EVs constituting about 1% of the total vehicle fleet.<sup>136</sup> The scale of mining for raw materials involved in replacing the world’s gasoline and diesel-fueled cars with EVs is vast. For example, Professor Michael Kelly estimates that if we replace all of the UK vehicle fleet with EVs, assuming they use the most resource-frugal next-generation batteries, we would need the following materials: about twice the annual global production of cobalt; three quarters of the world’s production lithium carbonate; nearly the entire world production of neodymium; and more than half the world’s production of copper in 2018.<sup>137</sup>

A major report recently issued by the IEA on the mining and refining of critical minerals required not only for EVs but also for solar and wind power components concludes that current plans for EVs, along with those for wind and solar, will require a 300% to 4,000% increase in global mine output for the necessary range of key minerals<sup>138</sup>. According to consultants Wood MacKenzie, if EVs constituted 10% of the global vehicle fleet, up from less than 1% currently, demand for mineral commodities would reach “untenable levels”.<sup>139</sup> The vast increases in the supply of the raw materials listed above would go far beyond known reserves. An increase in the global demand for minerals and rare earths needed for wind and solar energy components and electric vehicle batteries would lead to supply responses which may have differential impacts upon various APEC economies. Those APEC member economies that have resource endowments which include such minerals and rare earths such as Australia, Canada, the US, Russia, the Philippines and Papua New Guinea would benefit from the rents derived from an increasing demand profile. In this context, the need for transparency and appropriate governance of mining operations from the standpoint of environmental, social and governance aspects (such as human rights, youth and gender outcomes, employment conditions, etc.) would present a critical role for the APEC and G20 forums to cover and report on.

#### v. *Carbon Capture and Storage*

In terms of mitigating CO<sub>2</sub> emissions, the implementation of carbon capture and storage or sequestration (CCS) technology has much appeal. If the capture and long-term sequestration of emissions were economically scalable, the continued use of fossil fuels, and modern industrial civilization with existing technologies could theoretically be sustainable in the long run. There would not arise the need for a vast and wrenching industrial transformation – with all the challenges it would pose to human behavior and long held expectations of increasing affluence especially in the developing economies -- as discussed above.

However, the technology for CCS is far from demonstrated and despite significant investments in R&D for a range of CCS technologies (such as direct air carbon capture), there exist few projects in the world today.<sup>140</sup> After over two decades of R&D and support for “demonstration” plants, by the end of 2020 carbon capture and storage (CCS) facilities stored just 0.1% of global CO<sub>2</sub> emissions.<sup>141</sup> Many projects faced cost overruns, outright failure of high profile projects such as the Kemper plant in Mississippi<sup>142</sup>, the withdrawal of financial support by government (e.g. FutureGen),<sup>143</sup> and high profile failures in the oil and gas sector.<sup>144</sup>

<sup>134</sup> [https://unctad.org/en/PublicationsLibrary/ditcom2019d5\\_en.pdf](https://unctad.org/en/PublicationsLibrary/ditcom2019d5_en.pdf)

<sup>135</sup> <https://europe.autonews.com/article/20180220/COPY/302209953/cobalt-mines-linked-to-child-labor-thrive-in-rush-for-ev-batteries>

<sup>136</sup> <https://www.iea.org/reports/global-ev-outlook-2020>

<sup>137</sup> <https://www.thegwgf.org/content/uploads/2020/05/KellyDecarb-1.pdf>

<sup>138</sup> <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>

<sup>139</sup> <https://www.woodmac.com/news/opinion/can-metals-supply-keep-up-with-electric-vehicle-demand/>

<sup>140</sup> This excludes the long-established infrastructure in the US and the Middle East for carbon dioxide-assisted enhanced oil recovery with the gas stored in depleted oil wells. See [https://www.globalenergyinstitute.org/sites/default/files/020174\\_EI21\\_EnhancedOilRecovery\\_final.pdf](https://www.globalenergyinstitute.org/sites/default/files/020174_EI21_EnhancedOilRecovery_final.pdf)

<sup>141</sup> Cembalest, M., “Eye on the Market: 2021 Annual Energy Paper”, J. Morgan Asset and Wealth Management, 2021.

<sup>142</sup> <https://www.geoengineeringmonitor.org/2017/03/pioneering-coal-plant-with-ccs-isnt-viable-admits-ceo/>

<sup>143</sup> <https://reneweconomy.com.au/futuregens-demise-another-blow-to-ccs-48915/>

<sup>144</sup> <https://www.upstreamonline.com/energy-transition/blow-for-ccs-chevrons-giant-carbon-capture-project-falling-short-of-targets/2-1-1041696>

The key hurdle is the 15–30% of energy that is consumed to capture CO<sub>2</sub> from the power plants; the costs make the economics unfeasible.<sup>145</sup> The next stage, after capture, is storage, and this requires suitable geological sites such as saline aquifers or abandoned oil fields. The risks of storage leaks and liability issues constitute further hurdles to successful projects.

More R&D into CCS has been widely called for, despite the decades of research and investment already undertaken with few results.<sup>146</sup> While the direction of technological advances in any endeavor can never be determined in advance, it is interesting that a leading investment bank would make this skeptical assessment of the many claims made for the outlook for this technology: “The highest ratio in the history of science: the number of academic papers written on CCS divided by real-life implementation of it.”<sup>147</sup>

#### vi. Hydrogen

The appeal for hydrogen as a means of mitigating carbon emissions, as with CCS, lies in its apparent simplicity. Instead of combusting hydrocarbons (fossil fuels) we can leave out the carbon part, burn just the hydrogen and emit nothing but pure water vapor. The idea of replacing fossil fuels with hydrogen is not new, and President George W. Bush mentioned the coming “hydrogen economy” in his 2003 State of the Union Address where he launched his Hydrogen Fuel Initiative.<sup>148</sup>

In March 2019 the Government of Japan released its third Strategic Roadmap for Hydrogen and Fuel Cells which would increase domestic uptake of hydrogen as a viable way to increase its energy self-sufficiency; decarbonize its economy; increase industrial competitiveness; and position Japan as a fuel cell technology exporter.<sup>149</sup> In its 2019 National Hydrogen Strategy, Australia outlined goals to become a major producer and exporter by 2030.<sup>150</sup> The European Commission’s 2020 economic recovery plan “NextGenerationEU” describes hydrogen as “an investment priority to boost economic growth and resilience, create local jobs and consolidate the EU’s global leadership.”<sup>151</sup> In August 2020, Saudi Arabia announced a \$5 billion hydrogen plant – the world’s largest clean hydrogen plant to date. During the past year, both Saudi Aramco and the UAE’s national oil company ADNOC have completed shipments of ‘blue ammonia’ to Japan. These shipments, seeking to prove the concept, were produced from hydrogen with carbon capture, combined with nitrogen to produce ammonia as a carrier fuel.

International enthusiasm for the “hydrogen economy”, thus, is very high. There are over 30 economies with hydrogen roadmaps, 228 large-scale hydrogen projects announced with 85 per cent located in Europe, Asia, and Australia, and with more than \$300 billion earmarked for spending through 2030.<sup>152</sup> The enthusiasm for the “hydrogen economy” across the world is evidenced by the large funding provided to R&D focused on hydrogen production and transport. Figure 2.13 provides estimates for the R&D expenditures across key economies that have been interested in this technology from early on.

<sup>145</sup> Wilberforce, T.; Baroutaji, A.; Soudan, B.; Al-Alami, A.H.; Olabi, A.G. Outlook of carbon capture technology and challenges. *Sci. Total Environ.* 2019, 657, 56–72 (cited in Coilín ÓhAiseadha et al, op cit.)

<sup>146</sup> For instance, In Copenhagen, a consortium of companies, research institutes and universities, reports it will file a grant application with Denmark’s Energy Technology Development and Demonstration Program to support a pilot project that would permanently store up to 8 million metric tons per year of CO<sub>2</sub>. This is roughly 25% of Denmark’s total carbon emissions. If approved, the project could start by the end of 2021, with the offshore injection pilot staged in late 2022. See INEOS Energy, “Danish North Sea CCS Project Seeks Funding”, 18 August, 2021 accessed at <http://lenergyreports.com/articles/visitor.php?keyword=RVO>

<sup>147</sup> Cembalest, M., op cit.

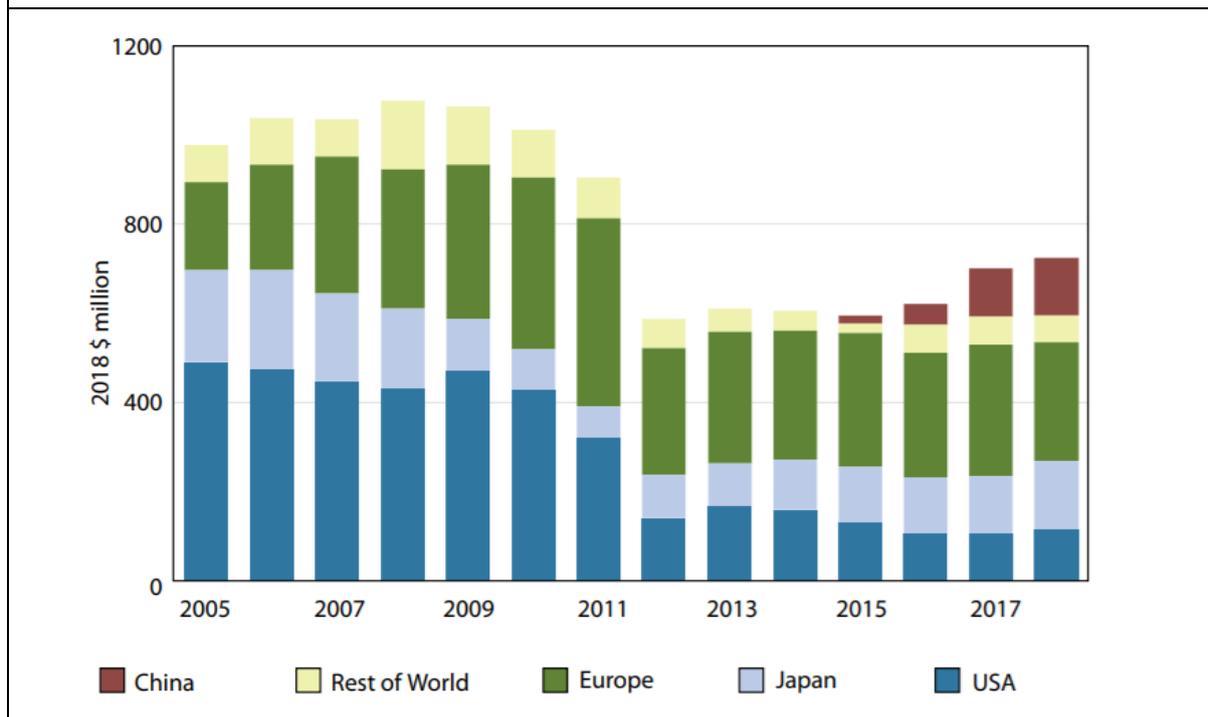
<sup>148</sup> <https://georgewbush-whitehouse.archives.gov/ceq/clean-energy.html>

<sup>149</sup> <https://www.mfat.govt.nz/en/trade/mfat-market-reports/market-reports-asia/japan-strategic-hydrogen-roadmap-30-october-2020/>

<sup>150</sup> <https://www.industry.gov.au/data-and-publications/australias-national-hydrogen-strategy#>

<sup>151</sup> See [https://ec.europa.eu/commission/presscorner/api/files/attachment/865942/EU\\_Hydrogen\\_Strategy.pdf.pdf](https://ec.europa.eu/commission/presscorner/api/files/attachment/865942/EU_Hydrogen_Strategy.pdf.pdf)

<sup>152</sup> Hydrogen Council, “Hydrogen Insights: A perspective on hydrogen investment, market development and cost competitiveness”, February 2021 accessed at <https://hydrogencouncil.com/wp-content/uploads/2021/02/Hydrogen-Insights-2021-Report.pdf>

**Figure 2.13: Government R&D expenditure on hydrogen and fuel cells 2005 - 2018**

Source: IEA, "The Future of Hydrogen: Seizing Today's Opportunities", 2019 (International Energy Agency: Paris).

Note: Government spending includes European Commission funding, but does not include sub-national funding, which can be significant.

The term "hydrogen economy" is used to cover the uses of hydrogen as the main fuel for heat, vehicles, energy storage and the long-distance transport of energy.<sup>153</sup> The reforming of methane to extract hydrogen, as already mentioned, emits carbon dioxide and so requires CCS which is not only prohibitively costly but unproven at the required scale (see the previous section). Hydrogen produced via steam reforming with CCS to capture the CO<sub>2</sub> that is emitted is termed "blue" hydrogen. The other method of extracting hydrogen is electrolysis of water which is exceedingly inefficient, expensive, and energy-intensive. Producing green hydrogen is characterized by high capital expenditure, low productivity, and significant energy losses.<sup>154</sup> For instance, it is estimated that generating enough green hydrogen to meet a quarter of global energy needs would take more electricity than the world generates today from all sources combined.<sup>155</sup>

Estimated abatements costs of carbon emissions by the hydrogen route is far in excess of the social cost of carbon estimated by the extant climate-economy models employed by the IPCC (see discussion in Section 3a). In other words, extracting, transporting, and using hydrogen costs more than the human welfare benefits it implies by reducing carbon emissions. The empirical evidence thus suggests that attempts to create a "hydrogen economy" fails the cost-benefit test and hence is economically infeasible at the current state of technology.<sup>156</sup> Hydrogen economy advocates argue that to make hydrogen feasible 'demand needs to be created to drive down costs, and a wide range of delivery infrastructure needs to be built'.<sup>157</sup> They argue for US\$150 billion in cumulative subsidies to 2030. Modelling undertaken in Australia suggests a limited role of hydrogen until the cost falls significantly.<sup>158</sup> One of the reasons given by the authors of the Australian study for their result is the lack of a carbon price or equivalent market signal for activities other than renewable electricity production that would bring forward investment in zero-emission technologies at scale.

<sup>153</sup> Hydrogen Council, "Hydrogen Insights: A perspective on hydrogen investment, market development and cost competitiveness", February 2021 accessed at <https://hydrogencouncil.com/wp-content/uploads/2021/02/Hydrogen-Insights-2021-Report.pdf>

<sup>154</sup> Constable, J., op cit.

<sup>155</sup> <https://www.bloomberg.com/news/articles/2020-10-27/green-power-to-draw-11-trillion-investment-by-2050-bnef-says>

<sup>156</sup> Constable, J., "Hydrogen: the Once and Future Fuel", Global Warming Policy Foundation, Working Paper, 2020, accessed at <https://www.thegwpcf.org/content/uploads/2020/06/Hydrogen-Fuel.pdf>

<sup>157</sup> <https://data.bloomberglp.com/professional/sites/24/BNEF-Hydrogen-Economy-Outlook-Key-Messages-30-Mar-2020.pdf>

<sup>158</sup> [https://www.futurefuelsrcr.com/wp-content/uploads/RP1.1-01\\_Final-Scenario-ReportPublic-Release-210924d.pdf](https://www.futurefuelsrcr.com/wp-content/uploads/RP1.1-01_Final-Scenario-ReportPublic-Release-210924d.pdf)

### 3. Carbon Markets, Carbon Prices and Carbon Trade Border Adjustments<sup>159</sup>

Many Parties communicated in their NDCs for the COP26 summit on the need for carbon pricing in their targets for emission reduction.<sup>160</sup> Almost all Parties provided information on “voluntary cooperation”, with the share of Parties stating that they plan to or will possibly use some form of voluntary cooperation more than doubling since their previous NDCs.<sup>161</sup>

One of the keys to increased ambition expected of Parties under the Paris Agreement at COP26 lies in the implementation of Article 6 of the agreement.<sup>162</sup> Article 6 aims at assisting governments in implementing their NDCs through voluntary international cooperation. This cooperation mechanism, if properly designed, should make it easier to achieve emission reduction targets and raise ambition. In particular, Article 6 could also establish a policy foundation for an emissions trading system, which could help lead to regional and global prices on carbon. Given that projected climate change damage imposed on life and property in any location is independent of the actual site of carbon emissions anywhere on the planet, it makes sense to reduce emissions where it is cheapest irrespective of location.

The rationale for Article 6 is that the joint implementation of projects between industrialized and developing economies would offer the benefits of lowering costs of emission reduction since it is typically cheaper to curb emissions in developing economies than in the developed ones which have already reduced emissions wherever it was affordable to do so. It would also lead to technology transfer and financing opportunities. Financially-constrained developing economies would have incentives to participate via Article 6 in promoting GHG emission reduction projects which can qualify for audited and certified “carbon credits” which can then be sold to developed economy buyers who exceed their allowances.

Article 6 of the Paris Agreement parallels the Clean Development Mechanism (CDM) which was designed for non-Annex 1 economies under the previous Kyoto Protocol. While non-Annex 1 economies did not have GHG emission restrictions, they had financial incentives to participate via CDM in promoting GHG emission reduction projects in their economies (against an agreed BAU projections).<sup>163</sup> Carbon market mechanisms can allow businesses to trade both carbon credits and carbon offsets within economies and across borders.<sup>164</sup> The potential terms of this trade are outlined in Article 6 of the Paris Agreement but issues over measurement, reporting, and verification (MRV) have meant that no proposals have been accepted by all Parties to date.

Under Article 6, businesses in economies with low emissions would be allowed to sell their excess allowances to larger emitters from other economies, with an overall cap of carbon emissions, ensuring their net reduction. In a fungible international market for carbon credits, supply and demand for such credits would lead to the establishment of a global carbon price that would tie the negative externalities of carbon emissions to those responsible for such emissions. Through this approach, it is argued, carbon emissions would undergo a strong decline, coupled with incentives for innovative and cleaner technologies and an overall transition towards a low-carbon economy at a global level.

#### a. Global Integrated Assessment Models and the Social Cost of Carbon

Estimates of the costs and benefits of carbon pricing at the global level are based on large Integrated Assessment Models (IAMs) which require a large data base and set of assumptions that tie together climate change processes with human economic activity (a climate science model) to measure tangible costs and benefits to human welfare (an economic model) of various levels of greenhouse gases cumulated into the atmosphere over the very long run (over the next 50 – 100 years and beyond).

<sup>159</sup> This section draws on previous research by the author. See Doshi, T. (2018). “Costs and Benefits of Market-Based Instruments in Accelerating Low-Carbon Energy Transition”, chapter in Venkatchalam Anbumozhi, Kaliappa Kalirajan and Fukunari Kimura (Eds.), “Unlocking the Potentials of Private Sector Financing for Accelerated Low-Carbon Energy Transition”. (Springer, 2018), pp. 239 – 276.

<sup>160</sup> UNFCCC, op cit., “Nationally determined contributions under the Paris Agreement: Synthesis report by the secretariat”.

<sup>161</sup> UNFCCC, op cit., “Nationally determined contributions under the Paris Agreement: Synthesis report by the secretariat”.

<sup>162</sup> International Chambers of Commerce, “Article 6: What is it and why is it important?”

<sup>163</sup> UNFCCC, “The Clean Development Mechanism”, undated, <https://unfccc.int/process-and-meetings/the-kyoto-protocol/mechanisms-under-the-kyoto-protocol/the-clean-development-mechanism>

<sup>164</sup> A carbon credit represents ownership of a unit of GHG (typically a ton of CO<sub>2</sub>-equivalent) that can be sold to another entity. A carbon offset represents ownership of a unit of reduction of CO<sub>2</sub>- equivalent emission which results in the generation of a carbon credit, based on an emission-reduction project which is verified with audited measurement, reporting and verification processes that meet legal standards in the operating jurisdiction.

Many IAMs have been built and used to estimate the social cost of carbon (SCC)<sup>165</sup> and evaluate alternative emission abatement policies. These models have crucial assumptions and sensitivities that affect causal relationship between human activity (including the combustion of fossil fuels), climate change and human welfare that make their use as a basis for policy proposals extremely contentious. For the purposes of this paper, it is important to emphasize that the global costs and benefits of carbon pricing are subject to many assumptions and uncertainties. IAM-based analyses of climate policy may create a perception of knowledge and precision, but that perception may be illusory and misleading.<sup>166</sup>

Despite the deep uncertainties inherent to IAMs, it is nevertheless instructive to use an example such as William Nordhaus' Dynamic Integrated Climate-Economy (DICE) model that "integrates in an end-to-end fashion the economics, carbon cycle, climate science, and impacts in a highly aggregated model that allows a weighing of the costs and benefits of taking steps to slow greenhouse warming."<sup>167</sup> According to Nordhaus, the net benefits of an optimally calibrated carbon tax that is simultaneously implemented by all governments around the world, and is maintained at the (time-varying) optimal level through the year 2100 is \$3 trillion. It is also clear from the Nordhaus model that a misapplication of carbon tax or an emission trading scheme (ETS) can lead to very high net costs. Indeed, overly high taxes can be worse than no tax at all.

This brief discussion of IAMs suggest that in discussions of costs and benefits of market-based instruments to promote a sustainable low-carbon energy transition path, sufficient care be taken to ensure that steep costs are not imposed by policies that are based on faulty modelling or wrong (or extreme) assumptions. The Nordhaus model base case, for instance, projects a net benefit of \$3 trillion with relatively modest initial carbon prices increasing over time. This provides a basis for attempting to make reasonable policy proposals for some level of carbon tax (or a comparable ETS system), even if it is at relatively low levels. The policy lesson, in the context of uncertainty in the modelling of complex systems, would be to "do no harm" in the first instance, by avoiding premature energy transitions effected at great cost by putting too high a price on carbon.

#### b. Market Based Instruments vs. Discretionary Instruments

Respondents to PECC's survey tended to focus on APEC's traditional areas of work, i.e. reducing barriers to trade and investment in renewable energy components and equipment in the region. This is an issue APEC members have a clear track record on with their commitment to reduce tariffs on a specific list of environmental goods in 2012. With the rapid developments in technology this list may be out of date and need revisiting. A further issue that needs to be explored is what constitutes an environmental service.

After work on APEC's core area of trade came work to reduce environmentally harmful fossil fuel subsidies. These have been previously discussed in this chapter.

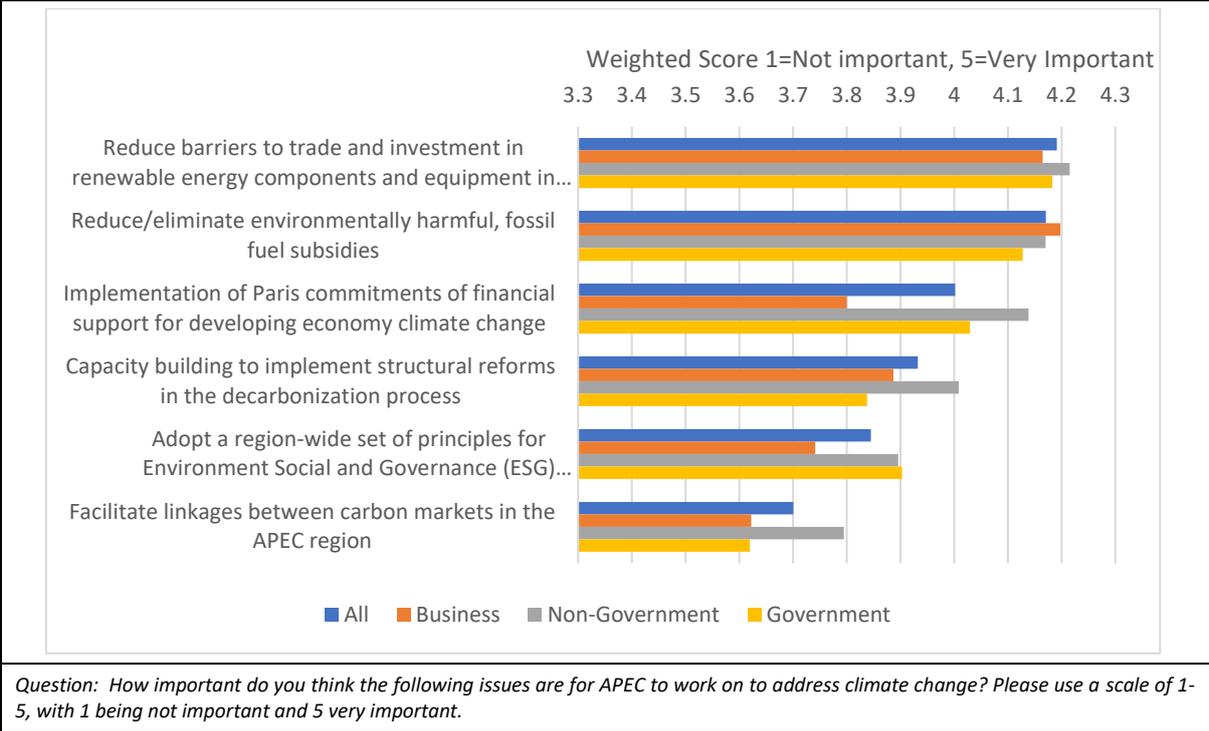
There was some significant difference on specific issues, for example while 84 percent of respondents from Pacific South America and 77 percent of Southeast Asian respondents thought that it was important or very important to "Adopt a region-wide set of principles for Environment Social and Governance (ESG) disclosures". Only 50 percent of North American respondents thought it was important or very important.

<sup>165</sup> The social cost of carbon is a measure of the real cost of the long-term damage done by a ton of carbon dioxide equivalent emissions in a given year. This dollar figure also represents the value of damages avoided for a small emission reduction (i.e., the benefit of a CO2 reduction).

<sup>166</sup> Robert S. Pindyck, "Climate change policy: what do the models tell us?", National Bureau of Economic Research, Working Paper 19244, July 2013. Accessed on 8 May 2017, <http://www.nber.org/papers/w19244>

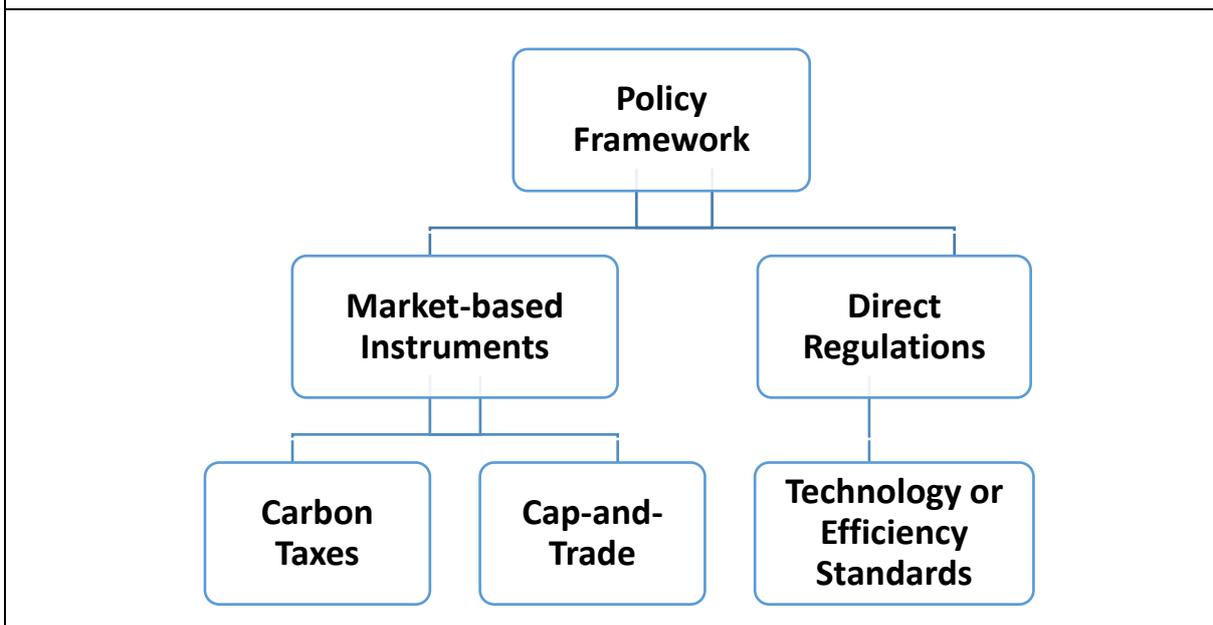
<sup>167</sup> Nordhaus, William D. 1993a. "Optimal Greenhouse Gas Reductions and Tax Policy in the 'DICE' Model." *American Economic Review*, 83: 313–317.

**Figure 2.14: Priorities Areas for APEC Work**



There are two categories of government actions that guide de-carbonization: market-based instruments (MBIs) and direct regulations. Market-based instruments are regulations that encourage human behavior through market signals rather than through explicit directives regarding pollution control levels or methods. It is well established among economists that MBIs such as carbon prices - imposed via taxes or some form of cap-and-trade scheme - are far superior to direct regulations that governments may impose, such as technical or engineering performance criteria for appliances, machinery, buildings, and cars. Greenhouse gas emissions are best controlled by putting a price on such emissions and allowing markets to find the lowest-cost solutions to reducing emissions.

**Figure 2.15: Policy Framework via MBIs and Direct Regulations**



Direct or “command and control” regulations include instruments such as permissions, prohibitions, standard setting, and enforcement as opposed to financial incentives. The potential benefit of using direct regulations to achieve a narrow objective. This may be useful when the threat of environmental damage is very specific (e.g., in the handling of radioactive waste).

The benefit of incorporating market signals into policy design is that it provides firms with greater flexibility in determining how they can best achieve the environmental objective. This flexibility provides incentives for greater pollution reductions in firms with lower abatement costs and lead to equalization of marginal abatement costs across all market participants. By contrast, direct regulations that set uniform standards on technical criteria are likely to impose higher costs on the economy, since firms with high abatement costs have to make the same reduction in emissions as firms with low abatement costs

MBIs use market signals to change behavior. Two alternative MBIs—a cap-and-trade system and a carbon tax have been applied in different economies, sometimes in combination rather than as mutually-exclusive alternatives. Cap-and-trade program sets the quantity of emissions during a fixed time period, letting the price of allowances to be discovered in the marketplace. A carbon tax sets a price on emissions, which provides an incentive for emissions reductions, but the actual amount of reduction that occurs can only be determined ex post.

In any emission reduction program facing government planners, whether through voluntary unilateral schemes or through international agreements, achieving emission reduction targets at least-cost is clear-cut in principle. The test of economic efficiency is the same, irrespective of the choice of market-based tools, namely carbon taxes or cap-and-trade pricing for carbon allowances. To achieve economic efficiency, marginal abatement costs of each of the sectors and industries is equivalent across sectors and industries. In a free market for greenhouse gas (GHG) abatement investments, private capital will flow to areas where returns (adjusted for risk) to emission-reducing investment are highest, thus fulfilling the efficiency criterion.

Both methods (tax or cap-and-trade) correct a market failure, as GHGs constitute an unpriced externality; that is, those responsible for GHG emissions do not have to pay for the damages they impose on the global environment, and the failure to internalize these costs in their economic behavior lead to higher levels of emissions than is socially optimal. Both instruments put a price on carbon (or GHG),<sup>168</sup> and by establishing this price they create market incentives to develop and invest in emission-reduction technologies. Both systems require monitoring, reporting, and verification (MRV) systems in place.

To the extent that the ultimate objective is to set an optimal path of emission reduction to reach a target end-state of stabilized and reduced emission rate (say by 2030 or 2050), the cap-and-trade solution is the correct one. It achieves an environmental goal, but the cost of reaching that goal is determined by market forces. In contrast, a tax provides certainty about costs of compliance (assuming that the tax policy itself is stable and durable over the long run), but the resulting reduction in GHG or carbon emissions cannot be predetermined.

### **Revenue-Neutral Carbon Taxes**

In order to get buy-in for a carbon-tax in the US, revenue-neutral carbon taxes have been recommended in the US in a bi-partisan approach to environmental policy by George Schultz and James Baker III.<sup>169</sup> This idea is not new and was previously proposed in another bi-partisan approach supported by Arthur Laffer and Bob Inglis (a House Representative from South Carolina) in 2008.<sup>170</sup>

There are a number of jurisdictions where carbon taxes or revenues raised by selling emission allowances in ETS are used to fund various beneficiaries. For instance, the ETS in Guangdong is meant to support investments in energy efficiency and renewable energy initiatives; in Oregon, the proposed ETS will fund dividend payments to residents of the state.<sup>171</sup>

<sup>168</sup> Throughout this paper, the terms “carbon”, “CO<sub>2</sub>” and “GHG” are used inter-changeably. A greenhouse gas (GHG or GhG) is a gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. The main greenhouse gases in Earth's atmosphere are water vapor (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and ozone (O<sub>3</sub>), and their respective contributions to the greenhouse effect are 36 – 72%, 9 – 26%, 4 – 9%, and 3 – 7%. GHGs are often expressed on a “CO<sub>2</sub>-equivalent” basis. See references in Wikipedia accessed at [https://en.wikipedia.org/wiki/Greenhouse\\_gas](https://en.wikipedia.org/wiki/Greenhouse_gas)

<sup>169</sup> George P. Shultz and James A. Baker III, “A Conservative Answer to Climate Change: Enacting a carbon tax would free up private firms to find the most efficient ways to cut emissions.” The Wall Street Journal, 7 February 2017.

<sup>170</sup> Bob Inglis and Arthur Laffer, “An emission plan conservatives could warm to”, New York Times, 27 December 2008.

<sup>171</sup> World Bank, “State and Trends of Carbon Pricing 2015”, p. 29.

Whether the “double dividend” of green taxes is forthcoming or not is thus a function of the prior tax system and how carbon tax revenues are re-cycled. The narrow base of green taxes is an “inherent efficiency handicap”, and according to one of the authors of the study the “bulk of existing research tends to indicate that even when revenues are recycled in ways conducive to a double dividend, the beneficial efficiency impact is not large enough to overcome the inherent handicap, and the double dividend does not arise”.<sup>172</sup>

A second problem is related to the estimated social cost of carbon (SCC) which is used as the basis for applying the optimal level of carbon tax.<sup>173</sup> As measures of SCC are typically derived from IAMs such as Nordhaus’ DICE Model, the same problems of interpretation and validation that apply to IAMs also apply to estimates of the SCC. Even though the SCC serves as the text-book measure of the optimal Pigouvian externality tax, this only holds in the case where all parties apply a similar carbon tax.

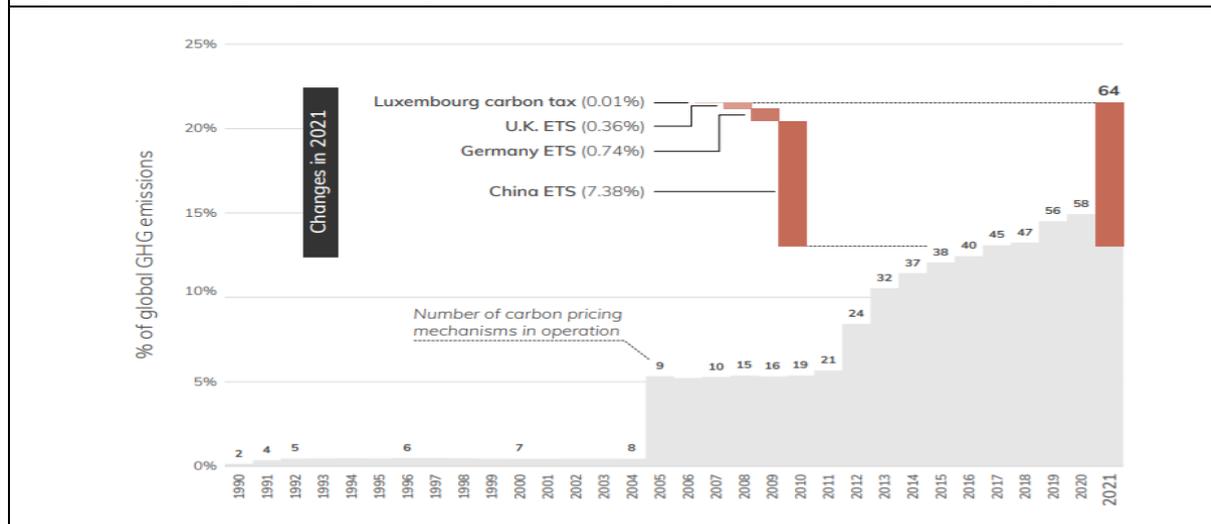
But when carbon leakage occurs, the SCC is over-stated. Thus, in the Nordhaus DICE model, if only half the world adopted a carbon tax, then the economic cost of achieving the same emission mitigation targets would increase by 250%.<sup>174</sup> It is thus inappropriate to conclude that an optimal tax to be levied by governments should be equal to the best estimate of SCC in the case where carbon leakages occur. Thus, Murphy concludes that “ [i]f we ignore the problem of leakage, then we will overestimate the true social cost of additional emissions in the regulated jurisdiction, and consequently the introduction of a carbon tax calibrated to the global SCC will be too high”.<sup>175</sup> In this context, when it is not apparent that all jurisdictions will jointly adopt a similar carbon tax globally, it would be inappropriate for most governments, representing their own citizens, to implement carbon taxes equal to the SCC unilaterally.

Pre-existing energy-related regulations such as gasoline taxes, renewable portfolio schemes (RPS) feed-in tariffs (FITs) and other subsidies for renewable energy technologies interact in complex ways with the imposition of a carbon tax. The regressive nature of carbon taxes generally, given that poorer households devote a larger portion of their budget to energy-costs such as transport and utility bills, adds a further complication to carbon tax proposals. In the context of governments needing political buy-in for carbon tax or ETS legislation, compensatory schemes for poorer households may be a critical requirement.

c. Existing Carbon Pricing Schemes and Trends

As of early 2021, there were 64 national and subnational initiatives at carbon pricing; the represents a 64% increase since January 2015, when the number was 39.<sup>176</sup> The share of global emissions under carbon pricing has increased 12% in 2015 to 21.5% (see Fig. 2.16).

**Figure 2.16: Share of global greenhouse gas emissions covered by carbon taxes and emissions trading systems**



Source: World Bank, “State and Trends of Carbon Pricing 2021”

<sup>172</sup> Lawrence H. Goulder, “Economic Impacts of Environmental Policies”, NBER Reporter: Spring 2000, June 28.

<sup>173</sup> The large literature on SCC is summarized by Richard S.J. Tol, “The Social Cost of Carbon: Trends, Outliers and Catastrophes”, Economics E-Journal, Vol. 2, 2008-25 August 12, 2008 accessed 02 June, 2017 at <http://www.economics-ejournal.org/economics/discussionpapers/2007-44>.

<sup>174</sup> Nordhaus, William. 2008. “A Question of Balance: Weighing the Options on Global Warming Policies”. New Haven, CT: Yale University Press, cited in Murphy, “Carbon tax swap deals”, p. 18.

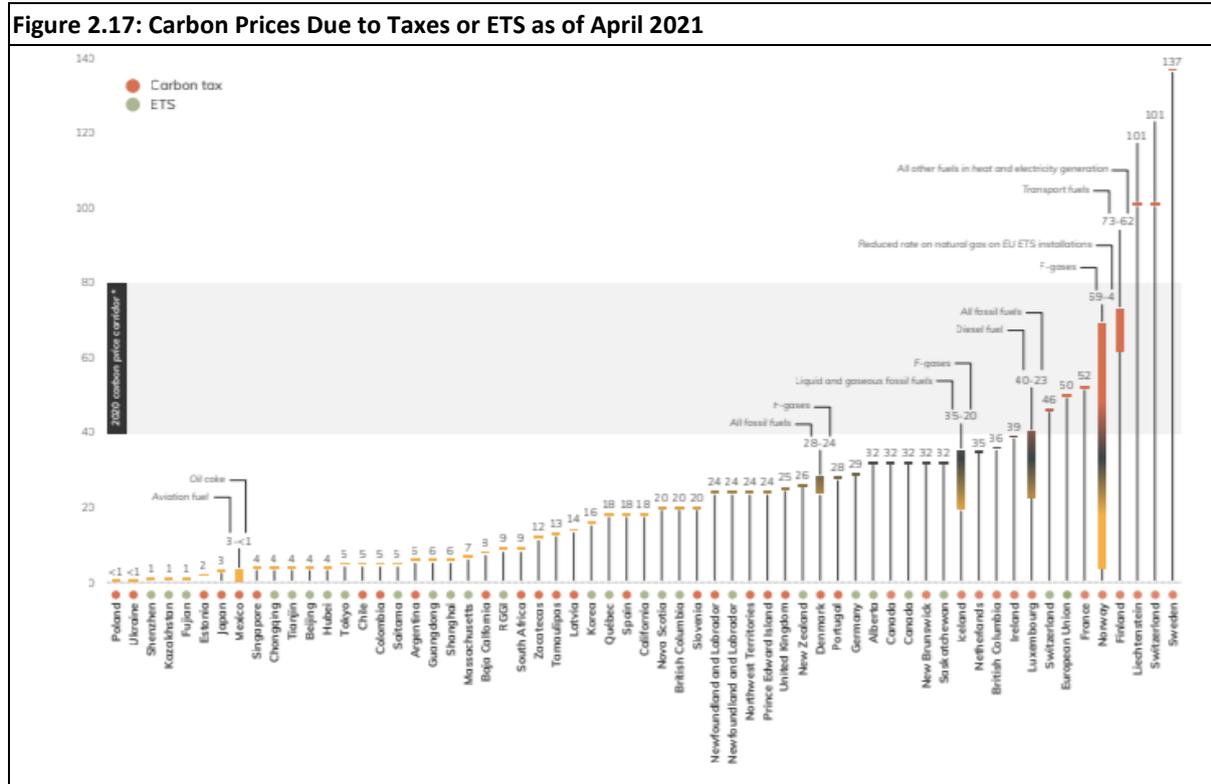
<sup>175</sup> Murphy, “Carbon tax swap deals”, p. 16.

<sup>176</sup> The data in this and following paragraphs are largely derived from World Bank, “State and Trends of Carbon Pricing 2021” unless otherwise stated.

The carbon prices in these different initiatives range widely, from less than \$1/tCO<sub>2</sub>e (tons of carbon dioxide equivalent) to over \$130/tCO<sub>2</sub>e (see Fig 2.17). It should be noted that in most cases, carbon prices are relatively modest. A majority of carbon prices still remain far below the US\$40–80/tCO<sub>2</sub>e range which the World Bank suggests is needed in 2020 and \$50 – 100/tCO<sub>2</sub>e by 2030 to meet the 2°C temperature goal of the Paris Agreement.<sup>177</sup> Only 3.8% of global emissions are covered by a carbon price at and above this range \$40 - 80/tCO<sub>2</sub>e in 2021. According to the World Bank, “even higher prices will be needed over the next decade to reach the 1.5°C target”.

Among the APEC member economies, the following jurisdictions have instituted either carbon taxes or ETS as of April 2021 (see Figure 2.17): Canada, as well as Quebec, Nova Scotia, British Columbia, New Brunswick, Newfoundland, Labrador, Alberta, Northwest Territory, Saskatchewan, Prince Edward Island (in Canada); Chile; Beijing, Fujian, Guangdong, Hubei, Shanghai, Shenzhen, Tianjin (in China); Japan, Tokyo, Saitama (in Japan); Mexico, Zacatecas, Tamaulipas (in Mexico); New Zealand; Singapore; South Korea; Massachusetts, Baja California, California, RGGI (a carbon emissions trading scheme covering 11 states in Eastern U.S.) (in the USA).<sup>178</sup> The recently announced China national ETS and the Mexico pilot ETS are not shown in this figure as price information for both of these are not available. It should also be noted that the carbon prices shown in the chart are merely illustrative. The prices in different jurisdictions are not comparable between carbon pricing initiatives because of differences in the sectors covered, allocation methods applied, specific industrial or sectoral exemptions, and different compensation methods.

China’s experiment with carbon pricing through ETS across several cities and provinces seem to be especially interesting, given its status as the world’s largest emitter. China’s long-expected carbon emissions trading scheme became operational in July 2021. Though at its initial phase, it is the largest ETS in the world, covering more than 2,000 entities with aggregate annual emissions exceeding 4 billion tons of CO<sub>2</sub> equivalent. The economy-wide carbon market has been publicized as a tool to promote China’s commitment to peak carbon before 2030 and achieve carbon neutrality before 2060.



Source: World Bank, “State and Trends of Carbon Pricing 2021”, p. 26.

<sup>177</sup> Carbon Pricing Leadership Coalition (a World Bank initiative), “Report of the High-Level Commission on Carbon Pricing and Competitiveness”, 2019. The report cites a previous version of the report (2017) that suggests this “price corridor”.

<sup>178</sup> Only those cities, provinces, states or economies not within parenthesis have instituted either carbon taxes or ETS; economy names within brackets are to identify where the named local, provincial or state jurisdictions are located in, but the economy itself have not instituted carbon taxes or ETS.

Similar to other emissions trading schemes it is a market-based government carbon-pricing scheme. China's ETS has a flexible emissions cap that can go up or down from year to year, depending on the output of the regulated sites. The scheme is initially limited to electricity generation and power plants serving industry – but this still covers 15 percent of global CO<sub>2</sub> emissions according to analysis by Carbon Brief.<sup>179</sup>

### *Private Sector Engagement*

The interest in carbon pricing has not been restricted to governments. There is evidence of a growing engagement by the private sector. The corporate sector is increasingly using internal benchmark carbon prices as a tool for business decision making and to identify low-carbon investment opportunities. For instance, in the lead up to the Paris Agreement in 2015, ten large international oil and gas companies (IOCs) called on governments represented at the UNFCCC to introduce carbon pricing consistently and coherently.<sup>180</sup> Growth in voluntary corporate commitments is the main driving force behind increased carbon credit demand. As of October 2020, 1,565 companies across all continents had adopted commitments to reduce their emissions to net zero.<sup>181</sup> About half of these companies have expressly indicated their intent to rely at least partially on carbon offsetting to achieve their targets.

According to the World Bank, nearly half of the largest 500 companies in the world by market cap report the use of an internal carbon price or the intention to use one within the next two years.<sup>182</sup> Internal carbon pricing is also being triggered by corporate climate governance initiatives. The Task Force on Climate-related Financial Disclosures (TCFD) — an initiative endorsed by over 1,900 organizations — encourages companies to issue climate-related financial disclosures and use internal carbon pricing to measure exposure to climate-related issues. The majority of the median internal carbon prices remain below the US\$ 40–80 per ton price range that the World Bank asserts is required to meet the temperature goals of the Paris Agreement.<sup>183</sup> Just over 16% of the companies use prices that fall within this range, and 9.8% use higher prices.

Internal carbon pricing benchmarks help companies translate carbon prices into normal business practice, gather internal management support for energy efficiency targets and achieve emission-mitigating targets. However, the lack of industry-wide carbon pricing methodologies and the lack of clarity and certainty in long-term government policy constrain many companies from effectively achieving best practice. Furthermore, internal carbon prices adopted for business planning purposes need to be high enough to cause a material change in investment decisions of firms in energy-intensive sectors. It should be noted that while participation by the private sector in using internal carbon prices to guide investments is important to promote low-carbon energy transitions, the context in which private sector participation is successful or otherwise depends on government policy stability and long-term credibility. Without a stable and credible emission mitigation policy over the long term, private sector efforts will inevitably be limited in their efficacy.

There are two other dimensions to business interest, beyond internal benchmark pricing. First, firms are making public commitments on their own future emissions trajectory. For example, BHP published its commitments on scope 1 and 2 and (partially) on scope 3 emissions.<sup>184</sup> It is driving business demand for reputable carbon credits, as part of the toolkit in how firms explain how they will achieve their commitments. This means that there will be an increasing focus on transparency and governance arrangements that are requisite to assessing the quality of carbon credits generated by private sector emission reduction activities.

Another recent example of voluntary private sector investments in carbon credit generation was provided by Shanghai Environment and Energy Exchange (SEEE) which issued the first carbon neutral petroleum certificate to Sinopec, Cosco Shipping and China Eastern Airlines on September 22 in Shanghai, China.<sup>185</sup> Sinopec, Cosco Shipping and China Eastern Airlines have taken their respective advantages to jointly develop a “cross-industry, full-cycle and zero-emission path” to reach peak carbon emissions and achieve carbon neutrality in transportation and the energy sector.

<sup>179</sup> <https://www.carbonbrief.org/in-depth-qa-will-chinas-emissions-trading-scheme-help-tackle-climate-change>

<sup>180</sup> The Oil and Gas Climate Initiative includes the BG Group, BP, Eni, Pemex, Reliance Industries, Repsol, Saudi Aramco, Shell, Statoil and Total.

<sup>181</sup> NewClimate Institute and Data-Driven EnviroLab. (October 2020). Navigating the Nuances of New-Zero Targets. [https://newclimate.org/wp-content/uploads/2020/10/NewClimate\\_NetZeroReport\\_October2020.pdf](https://newclimate.org/wp-content/uploads/2020/10/NewClimate_NetZeroReport_October2020.pdf)

<sup>182</sup> World Bank, “State and Trends of Carbon Pricing 2021”, op cit., p. 52.

<sup>183</sup> World Bank, “Report of the High-Level Commission on Carbon Prices”, 2017, accessed at <https://www.carbonpricingleadership.org/report-of-the-highlevel-commission-on-carbon-prices>.

<sup>184</sup> Scope 1 emissions are direct emissions from company-owned and controlled resources as a direct result of a set of activities, at a firm level. Scope 2 emissions are indirect emissions from the generation of purchased energy due to the consumption of purchased electricity, steam, heat and cooling in the course of doing business. Scope 3 emissions are all indirect emissions that occur in the value chain of the reporting company including both upstream and downstream emissions.

<sup>185</sup> <https://www.hydrocarbonengineering.com/clean-fuels/28092021/sinopec-certifies-first-shipment-of-carbon-neutral-petroleum/>

Second, financial intermediaries are increasingly focused on the sustainability of the enterprises they lend to (discussed in Sections 4c and 4d below). This is another source of pressure on firms to show that they can decarbonize over time. These changes are profound in creating private demand (and supply) of carbon credits, beyond any government-mandated scheme. Government can play a role in supporting private markets in carbon – even without establishing an emissions trading scheme or baseline and credit scheme – by broadening the range of voluntarily-traded carbon credits, creating international access to credits, and making carbon credits easier to trade. In Australia, for example, the Clean Energy Regulator is broadening the range of methods for creating Australian Carbon Credit Units (ACCUs) and creating an exchange traded market for ACCUs, that will deepen markets in carbon offsets and support a forward market. Across 16 APEC economies, there are 18 commodity exchanges that have produced guides for listed companies. Among the most prominent reporting frameworks being used by these exchanges are the Global Reporting Initiative (GRI), the Sustainable Accounting Standard Board (SASB) and the Task Force on Climate-Related Financial Disclosures (TCFD).<sup>186</sup>

### *Voluntary Carbon Markets*

There are a host of barriers to international trade in carbon markets. Market uncertainty is the key concern of any participant contemplating trading in new or untested carbon markets: is the underlying security (in this case, carbon credits) of requisite quality and does it have enough liquidity among other participants for it to be easily traded? For carbon credit quality, the importance of proper oversight and robust MRV systems in place is apparent. Transparent and credible MRV systems with comparable enforcement measures across jurisdictions to address compliance failures and fraud are a vital part of any viable international market in carbon credits. The presence of co-benefits that occur with reducing carbon emissions also needs to be emphasized. The immediate health benefits that accrue at the local and regional levels due to lower levels of sulphur and nitrous oxides and particulate matter that come about as a result of reducing GHG emissions can often be the major motivation for many economies in agreeing to participate in the Paris Agreement.<sup>187</sup>

The benefits of linking different ETS and carbon tax jurisdictions is related to the size and scope of the resulting common market. The greater the heterogeneity of abatement costs across jurisdictions, the larger the efficiency gains. The larger the sectoral and geographical scope of the linked market, the less the scope for carbon leakage as well. In theory, at the limit is a global uniform carbon price with unconstrained international trade in carbon emission credits. The maximum global benefit was estimated, for instance, by the Nordhaus DICE model discussed above. There are difficult technical and political challenges to linking various systems of carbon pricing into a broadly acceptable International Emissions Trading (IET) system. For instance, it is difficult to translate energy intensity targets and absolute emission reduction targets into a common metric without agreement on “business-as-usual” emission baselines.

Aligning different carbon pricing systems once they are operational is difficult. If ETS markets are not coordinated from the start, they reflect contingent local factors and socio-economic conditions which lead to heterogeneous market structures and governance norms. Different carbon pricing systems and governance institutions may become too deeply entrenched for easy harmonization of rules to be achievable. In this context, the concept of carbon emission trading hubs might provide a more promising approach than “top-down” multi-lateral harmonization agreements.<sup>188</sup> Carbon trading hubs provide a simple list of participation criteria and allow automatic membership so long as the criteria are fulfilled. For fungibility in the trading of emission reduction units, such units need to have a robust MRV system that assures that different jurisdictions offer units of equal mitigation value.

Nevertheless, different jurisdictions with varying standards of MRV and governance norms may yield emission reduction units that may differ in their implicit value in terms of mitigation. In this case, market mechanisms in carbon trading hubs can evolve a series of “exchange rates” or “discount factors” such that units from weaker jurisdictions have less value than those from jurisdictions that are perceived to be more robust and reliable. As suggested by one careful study, “units from systems that are considered insufficiently robust might thus be subject to a discount or disadvantaged exchange rate reducing their value for compliance in other systems without altogether sacrificing fungibility”.<sup>189</sup> In Australia, the Clean Energy Regulator administers schemes

<sup>186</sup> Sustainable Stock Exchanges Initiative; cited in Boffo, R., and R. Patalano (2020), “ESG Investing: Practices, Progress and Challenges”, OECD Paris,

<sup>187</sup> World Bank, 2016, op. cit. p. 92.

<sup>188</sup> Mehling, Michael and Benjamin Görlach, 2016. “Multilateral Linking of Emissions Trading Systems”, MIT Centre of Energy and Environmental Policy Research Working Paper, CEEPR WP 2016-009, April 2016.

<sup>189</sup> Mehling, Michael and Benjamin Görlach, 2016, *ibid.*, p. 16. The paper also provides a reasoned approach to how “exchange rates” and “discount factors” may be determined by regulated rating agencies that operate with transparent methodologies and avoid conflicts of interest.

legislated by the Australian Government for measuring, managing, reducing or offsetting Australia's carbon emissions, including the Emissions Reduction Fund (ERF). The ERF is a voluntary scheme that incentivizes organizations and individuals to adopt new practices and technologies to generate carbon credits. These credits are known as Australian Carbon Credit Units (ACCUs). In this example, the Clean Energy Regulator plays a role in certifying the quality of the carbon credits generated, taking into account external benefits such as biodiversity and the welfare of Aboriginal communities.<sup>190</sup>

Carbon trading hubs create incentives for different jurisdictions to improve environmental integrity so that their carbon units on offer may be traded without a penalty. Unlike the Australian example, where a regulator sets exchange rates between different carbon credits, voluntary trading hubs allow markets to establish premiums or discounts via market trading liquidity in various instruments including derivative markets in carbon markets (for example, derivatives in price differentials between various pedigrees of carbon credits generated). In Asia, trading and financial centers such as Hong Kong, China and Singapore may emerge as carbon trading hubs which make linked ETS jurisdictions more politically viable and quicker to implement relative to long and difficult multilateral negotiations necessary for top-down harmonization agreements. To this end, the Singapore government recently released the Singapore Green Plan 2030, setting out a path for the city-state to become a leading regional hub for carbon trading, green finance, consulting and risk management and other services.<sup>191</sup> The Singapore initiative will seek to enhance the transparency, integrity, and quality of carbon credits to support voluntary trading at the proposed carbon hub.

#### d. Carbon Leakage and Carbon Border Adjustments

Among the most important policy concerns challenging the introduction of carbon pricing around the world is the issue of “carbon leakage”. Carbon leakage will doubtless also be a central issue at the UN’s 26th Conference of Parties (COP26) hosted by the UK when it meets in Glasgow in November. As discussed in the previous section, current efforts at carbon pricing are fragmented, and coverage and carbon prices vary significantly across national and sub-national jurisdictions. Carbon leakage occurs when differences in emission regulations across jurisdictions can lead to re-location of carbon-intensive industries away from those jurisdictions which have tighter restrictions on carbon emissions and towards those that have either laxer or non-existent emission regulations.

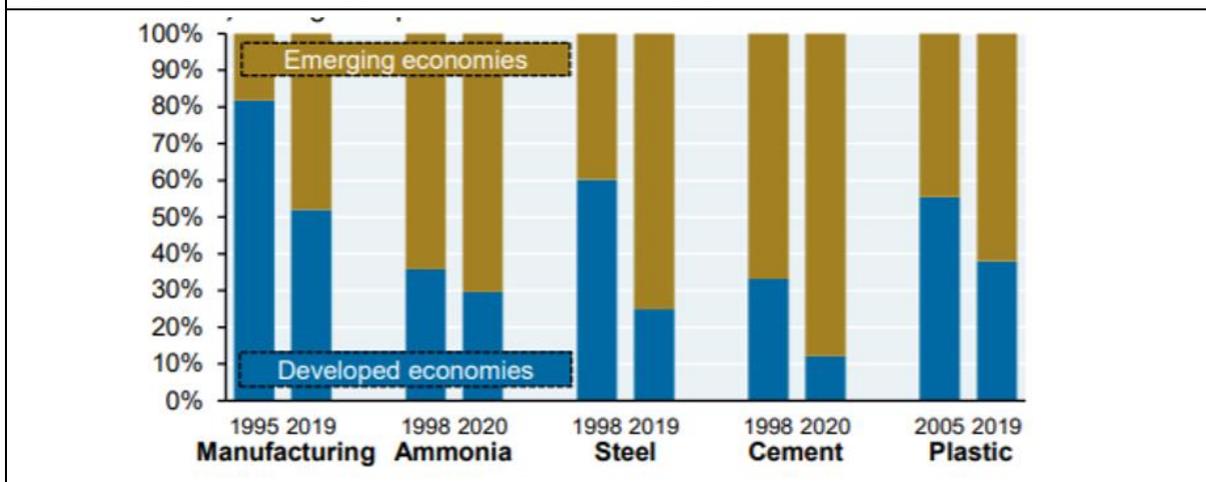
The assertion that carbon leakage has not been a major factor in OECD economies to date as made by the World Bank<sup>192</sup> is contentious. Thus, for instance, the European Commission’s Executive Vice President Frans Timmermans said earlier in the year that “It’s a matter of survival of our industry. So, if others will not move in the same direction, we will have to protect the European Union against distortion of competition and against the risk of carbon leakage.”<sup>193</sup>

<sup>190</sup> <http://cleanenergyregulator.gov.au/Infohub/Markets>

<sup>191</sup> ESG Investor, “Singapore Seeks to Become Global Hub for Carbon Trading”, 29 September 2021, accessed at <https://www.esginvestor.net/singapore-seeks-to-become-global-hub-for-carbon-trading/>

<sup>192</sup> World Bank, “State and Trends of Carbon Pricing 2016”, p. 52.

<sup>193</sup> Euractive.com with Reuters, “EU sees carbon border levy as ‘matter of survival’ for industry”, 19 January 2021, accessed at <https://www.euractiv.com/section/energy-environment/news/eu-sees-carbon-border-levy-as-matter-of-survival-for-industry/>

**Figure 2.18: Migration of Energy Intensive Industry to Emerging Economies**

Source: UN Dept. of Social and Economic Affairs, World steel, PlasticsEurope, USGS. 2020, JP Morgan 2021

Carbon leakage effects are difficult to measure accurately, given that carbon costs are only one factor in a host of business costs and risks that firms take into account when deciding on the location of capital investments. Demand and supply conditions, costs of imports, exchange rates, taxes, quality of infrastructure and governance, ease of doing business, etc., are among the host of factors that come into play in business investment decisions. It is thus difficult to attribute any long-term business decision to a single factor such as a carbon price.

Different government authorities around the world have given assistance to industries deemed most vulnerable to cost pressures imposed by carbon pricing schemes. Korea's and China's national carbon market under ETS, for instance, are expected to grant free allowances to affected firms during the early phases of the ETS. The EU ETS phases 1 and 2 provided assistance via free allocations of emission reduction certificates on a "grandfathering" basis. Other assistance modes include output or sector benchmarking in California and New Zealand, rebates and subsidies in the UK, and exemptions based on administrative decision in South Africa.<sup>194</sup> Each of these modes of assistance can be subject to perverse incentives and unintended consequences.

The question of how to assist firms faced with perceived threats to their viability due to carbon leakage might be less important than the question of how such assistance is demanded by constituents in the political process. "Integrated" measures of assistance are those where exemptions and state-funded assistance for affected constituencies are legislated as part of the overall package legislating for carbon pricing policy. These assistance measures are integrated into the basic enabling legislation for carbon pricing as part of political buy-in process in many legislatures. Sectors producing over 90 % of industrial emissions in the EU received all or most of their allowances for free in 2020.<sup>195</sup>

International cooperation as a direct means of alleviating carbon leakage and free rider incentives have long been part of the UNFCCC climate change negotiations. The principle was incorporated in the Kyoto Protocol via the Clean Development Mechanism (CDM) where carbon credits from verifiable emission mitigation projects in non-OECD developing economies (where abatement costs are typically far-lower) can be bought by firms in developed economies to fulfil part of their emission mitigation targets spelt out in the Protocol.<sup>196</sup> In the lead up to the Paris Agreement, the principle for financial transfers from developed to developing economies to help the most vulnerable low-income economies prepare for mitigation and adaptation to climate change was incorporated "as a key provider of predictable financial resources in the post 2020-framework...[with] the introduction of a floor of US\$100 billion annually on the level of climate finance" until 2025 and "acknowledges that climate finance needs to be further scaled-up".<sup>197</sup> Nevertheless, current progress in public climate finance commitments by the OECD members are modest and face serious challenges (discussed in Section 4 below).

<sup>194</sup> World Bank, "State and Trends in Carbon Pricing" 2016, p. 60.

<sup>195</sup> European Commission, "The European Union Emission Trading System", undated factsheet accessed June 2, 2017 at [https://ec.europa.eu/clima/sites/clima/files/factsheet\\_ets\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/factsheet_ets_en.pdf)

<sup>196</sup> See UNFCCC, "Kyoto Protocol: Clean Development Mechanism", accessed on June 02, 2017 at [http://unfccc.int/kyoto\\_protocol/mechanisms/clean\\_development\\_mechanism/items/2718.php](http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php)

<sup>197</sup> Thwaites, Joe (18 December 2015). "What Does the Paris Agreement do for Finance?". WRI. WRI. Retrieved 10 April 2017.

We noted above the wide and varying levels of carbon prices and coverage. For such a heterogeneous system to be cost-effective globally, a key feature of any international cooperation would be trading and investment linkages among them. Such linkages imply “a formal recognition by a greenhouse gas mitigation program in one jurisdiction of emission reductions undertaken in another jurisdiction for purposes of complying with the first jurisdiction’s mitigation program.”<sup>198</sup>

In this context, an international policy architecture that incorporates mechanisms such as the CDM under the Kyoto Protocol could facilitate the establishment of a robust system of least-cost abatement opportunities that leverages private and public finance. China, for instance used CDM methodologies as a basis for issuing domestic emission reduction certificates and green bonds on the basis of CDM-type projects.<sup>199</sup> The Kyoto Protocol experience with CDM promoted some level of harmonization of carbon pricing globally and leveraged private sector financial flows from the developed economies to develop emission reduction projects in low abatement-cost jurisdictions in the developing economies. Audited MRV procedures for such projects can help overcome political and sovereign risks faced by private sector investors.

#### *The EU’s Carbon Border Adjustment Mechanism proposal*

In any discussion of international cooperation, the unilateral imposition of “carbon border adjustment mechanisms” (CBAM) by economies participating in international trade is a contentious one. CBAM schemes are being proposed in a number of legislative and political forums as a means to mitigate competitiveness concerns and carbon leakage, and to help encourage jurisdictions with laxer emission regulations to adopt higher mitigation standards for their key exports. The actual design details of any particular CBAM legislation will determine whether such unilateral moves are WTO-compliant.<sup>200</sup> There are risky and unintended consequences for the norms of international trade if any major trading economy or trading bloc were to unilaterally adopt CBAM policies unless a coalition of trading partners which accounted for a large proportion of trade in the affected industry or sector were to simultaneously adopt such legislation in common.

On March 10th, the European Parliament overwhelmingly endorsed the creation of a CBAM that would shield EU companies against cheaper imports from economies with “weaker” climate policies.<sup>201</sup> The EU published additional climate policies on July 14th with its long-awaited package to make Europe carbon neutral by 2050.<sup>202</sup> On July 19th, US Democrat legislators introduced a similar bill to tax imported goods for their carbon content sourced from economies that lack strict environmental policies.<sup>203</sup>

The EU’s CBAM would require importers of certain products to pay a charge reflecting the embedded carbon emissions of those products. After a pilot phase, running from 2023 to 2025, it would come into force in earnest from 2026, initially applying to imported iron, steel, aluminum, cement, fertilizers and electricity. Carbon leakage will doubtless also be a central issue at the UN’s 26th Conference of Parties (COP26) hosted by the UK when it meets in Glasgow in November. Kwasi Kwarteng, UK’s business secretary in the Boris Johnson government and host for the meeting, opined that “there will be a discussion about carbon border adjusting, carbon leakage. That has to be part of the multilateral discussion.”<sup>204</sup>

Under EU’s proposed CBAM legislation, foreign firms would have to provide carbon audits to report emissions to EU trade authorities.<sup>205</sup> The complexity of the Brussels-concocted plan ensures that exporters to the EU will have their work cut out for them. Exporting firms will have to document detailed carbon audits on their emissions which would include calculating the percentage of emissions that are already covered by carbon taxes elsewhere (domestic and for imports which go into manufacturing the exports). If these complex and expensive analyses are beyond the compliance capabilities of firms, especially for small and medium-sized businesses, the EC will unilaterally establish carbon tariffs on the basis of the dirtiest 10% of European producers of the same good.

<sup>198</sup> Daniel Bodansky, et al, 2014, “Facilitating Linkage of Heterogeneous Regional, National, and Sub-National Climate Policies Through a Future International Agreement”, Harvard Project on Climate Agreements, November.

<sup>199</sup> See World Bank, “State and Trends of Carbon Pricing”, 2015, p. 34.

<sup>200</sup> See Joel P. Tracht, 2016, “WTO Law Constraints on Border Tax Adjustment and Tax Credit Mechanisms to Reduce the Competitive Effects of Carbon Taxes”, Resources for the Future Discussion Paper, January.

<sup>201</sup> <https://www.euractiv.com/section/energy-environment/news/european-parliament-backs-plan-to-price-carbon-at-eus-border/>

<sup>202</sup> <https://www.dw.com/en/eu-proposes-sweeping-fit-for-55-emissions-reduction-plan/a-58269252>

<sup>203</sup> <https://www.nytimes.com/2021/07/19/climate/democrats-border-carbon-tax.html>

<sup>204</sup> <https://thefifthestate.com.au/business/government/battle-looms-for-morrison-over-eu-g7-carbon-border-tax/>

<sup>205</sup> Editorial, “Here Come the Climate Protectionists”, Wall Street Journal, 11 July 2021 accessed at [https://www.wsj.com/articles/here-come-the-climate-protectionists-11626042142?mod=searchresults\\_pos2&page=1](https://www.wsj.com/articles/here-come-the-climate-protectionists-11626042142?mod=searchresults_pos2&page=1)

While CBAM might be seen as an enabler of climate ambition by its proponents in the EU and the US, it “is a horribly complex, legally questionable and politically explosive instrument” as one observer put it.<sup>206</sup> Carbon trade tariffs would impose high costs on companies seeking to sell to the EU and will likely trigger challenges at the WTO. If such disputes intensify, tit-for-tat trade tariffs between advanced economies (if they adopt similar CBAM legislation) and developing economies could lead to the further unravelling of the liberal trading order which is already under significant challenges. On July 26th, China objected to the EU’s plan to impose the world’s first carbon border tax, stating that it intruded climate issues into international trading norms, broke WTO rules and undermined prospects for economic growth.<sup>207</sup>

Earlier in April when it became apparent that both the EU and the US Biden administration were considering unilateral trade tariffs to enforce upon the world their own predilections to “fight climate change”, India also adopted a position similar to China’s. It issued a joint statement with the BASIC bloc — Brazil, South Africa, India, and China — calling CBAM “discriminatory” and expressing its “grave concern”.<sup>208</sup> It is not just developing economies that oppose the EU’s CBAM plan. Australian Trade Minister Dan Tehan labelled carbon tariffs “a new form of protectionism”.<sup>209</sup> Russia, like China, sees the CBAM as running afoul of WTO rules and had already made clear its views a year ago when the EU was mooting its Green Deal plans which included carbon tariffs.<sup>210</sup>

In terms of policy instruments for addressing climate change carbon border taxes on imports were at the bottom of the list of respondents priorities but at the same time respondents also agreed that carbon border taxes are needed to account for differing climate change policies. These are not necessarily irreconcilable positions but we may well end up in a world of tit-for-tat reprisals. Not to mention running contrary to the very spirit of Article 4.3 of the Paris Agreement of “highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities”.

It is not clear whether the EU CBAM proposal is compatible with WTO rules. Apart from the UN climate body’s Article 4, there are other areas in which the proposed carbon tariffs may conflict with WTO trading rules. They may be found to contravene the WTO’s rule of non-discrimination, a mainstay of international trading norms which requires that any advantage granted to the imported products of one WTO member must be accorded immediately and unconditionally to like products originating from all other WTO members.<sup>211</sup> Carbon tariffs could also be inconsistent with the WTO’s ‘national treatment rule’, another foundation stone of modern international trade under the WTO regime which requires that imported products be given “no less favorable” treatment than that given to like domestic products.<sup>212</sup> If European producers continue to receive free emissions allowances (as they do now under the EU’s Emission Trading System), then the EU will be found in violation of the “national treatment” rule.

#### 4. Green Finance

The investments required to transition the global energy system -- currently depending on fossil fuels for 85% of final energy consumption -- to “net zero by 2050” are immense. Estimates for “green finance” requirements vary widely. The IEA suggests annual investment in energy must increase from around \$2 trillion (trn) per year now to \$5trn by 2030, and then back down to \$4.5trn by 2050.<sup>213</sup> Another forecast from the Energy Transitions Commission, a group of multinationals committed to decarbonization, estimates net zero will cost an estimated \$1.5-1.8trn every year until 2050.<sup>214</sup> The International Renewable Energy Agency (IRENA) estimates a lump sum of \$33trn over the period from now to 2050.<sup>215</sup> These estimates should be treated with great caution as they embody a very large number of assumptions on a range of parameters such as future economic growth, technological change and social attributes. In particular, there is great uncertainty related to costs of new and emerging energy technologies which are not yet in commercial use, such as “green hydrogen” and CCS (discussed in Section 2).

<sup>206</sup> Nicholls, M., “EU enters trade fray with carbon border levy plan”, Energy Monitor, 15 July 2021 accessed at <https://energymonitor.ai/policy/eu-enters-trade-fray-with-carbon-border-levy-plan>

<sup>207</sup> <https://www.msn.com/en-us/money/markets/china-says-eus-planned-carbon-border-tax-violates-trade-principles/ar-AAMyBuY>

<sup>208</sup> <https://www.gov.za/nr/speeches/joint-statement-issued-conclusion-30th-basic-ministerial-meeting-climate-change-hosted>; see also

<sup>209</sup> <https://www.climatechangenews.com/2021/04/09/emerging-economies-share-grave-concern-eu-plans-carbon-border-tax/>

<sup>210</sup> <https://www.smh.com.au/politics/federal/new-protectionism-australia-to-fight-boris-johnson-s-green-tariff-bid-20210210-p5714j.html>

<sup>211</sup> <https://www.euractiv.com/section/economy-jobs/news/moscow-cries-foul-over-eus-planned-carbon-border-tax/>

<sup>212</sup> [https://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/fact2\\_e.htm](https://www.wto.org/english/thewto_e/whatis_e/tif_e/fact2_e.htm)

<sup>213</sup> [https://www.wto.org/english/docs\\_e/legal\\_e/gatt47\\_01\\_e.htm#articleIII](https://www.wto.org/english/docs_e/legal_e/gatt47_01_e.htm#articleIII)

<sup>214</sup> <https://www.iea.org/reports/net-zero-by-2050>

<sup>215</sup> <https://www.energy-transitions.org/sector/finance/>

<sup>216</sup> [https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/March/IRENA\\_World\\_Energy\\_Transitions\\_Outlook\\_2021.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/March/IRENA_World_Energy_Transitions_Outlook_2021.pdf)

a. Progress towards the \$100 bn target

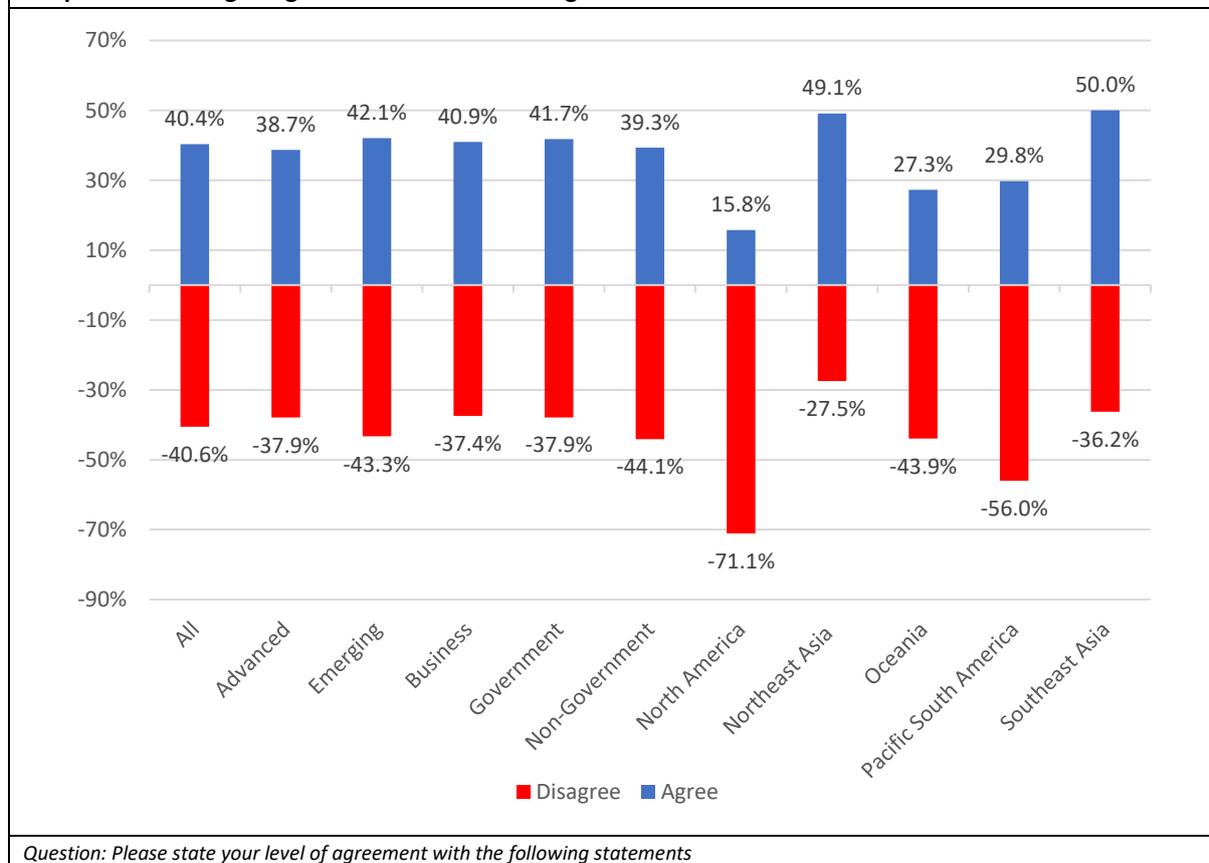
In the UNFCCC Conference (COP25) in 2019, the parties concurred in paragraphs 11 that

*“Recalls the commitment made by developed country Parties, in the context of meaningful mitigation actions and transparency on implementation, to a goal of mobilizing jointly USD 100 billion per year by 2020 to address the needs of developing country Parties*

*Calls on international entities, including financial institutions, to continue supporting the development and implementation of measures to avert, minimize and address the adverse impacts of climate change”*

Climate finance was already a critical element of international climate policy before the Paris Agreement in 2015 during the lengthy international negotiations process since the Kyoto Protocol – adopted in 1997 and entering into force in 2005.

**Figure 2.19: Sufficient funding is available to assist developing economies to meet both mitigation and adaptation existing obligations under the Paris Agreement.**



Views on whether sufficient funding is available to assist developing economies to meet both mitigation and adaptation existing obligations under the Paris Agreement were split across the region. While on balance respondents disagreed, the breakdown at the levels of development and sub-regional levels is revealing.

- North American respondents disagreed the most with the statement that sufficient funding was available
- Respondents from Pacific South America also strongly disagreed that sufficient funding was available

There was very little to divide those who agreed/disagreed on this issue looking at the issue from an advanced/emerging economy perspective.

At stake are not only questions on which economy (or group of economies) does what in curbing emissions and preparing to adapt to climate change impacts, but also which economies are net recipients of climate finance and which are net contributors and by what amount. In 2009, developed economies jointly agreed to raise US\$100 billion per year in climate finance by 2020.<sup>216</sup> Alok Sharma, the president of the 2021 UN climate conference (COP26) warned that a lack of financing puts the objectives of the conference, agreed in the Paris in 2015, at risk.<sup>217</sup> Developing economies have also expressed their concern, “The Ministers expressed their deep concern on the insufficiency and inadequacy of the support provided by developed countries to date. The scale and speed of climate finance from developed countries has to increase considerably.”<sup>218</sup>

According to the OECD, climate finance provided and mobilized by developed economies for climate action in developing economies reached US\$78.9 billion (bn) in 2018, up from US\$71.2 bn in 2017 (see Table 2.10).<sup>219</sup> An assessment conducted by the UNFCCC’s Standing Committee on Finance indicated that governments are “in the neighborhood of achieving the target” by the end of 2020.<sup>220</sup>

**Table 2.10: Climate finance provided and mobilized by developed economies (2013-18, US\$ bn)**

	2013	2014	2015	2016	2017	2018
Bilateral public climate finance (1)	22.5	23.1	25.9	28.0	27.0	32.7
Multilateral public climate finance attributable to developed countries (2)	15.5	20.4	16.2	18.9	27.5	29.6
<b>Subtotal (1+2)</b>	<b>37.9</b>	<b>43.5</b>	<b>42.1</b>	<b>46.9</b>	<b>54.5</b>	<b>62.2</b>
Climate-related officially-supported export credits (3)	1.6	1.6	2.5	1.5	2.1	2.1
<b>Subtotal (1+2+3)</b>	<b>39.5</b>	<b>45.1</b>	<b>44.6</b>	<b>48.5</b>	<b>56.7</b>	<b>64.3</b>
Private climate finance mobilised (4)	12.8	16.7	N/A	10.1	14.5	14.6
By bilateral public climate finance	6.5	8.1	N/A	5.0	3.7	3.8
By multilateral public climate finance attributable to developed countries	6.2	8.6	N/A	5.1	10.8	10.8
<b>Grand Total (1+2+3+4)</b>	<b>52.2</b>	<b>61.8</b>	<b>N/A</b>	<b>58.6</b>	<b>71.2</b>	<b>78.9</b>

Source: OECD, “Climate Finance Provided and Mobilised by Developed Countries in 2013-18”, 2020, <https://www.oecd-ilibrary.org/docserver/f0773d55-en.pdf?expires=1631113070&id=id&accname=quest&checksum=AFBEC78937142E8AB7BA5CEF8098CB47>

Assessing progress toward the US\$100 billion target is contentious. However, the UNFCCC assertion of “being in the neighborhood” of achieving the target of \$100 billion needs to be interpreted with caution. Given that the assessment depends on how climate finance is defined and that an agreed definition is lacking, it is indeed not possible to realistically assess climate finance commitments (let alone actual delivery) for mitigation and adaptation efforts in both developed and developing economies.<sup>221</sup> An agreement on climate change finance is now viewed as critical to the success of the upcoming COP26 conference to be held in Glasgow in November 2021 and the financing gap remains a key obstacle to the success of the talks.<sup>222</sup>

#### b. Definitions of Green Finance

There is a large literature on what has been broadly termed “green finance”, the respective roles and importance of public and private sectors, and the variety of financial instruments deployed. However, there is no precise and commonly accepted definition of the term.<sup>223</sup> The World Bank defines it as “the financing of investments that provide environmental benefits in the broader context of environmentally sustainable development”.<sup>224</sup>

Green investments include investments in environmental goods and services, and mitigation and adaptation investments specifically related to climate change. There is also no accepted common definition to the term

<sup>216</sup> Delivering on the \$100 billion climate finance commitment and transforming climate finance”, Independent Expert Group on Climate Finance, December 2020, [https://www.un.org/sites/un2.un.org/files/100\\_billion\\_climate\\_finance\\_report.pdf](https://www.un.org/sites/un2.un.org/files/100_billion_climate_finance_report.pdf) accessed on 4 September 2021.

<sup>217</sup> <https://www.ft.com/content/5072b2be-17ed-4c20-a0e5-e631f17a8d5b>

<sup>218</sup> Shreya Jai, “BASIC nations bat for finances from developed world to fight climate change”, Business Standard, 8 April 2021 accessed at [https://www.business-standard.com/article/current-affairs/basic-nations-bat-for-finances-from-developed-world-to-fight-climate-change-121040801560\\_1.html](https://www.business-standard.com/article/current-affairs/basic-nations-bat-for-finances-from-developed-world-to-fight-climate-change-121040801560_1.html)

<sup>219</sup> OECD, “2020 Projections of Climate Finance Towards the USD 100 Billion Goal Technical Note”

<https://www.oecd.org/environment/climate-finance-provided-and-mobilised-by-developed-countries-in-2013-18-f0773d55-en.htm> accessed on 15 August 2021.

<sup>220</sup> <https://unfccc.int/sites/default/files/resource/51904%20-%20UNFCCC%20BA%202018%20-%20Summary%20Final.pdf>

<sup>221</sup> Stockholm Environment Institute, “Beyond the 100 billion dollar goal for climate finance”, 2020,

<https://www.sei.org/perspectives/beyond-the-100-billion-dollar-goal-for-climate-finance/>

<sup>222</sup> <https://www.euractiv.com/section/climate-environment/news/climate-finance-gap-remains-a-stumbling-block-in-climate-diplomacy/>

<sup>223</sup> For various definitions, see Lindenbergh, N., “Definition of Green Finance”, German Development Institute,

April 2014 accessed at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2446496](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2446496)

<sup>224</sup> <https://www.greenfinanceplatform.org/organization/world-bank-group#>, accessed on 3 September 2021.

“environmental services”.<sup>225</sup> It is not possible to make a distinction between a narrowly defined set of environmental services (such as sewerage treatment, waste collection treatment and disposal, sanitation and remediation services) and a wider set that serve to protect the environment in its broadest sense.<sup>226</sup> The latter would include financing investments in reducing air pollution at the local and regional levels and achieving the aspirations of the Paris Agreement on climate change at a global level.

Green finance is allocated to two purposes in climate change-related investments: mitigation and adaptation. Mitigation finance refers to investments in projects and programs that contribute to reducing or avoiding greenhouse gas emissions (GHGs). The investments supported by mitigation finance are focused on renewable energy projects and energy efficiency improvements.

The major sources of international public finance for climate mitigation in developing economies are the World Bank-administered Clean Technology Fund (CTF), the Green Climate Fund (GCF) and the Global Environment Facility (GEF). Since its start-up in 2015, the GCF has become the major source of mitigation finance. It approved mitigation finance at USD 1,022 million for 11 mitigation projects during 2020, in the first year of its first replenishment period.<sup>227</sup> About 45% of the financing approved since 2003 by dedicated climate finance initiatives approved for mitigation activities largely devoted to the development and deployment of renewable energy and energy efficiency technologies in fast growing economies.<sup>228</sup> The cumulative amount of finance approved for mitigation from climate funds was USD 11.2 billion as of December 2020.

Adaptation finance refers to investments that contribute to reducing the vulnerability of property and persons to the effects of climate change such as coastal protection or wind-proofing homes against severe weather effects.<sup>229</sup> The largest sources of approved funding for adaptation projects are the GCF, the Least Developed Countries Fund (LDCF) administered by the Global Environment Facility (GEF), the Pilot Program for Climate Resilience (PPCR) of the World Bank’s Climate Investment Funds (CIFs) and the Adaptation Fund (AF).<sup>230</sup> However, according to data monitored by “Climate Funds Update (CFU)”,<sup>231</sup> contributions to adaptation funds “remain low compared to funds supporting mitigation”. Of the \$78.9 billion in climate finance transferred by rich economies in 2018, only 21% was spent on adaptation.<sup>232</sup> The GCF approved the largest volume of adaptation finance in 2020, with USD 313 million approved for 11 projects targeting adaptation. The amount of cumulative finance approved for adaptation from key climate funds grew to USD 5.8 billion in 2020. Economies that are most vulnerable to climate change should be given priority for funding which should balance between adaptation and mitigation efforts as noted in the Paris Agreement.<sup>233</sup>

### c. Green Finance Standards

Green finance standards refer to codes, taxonomies, regulations, and guidelines which aim to support governments, financial institutions, listed corporations and private investors to determine the financing of investments in “environmentally-friendly” projects. In a general descriptive sense, “environmentally-friendly” projects are typically defined in relation to the UN’s “sustainable development goals” or the goals of the 2015 Paris Agreement. Green finance standards have proliferated over the past few decades, supporting a large range of competing and often overlapping investment initiatives in climate change mitigation and adaptation.<sup>234</sup> The lack of clear criteria in the classification of the activities underlying green finance and the lack of clarity in comparability across economic sectors, industries and projects increases the uncertainty associated with financing investment decisions and distorts or obviates clear policy signals.

<sup>225</sup> WTO, August 2010, “Background Note on Environmental Services: Note by the Secretariat” accessed at [https://docs.wto.org/dol2fe/Pages/FE\\_Search/FE\\_S\\_S006.aspx?Query=\(%20@Symbol=%20s/c/w/%20\)%20and%20\(%20@Title=%20background%20note%20\)%20and%20\(%20@DocumentDate%20%3E=%20202009/01/01%2000:00:00%20\)&Language=ENGLISH&Context=FomerScriptedSearch&languageUICanged=true#](https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=(%20@Symbol=%20s/c/w/%20)%20and%20(%20@Title=%20background%20note%20)%20and%20(%20@DocumentDate%20%3E=%20202009/01/01%2000:00:00%20)&Language=ENGLISH&Context=FomerScriptedSearch&languageUICanged=true#)

<sup>226</sup> Doshi, T. “Sector Study on Environmental Services: Renewable Energy”, APEC Policy Support Unit, 2017. Accessed at [https://www.apec.org/-/media/APEC/Publications/2017/10/Sector-Study-on-Environmental-Services-Renewable-Energy/217\\_PSU\\_Environmental-Services\\_Renewable-Energy.pdf](https://www.apec.org/-/media/APEC/Publications/2017/10/Sector-Study-on-Environmental-Services-Renewable-Energy/217_PSU_Environmental-Services_Renewable-Energy.pdf)

<sup>227</sup> Climate Funds Update, “Climate Finance Thematic Briefing: Mitigation Finance (2020)”, <https://climatefundsupdate.org/publications/climate-finance-thematic-briefing-mitigation-finance-2020/>, accessed on 30 August 2021.

<sup>228</sup> The data excludes REDD+ finance, referring to reducing emissions from deforestation and forest degradation, plus the sustainable management of forests and the conservation and enhancement of forest carbon stocks.

<sup>229</sup> The climate literature makes a distinction between weather as contingent events and climate which relates to long term trends over 30 years. Whether carbon emissions are leading to more weather extremes is scientifically contentious. Attribution of specific weather events to “climate change” is a much-debated issue and, due to large uncertainties in the scientific literature, remain unresolved. See for instance, Koonin, S. E., “Unsettled: What climate science tells us, what it doesn’t and why it matters” (BenBella, Dallas, TX: 2021).

<sup>230</sup> Climate Funds Update, op cot.

<sup>231</sup> Climate Funds Update, <https://climatefundsupdate.org/>.

<sup>232</sup> OECD (2020), Climate Finance Provided and Mobilised by Developed Countries in 2013-18, OECD Publishing, Paris, accessed at <https://www.oecd-ilibrary.org/docserver/f0773d55-en.pdf?expires=1631856501&id=id&accname=guest&checksum=96C19BB279DA51881B905BE88F7C9E1D>

<sup>233</sup> UNFCCC (2015). Paris Agreement. FCCC/CP/2015/L.9/Rev.1. United Nations Framework Convention on Climate Change.

<sup>234</sup> See for instance, Zhang, D.; Zhang, Z.; Managi, S. “A Bibliometric Analysis on Green Finance: Current Status, Development, and Future Directions”. *Financ. Res. Lett.* 2019, 29, 425–430; Heaps, T.; Guyatt, D. “A Review of International Financial Standards as They Relate to Sustainable Development” UN Environment Inquiry; United Nations Environment Programme (UNEP): Nairobi, Kenya, 2017.

A wide range of institutions and organizations have issued green finance standards. Among these, according to the World Bank Green Finance Platform, governments and regulators have issued nearly 400 green finance measures. Private and public financial institutions have issued local and international standards related to green finance (for instance, International Finance Corporation’s “Performance Standards”, Inter-American Development Bank’s “Environmental and Safeguards Compliance Policy”, Barclays’ “Impact Eligibility Framework for Shared Growth Ambition” and HSBC’s “Sustainability Risk Policy”). Think tanks and UN organizations likewise have issued standards (for instance, “UN Principles of Responsible Investment”, “CICERO”, “Climate Bonds Initiative”, “Global Reporting Initiative”, etc.). Various associations have also played a key role in issuing proposals and models for green finance standards, including the Sustainable Accounting and Standards Board, the Taskforce for Climate-Related Financial Disclosure, International Capital Market Association, Global Impact Investing Network, Impact Management Project and Carbon Disclosure Project.

There is a critical need for harmonization of green finance standards to lower transaction costs, enhance the efficiency of financing investments which support seamless investment flows across jurisdictions, and support member economies’ climate mitigation and adaptation policies and projects. The heterogeneity of approaches in green finance standards reflect specificities in economic and financial conditions, institutional capacities and governance norms to implement such standards. While continued research into harmonizing green finance standards across APEC member economies should, and will likely, continue, it would be unproductive to try to answer the question as to which green finance standard is the “best” in terms of mobilizing green finance.

At the policy level, it is important to understand the underlying reasons for the heterogeneity in sustainable finance standards that need to be considered for further harmonization efforts of green finance standards. The quest for harmonizing green financing standards would be well served if a broader approach to climate change mitigation and adaptation projects were to be adopted. This broader approach would meet the needs of developing member economies in which energy security and energy affordability are key goals in the broader quest for economic development and poverty alleviation, in line with the UN’s SDG goals.

#### d. CSR and ESG in Green Finance

Forms of green finance have grown rapidly in recent years, as a growing number of institutional investors and funds incorporate various Corporate Social Responsibility (CSR) and Environmental, Social and Governance (ESG) investment initiatives.<sup>235</sup> In the 2019 Joint Ministerial Statement, APEC Finance Ministers commissioned the OECD to produce a compendium on the implementation of ESG in financial markets throughout the APEC region, looking at effective approaches and challenges. In 2020, the OECD issued a report based on the work and efforts of the OECD’s Committee on Financial Market to assess ESG investing and key findings from evidence-based reports in APEC economies.<sup>236</sup>

In June 2021, the finance ministers of the G-7 called for making disclosure of climate-related financial risks compulsory for companies.<sup>237</sup> The G-7 group supported moves requiring companies to report how climate change is affecting their business to accelerate the process toward reaching global standards for disclosing climate-related data that is relevant to investors. With respect to such global standards, the Financial Stability Board (FSB) created the Task Force on Climate-related Financial Disclosures (TCFD) to improve and increase reporting of climate-related financial information.<sup>238</sup> The TCFD works to develop recommendations for more effective climate-related disclosures that promote informed investment, credit, and insurance underwriting decisions and, in turn, enable stakeholders to understand better the financial system’s exposures to climate-related risks.

The TCFD says companies should make public in their financial reports information on how climate change could hit their revenue outlook. While currently voluntary, the framework is increasingly being used by large corporations and supported by regulators world-wide. “We support moving toward mandatory climate-related financial disclosures... that are based on the Task Force on Climate-related Financial Disclosures framework,” the

<sup>235</sup> In the discussion on CSR and ESG that follows, the focus is on environmental criteria for the purposes of this report. It should be noted that ESG also incorporates social and governance objectives such as gender and racial equity, human rights and so on.

<sup>236</sup> Boffo, R., and R. Patalano (2020), “ESG Investing – Trends in APEC Economies”, OECD Paris, Accessed at <https://www.oecd.org/finance/ESG-Investing-Practices-Progress-Challenges.pdf>

<sup>237</sup> Sardon, M., “G-7 backs requirement that companies publicly report climate risks to their businesses”, Dow Jones Newswires, June 7, 2021 accessed at <https://www.marketwatch.com/story/g7-backs-requiring-companies-to-report-on-climate-risks-271623064586>

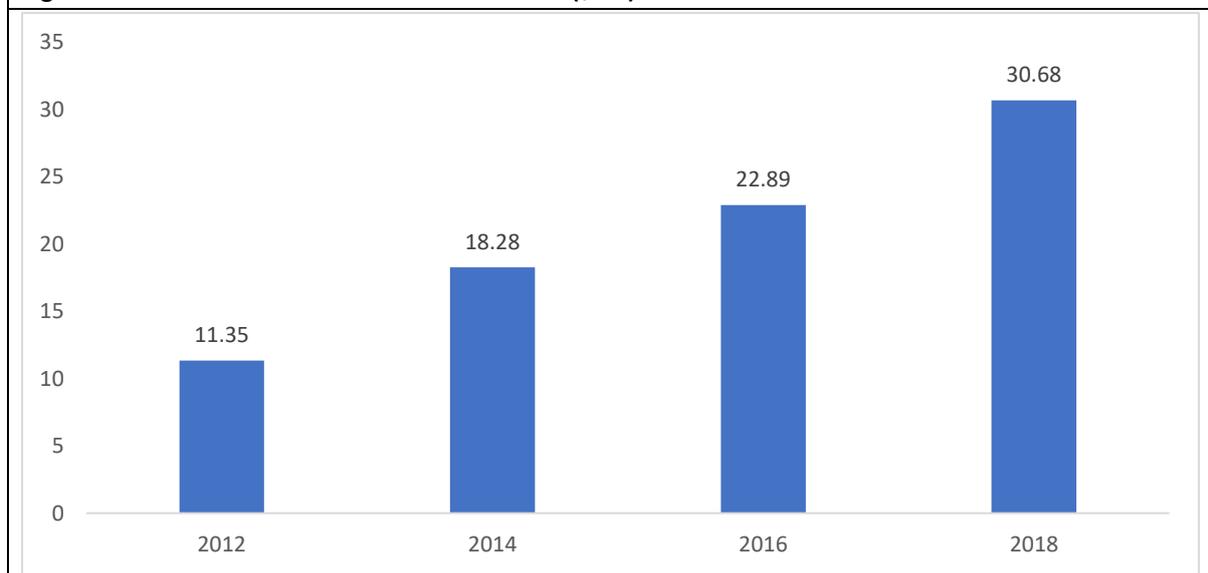
<sup>238</sup> Refer to the TCFD website, accessed at <https://www.fsb-tcfid.org/about/>

G-7 finance ministers said in a statement.<sup>239</sup> The group highlighted the need for a “baseline global reporting standard for sustainability” to help investors in their decision making.

To achieve this objective the TCFD has developed a reporting framework based on a set of consistent disclosure recommendations for use by companies as a means of providing transparency about their climate-related risk exposures to investors, lenders, and insurance underwriters. Improving the quality, consistency and transparency of climate-related financial disclosures will allow economies to have the necessary information to better assess the impact and effects of an organization on climate change. Around 1,700 organizations worldwide -- in the public and private sectors, as well as government entities -- support the TCFD.<sup>240</sup>

ESG investments have grown rapidly over the past decade, and the amount of professionally managed portfolios that have integrated key elements of ESG assessments exceeds \$17.5 trillion globally by some estimates.<sup>241</sup> Global ESG assets are on track to exceed \$53 trillion by 2025, representing more than a third of the \$140.5 trillion in projected total assets under management.<sup>242</sup> According to Statista, ESG investments grew to \$30.68 bn by 2018, at an annual compound rate of 18% from 2012.<sup>243</sup> Investors with over \$80 trillion in combined assets have signed a commitment to integrate ESG information into their investment decisions.<sup>244</sup>

**Figure 2.20: ESG Investment Growth 2012 – 2018 (\$ bn)**



Source: Statista 2021, accessed at

<https://www.statista.com/statistics/1135526/investment-environmental-social-corporate-governance-globally/>

The size of ESG investments in the total investment universe is difficult to assess given the multiple data sources from different providers of ESG data and the varying definitions employed. A recent estimate of “sustainable and responsible investing” in the US market for professional managed assets in 2018 yields some perspective. The “sustainable and responsible investing” segment accounts for over 25% of total professionally managed assets in the US in that year. Demand for ESG investment products in the Asia Pacific region has been climbing significantly. According to the Global Sustainable Investment Alliance the proportion of sustainable investing assets in Japan, Australia and New Zealand currently stands at around US\$ 3 trillion, representing 9% of the total global sustainable assets under management and with a growth of over 40% in Australia and more than 300% in Japan.<sup>245</sup> This strong growth in “sustainable” investing in the APEC economies has been driven by commitments from large institutional investors, international investors and regulatory pressures. For example, Japan’s Government Pension Investment Fund (GPIF), one of the world’s largest pension fund, focuses on ESG

<sup>239</sup> Sardon, M., *ibid*

<sup>240</sup> Deloitte, “What is the TCFD and why does it matter?”, undated, accessed at <https://www2.deloitte.com/ch/en/pages/risk/articles/tcf-and-why-does-it-matter.html>

<sup>241</sup> Op cit., OECD, <https://www.oecd.org/finance/ESG-Investing-Practices-Progress-Challenges.pdf>

<sup>242</sup> Bloomberg Intelligence, “ESG assets may hit \$53 trillion by 2025, a third of global AUM”, February 23, 2021 accessed at <https://www.bloomberg.com/professional/blog/esg-assets-may-hit-53-trillion-by-2025-a-third-of-global-aum/>

<sup>243</sup> Statista, “Investment on environmental, social, and corporate governance worldwide from 2012 to 2018(in billion U.S. dollars)”, undated, accessed at <https://www.statista.com/statistics/1135526/investment-environmental-social-corporate-governance-globally/>

<sup>244</sup> Principles for Responsible Investment (PRI) Annual Report 2021. Accessed at <https://www.unpri.org/>

<sup>245</sup> Global Sustainable Investment Alliance (2018) accessed at [http://www.gsi-alliance.org/wpcontent/uploads/2019/03/GSIR\\_Review2018.3.28.pdf](http://www.gsi-alliance.org/wpcontent/uploads/2019/03/GSIR_Review2018.3.28.pdf)

in its investment strategy by investing in sustainable indexes and improving the ESG standards it applies to its asset portfolios.

There is an increasing interest from regulators and investors in the APEC economies including emerging markets to recognize and integrate international ESG standards and disclosure practices. Table 2.11 below identifies 18 exchanges of 16 APEC economies that have produced guides for listed companies. Among the most prominent reporting frameworks being used are the Global Reporting Initiative (GRI), the Sustainable Accounting Standard Board (SASB) and the Task Force on Climate-Related Financial Disclosures (TCFD).

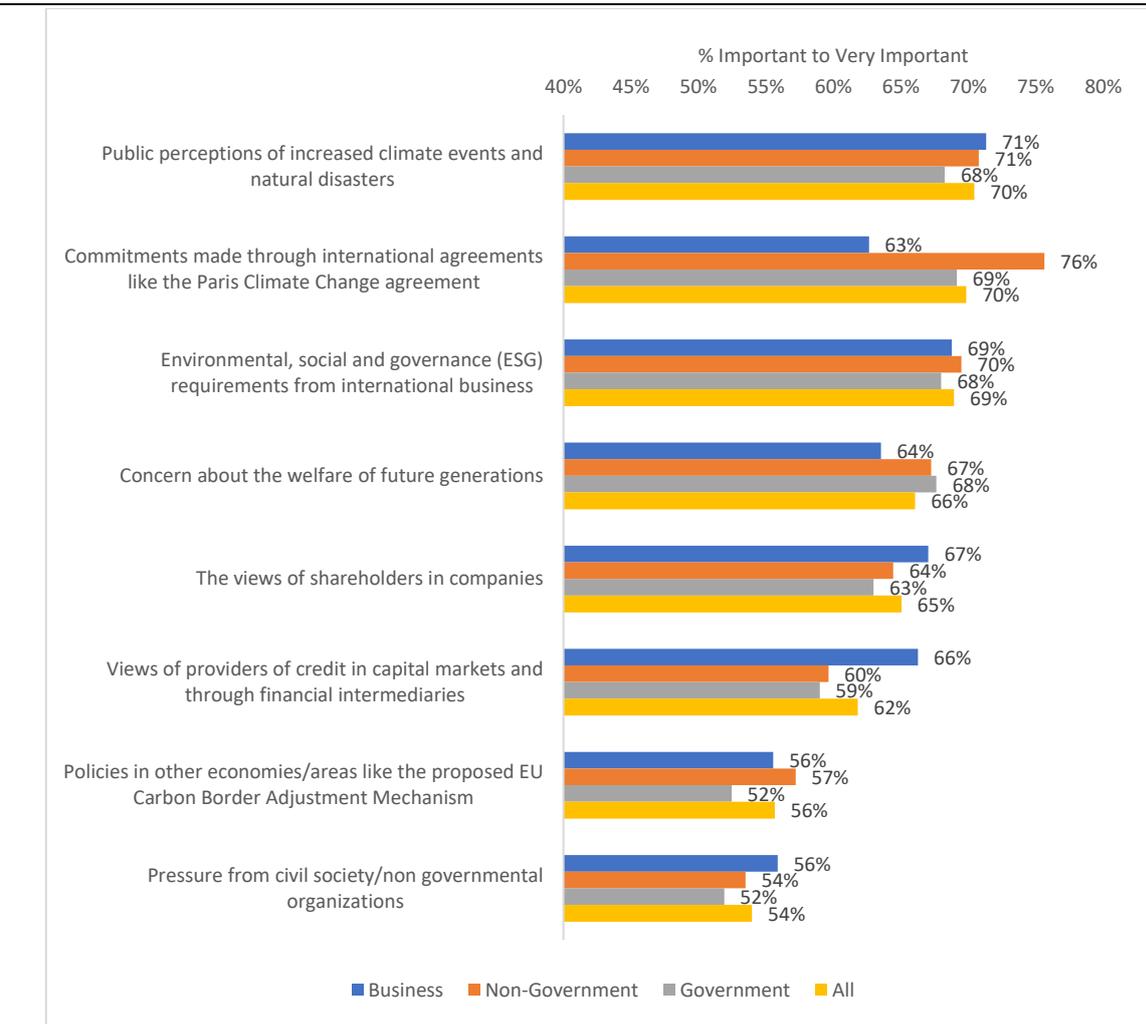
**Table 2.11: ESG Guidance in Exchanges in APEC Member Economies**

Economy	Exchange	ESG Guidance	GRI	SASB	TCFD
Australia	Australian Securities Exchange	<a href="#">ESG Reporting Guide for Australian Companies (2015)</a>	X	X	X
Canada	TMX Group Inc.	<a href="#">A Primer for Environmental &amp; Social Disclosure (2020)</a>	X	X	X
Chile	Bolsa de Comercio de Santiago	<a href="#">How to include ESG factors: design and construction of sustainability reports (2017)</a>	X	X	
China	Shanghai & Shenzhen Stock Exchange	<a href="#">Guidelines for Environmental Information Disclosure of Listed Companies in Shanghai Stock Exchange (2008)</a> & <a href="#">Social Responsibility Instructions to Listed Companies (2006)</a>			
Hong Kong, China	Hong Kong Exchange	<a href="#">How to Prepare an ESG Report: A Step-by-Step Guide to ESG Reporting (2020)</a> & <a href="#">Guide for Board and Directors: Leadership role and accountability in</a>	X	X	X
		<b>ESG (2020)<sup>5</sup></b>			
Indonesia	Indonesia Stock Exchange	<a href="#">Application of Sustainable Finance for Financial Services Institutions, Issuers and Public Companies (2017)</a>			
Japan	Japan Exchange Group	<a href="#">Practical Handbook for ESG Disclosure (2020)</a>	X	X	X
Malaysia	Bursa Malaysia	<a href="#">Sustainability Reporting Guide (2020)</a>	X	X	X
Mexico	Bolsa Mexicana de Valores	<a href="#">Sustainability Guide: Towards Sustainable Development of Companies in Mexico (2017)</a>	X	X	
New Zealand	New Zealand Stock Exchange	<a href="#">Environmental, Social and Governance: NZX Guidance Note (2017)</a>	X	X	X
Peru	Bolsa de Valores de Lima	<a href="#">Guía de Usuario para facilitar el llenado del Reporte de Sostenibilidad Corporativa (2017)</a>	X	X	
Philippines	Philippine Stock Exchange	<a href="#">Sustainability Reporting Guidelines for Publicly Listed Companies (2019)</a>	X	X	X
Singapore	Singapore Exchange	<a href="#">Sustainability Reporting Guide (2018)</a>	X	X	
Thailand	Stock Exchange of Thailand	<a href="#">Guidelines for the preparation of sustainability reports (2012)</a>	X		
Viet Nam	Hanoi & Ho Chi Minh Stock Exchange	<a href="#">Environmental and Social Disclosure Guide (2016)</a>	X		
United States	Nasdaq	<a href="#">ESG Reporting Guide 2.0: A Support Resource for Companies (2019)</a>	X	X	X

Source: Sustainable Stock Exchanges Initiative; cited in Boffo, R., and R. Patalano (2020), "ESG Investing: Practices, Progress and Challenges", OECD Paris,

Drivers of Climate Change Policy

Figure 2.21: Drivers of Climate Change Policy



Question: How important do you think the following are in driving climate change policy in your economy?

According to the PECC questionnaire, ESG requirements are seen as the third most important driver of climate change policy after public perceptions of climate events and commitments made through international agreements such as the Paris Climate Change Agreement.

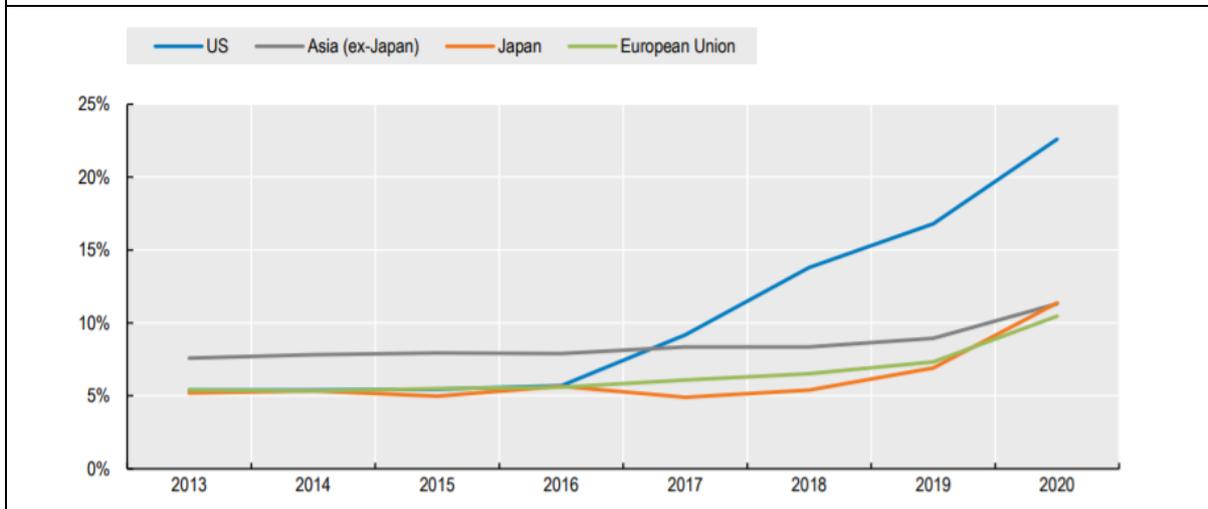
The growth in green finance along ESG criteria is a function of three factors. First is the perception that ESG criteria can help improve risk management and lead to returns that are at least comparable if not superior to returns from traditional financial investments. The second factor relates to the growing attention paid to the risks from climate change and the believe that this will increasingly influence investor and consumer choices which impact corporate performance. Third, corporations and financial institutions are under shareholder and government pressure to move way from short-term perspectives of risks and returns in order to better reflect longer-term sustainability in investment performance.

While demand for ESG investment options is growing rapidly, it is clear that ESG ratings are still at an early stage of development. Risk-adjusted returns on ESG investments differ widely in performance, and evidence suggests that there is a lack of correlation between ESG ratings and investment performance.<sup>246</sup> The inconsistencies and lack of comparability across different ESG metrics offered by rating agencies and consultants is a result of the

<sup>246</sup> Op cit., Boffo, R., and R. Patalano (2020), "ESG Investing – Trends in APEC Economies", OECD Paris; see also Florian Berg, Julian F. Koelbel, and Roberto Rigobo, "Aggregate Confusion: The Divergence of ESG Ratings", MIT Sloan School Working Paper 5822-19, 2019, accessed at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3438533](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3438533)

use of different conceptual frameworks, measures, key indicators, qualitative judgement, and varying and often arbitrary weighting of different subcategories within ESG frameworks. There is little consensus on the objective measures of achievement in ESG.

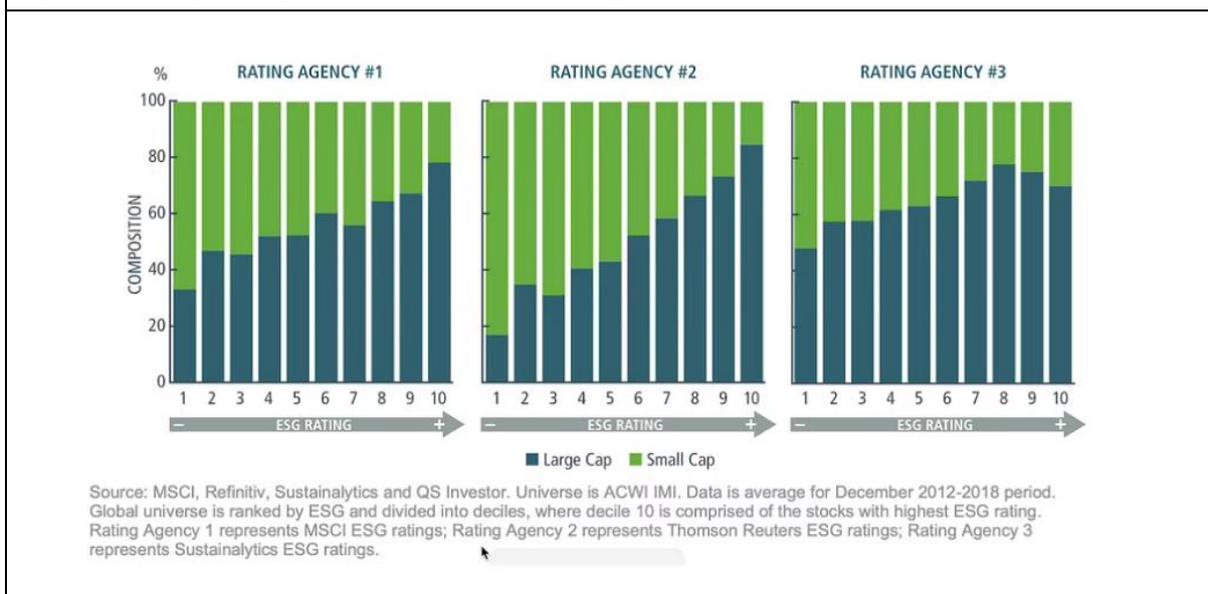
**Figure 2.22: ESG ratings market coverage share (%)**



Source: Refinitiv (Reuters) and OECD, cited in *Op cit.*, Boffo, R., and R. Patalano (2020), “ESG Investing – Trends in APEC Economies”, OECD Paris

In general, larger companies have higher ESG ratings compared to smaller companies. The largest companies by market capitalization have ample resources to invest in disclosing information concerning their ESG scores while small capitalized companies cannot afford the threshold costs associated with gathering and collating the data needed to disclose non-financial ESG information. The influence of size and location of companies on ESG ratings naturally bias the “ESG game” against small and medium enterprises which cannot afford the services of large accounting firms, consultancies and banks which offer ESG rating services.<sup>247</sup>

**Figure 2.23: Larger Companies Do Better in ESG Ratings**



<sup>247</sup> Damodaran, A., Tuesday, “The ESG Movement: The “Goodness” Gravy Train Rolls On!”, Bloomberg Opinion, September 19, 2021 accessed at <https://www.bloombergquint.com/markets/the-esg-movement-the-goodness-gravy-train-rolls-on>

In assessing the role of ESG investing in the APEC economies, the fundamental causality question remains: are companies pursuing ESG criteria more profitable, or are the more profitable companies those that are able to afford the services of ESG rating services offered by accounting firms, ESG disclosure advisors and consultants, and investment fund managers? The empirical evidence provides little support to suggest that ESG ratings provide adequate measures of “green finance” for climate change mitigation and adaptation efforts.

#### e. Central Banks and Multilateral Financial Institutions’ Role in Green Finance

The world’s central banks have traditionally operated under narrow mandates to safeguard financial stability by overseeing the financial system of private and public-sector banks and managing liquidity and interest rates. In recent years, however, central banks as well as multilateral financial institutions such as the World Bank and the IMF are increasingly involved in efforts to enhance the role of ESG, CSR and “stakeholder capitalism” in capital markets. With the US, EU, and UK push to “fight climate change” in the run-up to the UN climate conference in Glasgow in November (COP26), there has been much discussion on the role of central banks in addressing risks associated with climate change and in supporting the development of green finance.

The World Bank, the Asian Development Bank, the European Investment Bank and the International Monetary Fund have either already stopped, or plan to end soon, the funding of fossil fuel-based projects.<sup>248</sup> The IMF supports the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) to promote green finance. The Biden administration’s new Secretary of the Treasury Janet Yellen plans to push lenders to adopt more “green” lending policies. According to Yellen, the US federal government will “need to seriously look at assessing the risk to the financial system from climate change.”<sup>249</sup>

Should member economies support a vastly expanded remit -- far beyond the traditional objectives of price stability and avoiding financial crises -- for their central banks? The move by central banks to incorporate green finance into monetary policy poses key risks to member economies. In noting this dangerous ‘mission creep’ of central banks, Professor John Cochrane in a recent testimony to the US Senate Committee on Banking, Housing and Urban Affairs warned that the boardrooms of central banks risk becoming politicized.<sup>250</sup> The considerable power of the central bank over investment decisions and corporate behavior risks the politicization of the capital allocation process and fundamentally undermine the efficiency of capital markets. Member economies’ broad response to climate change is more properly decided by elected leaders with policies enacted through the legislative process after having engaged with specialized environmental and scientific agencies and ministries.

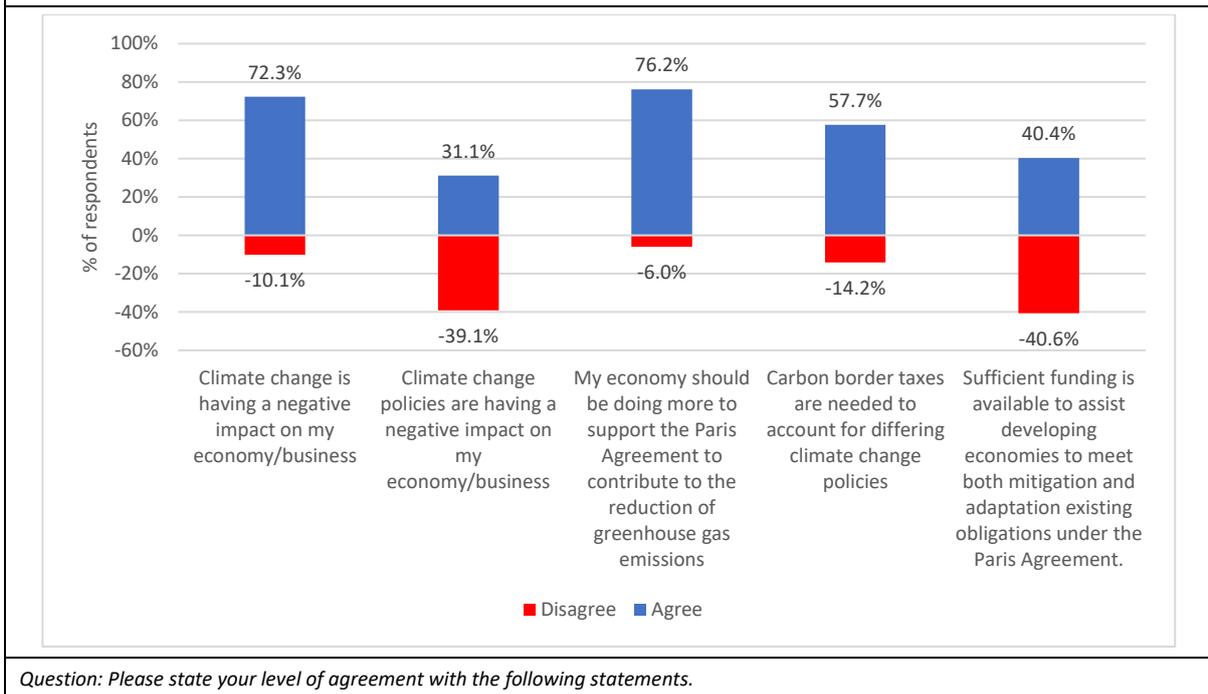
While there was strong support for action on climate change, that is climate change was having a negative impact on the economy and that their economies should be doing more to support the Paris Agreement, there was also a significant alternative view – 31 percent of respondents thought that climate change policies are also having a negative impact on their economies/businesses.

<sup>248</sup> For instance, [https://bankwatch.org/press\\_release/world-s-largest-multilateral-bank-ends-fossil-fuels-financing](https://bankwatch.org/press_release/world-s-largest-multilateral-bank-ends-fossil-fuels-financing) ; <https://www.bloombergquint.com/markets/yellen-targets-curbs-on-development-bank-support-for-fossil-fuel> ; <https://noharm.co/asian-multilateral-bank-claims-to-close-coal-linked-funding/>

<sup>249</sup> <https://thefinancialbrand.com/108129/biden-administration-regulator-picks-fintech-fair-lending-covid-inequality-green-yellen/>

<sup>250</sup> US Senate Committee Hearing, “21st Century Economy: Protecting the Financial System from Risks Associated with Climate Change”, 18 March 2021; testimony by John Cochrane accessed at <https://www.banking.senate.gov/hearings/21st-century-economy-protecting-the-financial-system-from-risks-associated-with-climate-change>

**Figure 2.24: Asia-Pacific Views on Climate Change Issues**



Much more needs to be done to ensure that a cost-benefit analysis is applied to climate change solutions based on the best information available. The divided views on whether sufficient finance has been made available was not an emerging economy vs. advanced economy issue within the Asia-Pacific policy community. Indeed, many of the issues that traditionally divide emerging and advanced economies were not evident in PECC's survey results.

**Concluding Thoughts**

The negotiations at the upcoming COP26 summit in November in Glasgow will be contentious and difficult, perhaps more so than at any time since the Paris Agreement came into force in November 2016. There are several issues that will constitute significant challenges to the adoption of more ambitious NDCs by all Parties. Of these, the commitment to and delivery of, financial support, technology transfer and capacity building assistance by developed economies to the developing economies will once again be a major area of discussion and debate. A second issue of major concern will be presented by the EU's proposed carbon border adjustment mechanism which has already been objected to by its major trading partners. From the point of view of the developed OECD economies, the adoption and implementation of sufficiently ambitious climate mitigation commitments by the major developing economies will be of key concern.

APEC member economies can play a significant constructive role in the outcome of the COP26 negotiations. APEC's Putrajaya vision of "an open, dynamic, resilient and peaceful Asia-Pacific community by 2040" can be the basis to find ways to support Article 6 of the Paris Agreement which aims at assisting governments in implementing their NDCs through voluntary international cooperation. Such voluntary international cooperation will require an assurance for the developing APEC member economies -- along with other developing economies -- that energy security, reliability and affordability requisite for their economic development and poverty alleviation objectives will be given priority. Significant achievements in establishing region-wide carbon markets in the Asia-Pacific region which can have linkages with existing carbon markets in Europe and North America are within reach, and APEC member economies would gain mutual benefits from such arrangements and the momentum from business-driven demand for carbon credits and markets. Trade in environmental goods and services can be further enhanced if it included the potential for voluntary trade in carbon credits and offsets. Carbon mitigation and adaptation projects jointly implemented between APEC developed and developing economies, supporting a supply of good quality carbon credits and offsets and the creation of missing markets in natural capital could demonstrate the value of such projects beyond the APEC region.

# CHAPTER 3

## INDEX OF ECONOMIC INTEGRATION IN THE ASIA-PACIFIC

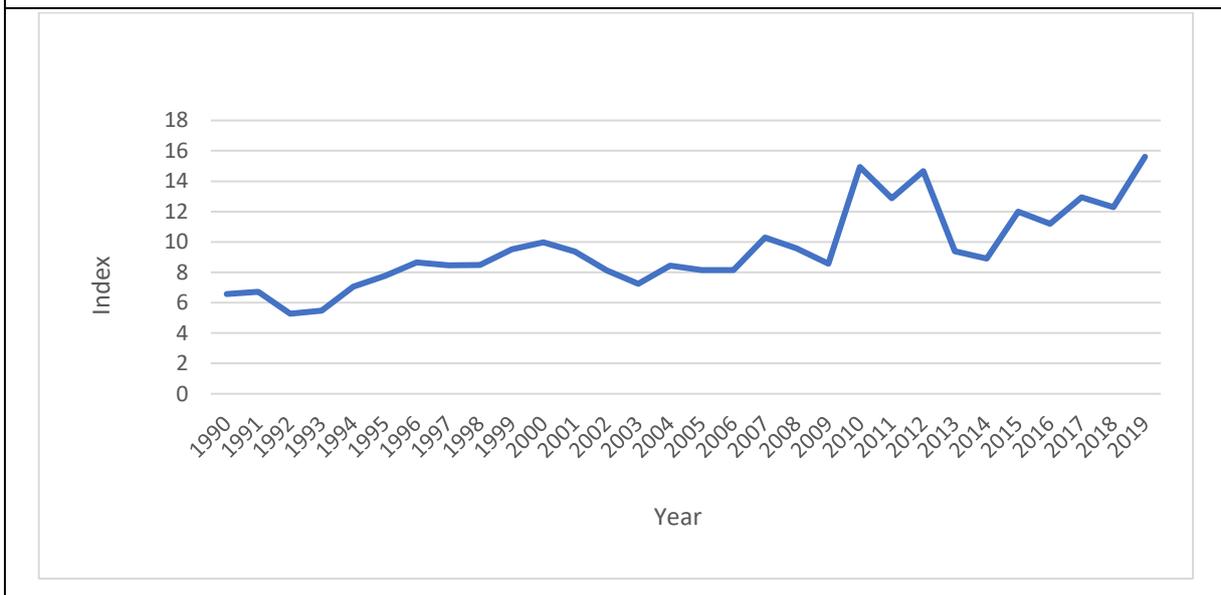
# CHAPTER 3: INDEX OF ECONOMIC INTEGRATION IN THE ASIA-PACIFIC\*

Contributed by Bo Chen<sup>†</sup>

The latest update to PECC's index of economic integration in the Asia-Pacific region in 2019 continued to show an increased level of integration, even surpassing the previous peak in 2010. The increase in the index reflects the process of the economic integration in the Asia Pacific region has achieved solid progress regardless of the US-China trade war initiated in 2018, which indicates a substitution effect rather than a destruction effect of the trade war in the Asia Pacific region, at least for 2018 and 2019.

The index measures the degree of integration taking place in the Asia-Pacific region based on intraregional flows of: goods; investment; tourists; and five measures of convergence: gross domestic product (GDP) per capita; share of non-agriculture to GDP; the urban resident ratio; life expectancy; and share of education expenditure in gross national income (GNI). The index was developed in 2008 as a tool to measure the degree of integration taking place in the Asia-Pacific. Regional economic integration has become a core objective of the Asia-Pacific Economic Cooperation (APEC) forum. The process of economic integration is commonly defined as the intra-regional freer movement of goods, services, labor, and capital across borders.

**Figure 3.1: Composite Index of Regional Economic Integration**



The degree of economic integration can be analyzed at bilateral, regional, and global levels. Even though the Asia-Pacific region is not covered by a single trading agreement, there is much anecdotal evidence to suggest that it is becoming more integrated. As defined by the APEC membership, the region consists of not only developed economies such as the United States, Japan, Canada, and Australia, but also emerging markets from ASEAN. It is well known that parts of the region are already highly integrated through production networks that facilitate trade of intermediate and finished goods across borders. Since 1998, many economies in the region have negotiated bilateral and sub-regional free trade agreements with partners in the region as well as outside

\* For approach details, data sources and treatment, please refer to Bo Chen and Yuen Pau Woo (2010), "Measuring Economic Integration in the Asia-Pacific Region: A Principal Components Approach," *Asian Economic Papers*, Vol.9(2), pp. 121-143.

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the region. APEC Leaders have also reaffirmed their commitment “to advance the process in a comprehensive and systematic manner towards the eventual realization of the FTAAP as a major instrument to further APEC’s regional economic integration agenda”, which if successful, would constitute the largest regional trading bloc in the world.

An important feature of the index is that it excludes trade and investment flows among geographically contiguous sub-regional trading partners, namely US-Mexico-Canada Agreement (the updated NAFTA Agreement), the members of ASEAN, and Australia-New Zealand Closer Economic Relations. It also excludes flows among China, Hong Kong (China), and Chinese Taipei. This is to control for the effect that sub-regional flows may have on the index, whereby a very high degree of integration among, for example, USMCA economies could result in a falsely high measure of integration with the Asia-Pacific region as a whole.

Furthermore, since trade, investment, and tourism measures are calculated relative to global transactions, the index will rise for a given economy only if that economy’s share of intraregional trade/investment is growing relative to total trade and investment.

The weights given to each dimension are determined using principal component analysis.<sup>251</sup>

**Table 3.1: Weights Used**

*Composite Index*

Category	Weight (%)
<b>Convergence*</b>	22.2%
<b>Trade</b>	37.3%
<b>Foreign Direct Investment (FDI)</b>	36.4%
<b>Tourism</b>	4.1%

\* *Convergence Sub-Index*

Category	Weight (%)
<b>GDP per capita</b>	12.0%
<b>Non-agriculture share of GDP</b>	13.0%
<b>Urban ratio</b>	11.0%
<b>Life expectancy</b>	14.0%
<b>Education expenditure share of GNI</b>	50.0%

The convergence measures are premised on the notion that integration will lead to greater uniformity among the economies. Accordingly, more trade and investment among regional partners may not translate into a higher score on the integration index if at the same time the partners are diverging in terms of income, education, life expectancy, urbanization, and economic structure.

Caution should be exercised in the interpretation of these findings. The measures chosen for inclusion in the composite index are imperfect indicators of “convergence” and trade/investment integration. The rankings in turn should not be read normatively as “league tables” in the sense that a higher ranking is superior to a lower ranking. A low ranking may simply indicate that an economy is oriented more globally than regionally, as is likely the case for China and the United States.

<sup>251</sup> See Bo Chen and Yuen Pau Woo (2010), “Measuring Economic Integration in the Asia-Pacific Region: A Principal Components Approach,” *Asian Economic Papers*, Vol.9 (2), pp. 121-143.

Nevertheless, the change in index value for a given economy over time can be read as a measure of its changing economic orientation. The index value for the region as a whole can also be seen as a measure of closer economic ties among Asia-Pacific economies and as one indicator of APEC's success.

The 2021 update to the index is based on the latest data available for the selected dimensions from 2019. Missing data were approximated using standard interpolation and extrapolation techniques. Furthermore, in the following text, we compared the most updated 2019 indices/indicators with the 2015 counterparts as the 2015 ones is in the most recent report.

The most recent figures showed a robust increase in the index even though the fierce US-China trade war began in 2018. The more integrated economies in Asia Pacific region show a more frequent exchange on goods, capital, and people. The US-China trade war might lead a more reallocation of the supply chains than the destruction of them, at least up to 2019. Overall, the 2021 update for the convergence indices continues its rebound after 2013 albeit a slight decrease in 2019 compared to 2018. As a result convergence increased for 11 out of the 17 Asia-Pacific economies included in this study.

**Table 3.2: Comparison of 2019 and 2015 Indices**

Economy	Convergence Index		Composite Index		Ranking
	2019	2015	2019	2015	
Australia	8.53	-5.49	57.88	39.41	7 (6)
Canada	32.25	24.51	26.69	21.41	11 (12)
Chile	28.73	50.72	24.36	34.27	12 (9)
China	-41.05	-42.00	-10.43	-9.87	16 (16)
Hong Kong (China)	-27.44	-28.62	226.66	241.57	2 (2)
Indonesia	-29.32	-37.00	-1.13	-1.35	15 (15)
Japan	-8.69	0.23	51.06	33.69	9 (10)
Korea	33.01	63.17	71.86	76.6	5 (3)
Malaysia	43.48	-27.52	69.93	52.65	6 (5)
Mexico	38.53	39.99	20.07	21.19	14 (13)
New Zealand	-47.28	-50.14	54.02	28.35	8 (11)
Philippines	-84.07	-89.05	-11.35	-9.98	17 (17)
Singapore	-48.4	-39.64	389.97	253.31	1 (1)
Chinese Taipei	-75.83	-28.92	38.01	35.20	10 (7)
Thailand	35.51	29.54	87.04	72.28	3 (4)
United States	30.27	13.87	23.17	14.2	13 (14)
Vietnam	-3.6	-21.44	84.21	34.97	4 (8)
<b>Asia-Pacific Region</b>	<b>-3.19</b>	<b>-6.77</b>	<b>15.61</b>	<b>11.99</b>	<b>--</b>

Source: Authors' calculations and Chen and Woo (2010).

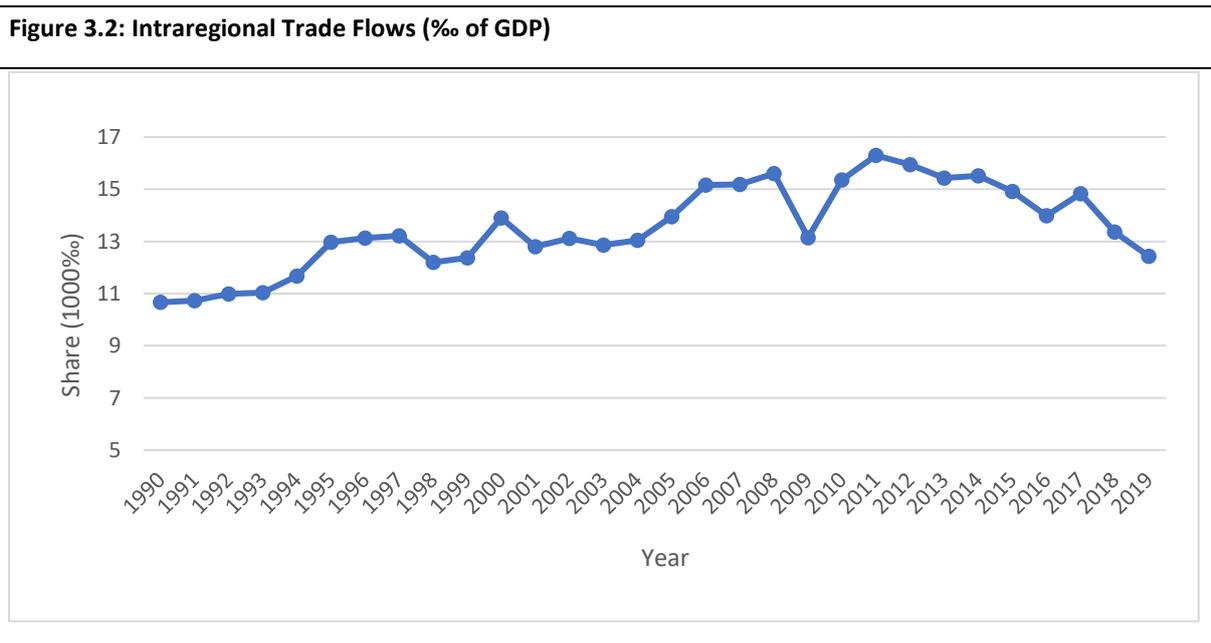
\* Rankings shown in parentheses indicate those from previous year (2014).

Noticeably, Singapore and Hong Kong (China) are still the most integrated economies with the AP markets. As the freest business harbors, Singapore and Hong Kong (China) benefit the most from economic integration in trade, investment, and tourism. The Philippines, however, still has the biggest gap behind the regional average, and its convergence ranking remains the lowest amongst all 17 economies in both 2015 and 2019. The overall convergence index in 2019 resumes its increasing trend after 2013, reflecting that Asia Pacific economies

exhibited a more balanced development pattern and thus the gaps between the 17 economies, which are measured by deviations from the regional averages of GDP per capita, non-agricultural GDP share, urbanization, life expectancy as well as education expense ratio, became smaller in 2019 compared to 2015. Furthermore, it is worth noting that Vietnam’s performance is outstanding. In 2015 Vietnam was ranked the 8<sup>th</sup>, in the middle of the rankings. However, after 4 years, Vietnam’s convergence index measurement quickly increased from 34.97 in 2015 to 84.21 in 2019, lifting it from the 8<sup>th</sup> to 4<sup>th</sup> place. Data shows that Vietnam had a significant increase in convergence measures as well as its trade, investment, and tourism interactions with other Asia Pacific economies.

**Asia-Pacific Trade Flows**

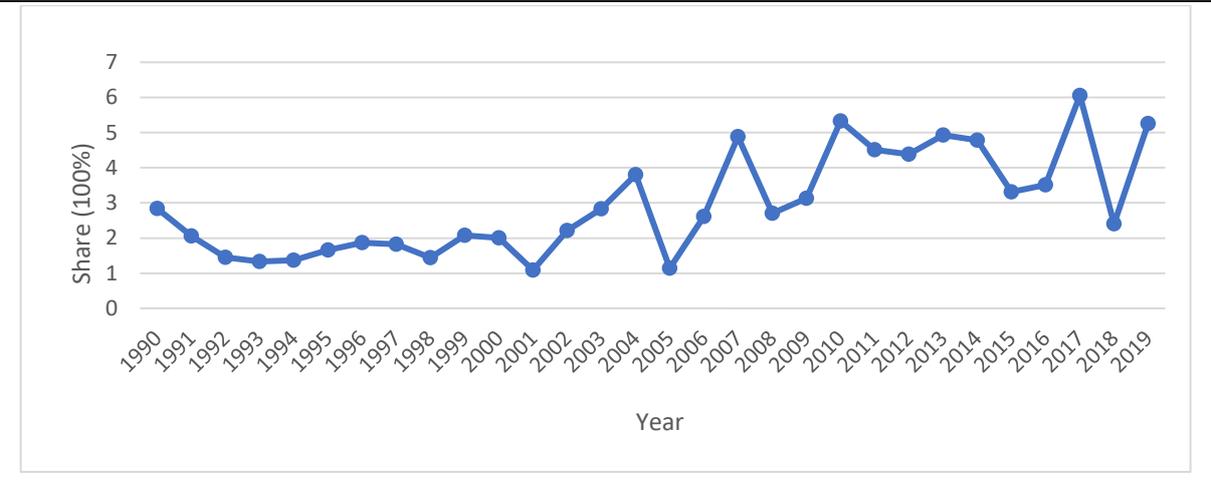
Figure 3.2 shows the share of Asia-Pacific intra-regional imports and exports to regional GDP. The intra-regional trade flows in 2018 and 2019 were declining significantly, due to the US-China trade war. The intra-regional trade flow share to GDP declined to 12.43‰ in 2019 from 14.92‰ in 2015 and its peak of 16.30‰ in 2011. The US-China trade war has contributed to the weaker intra-regional trade flow mainly via two channels. First, one of the U.S. purposes has been to bring manufacturing jobs back home. As a result, part of the decline in trade is a result of U.S. increased domestic production. Second, the high tariffs imposed by both economies deter some bilateral trade and affect other economies (mainly in the Asia Pacific region) on the same value chain. It should be re-emphasized here that this index excludes flows among sub-regions: the economies of Southeast Asia, North America and those among China, Chinese Taipei and Hong Kong (China).



Compared to 2015, in 2019 only 6 out of the 17 included economies show an increase in their intra-regional trade shares: the Philippines, Vietnam, Mexico, Canada, Australia, and New Zealand. Meanwhile, major trading economies, such as China, the United States, Japan, and Korea, have nontrivial decreases, which mainly occurred in 2018 and 2019.

**Foreign Direct Investment**

**Figure 3.3: Intra-regional Flows of Foreign Direct Investment (%)**



Compared to flows of goods, intra-regional flows of investment show a much more erratic pattern in figure 3.3. The intra-regional FDI flow shares are measure as the ratios of bilateral FDI (annual change of the FDI stock) within these 17 included economies versus their own capital formation. It reached its peak in 2017, tumbled in 2018, and rebounded in 2019. The most recent volatility is believed mainly due to the US-China trade war. Before the trade war occurred in 2017, the substantial economic growth in both economies and stable relations attracted investors confidently invest to them as well as the whole region. While the trade war caused investors to pause their investment. By 2019 many believed that the trade war could not be quickly resolved as they had hoped and started to reallocate their investment to other places to avoid the tariff and non-tariff barriers imposed by these two major economies. Data breakdown shows that China lost FDI significantly in 2019 to the lowest in our study (i.e. from 1990-2019) while the United States received the highest. Interestingly, the overall bilateral FDI in the Asia Pacific region shows that the 2019 level is indeed the second highest during 1990-2019. It implies that the reallocation of intra-regional FDI, rather than destruction, is dominant under the trade war.

**Tourism Flows**

**Figure 3.4: Intra-regional Tourist Inflows (% of total)**

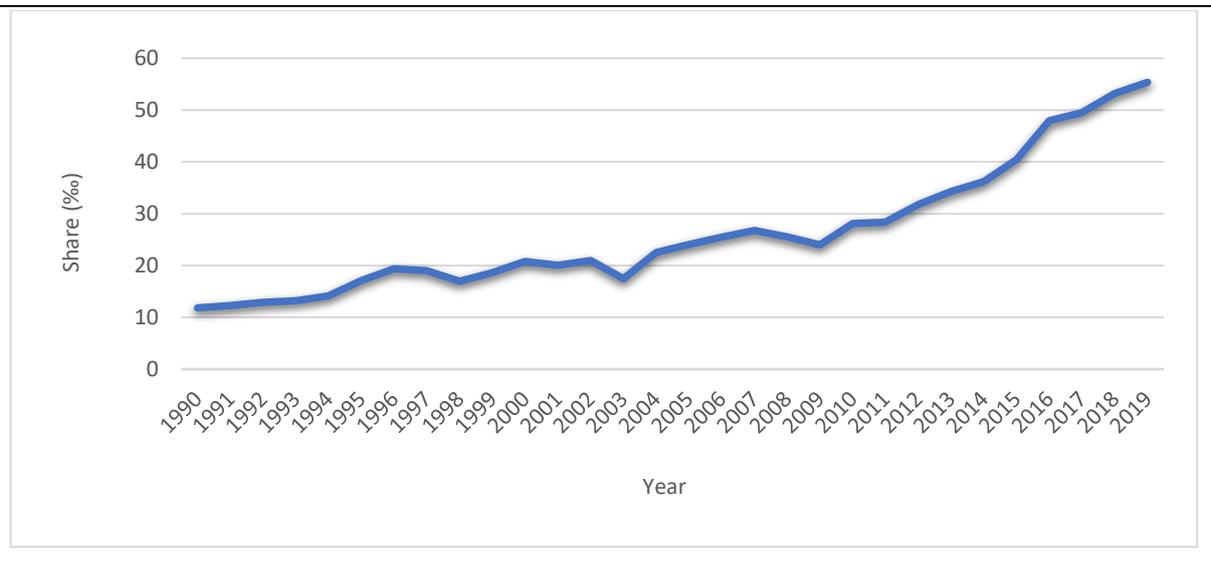


Figure 3.4 shows the substantial increase of the intraregional tourism in the years prior to the pandemic. It indicates that the intraregional tourist share (to every 1,000 citizens in hosting economy of the sample) has continually broke its record compared to the previous year since 2011.

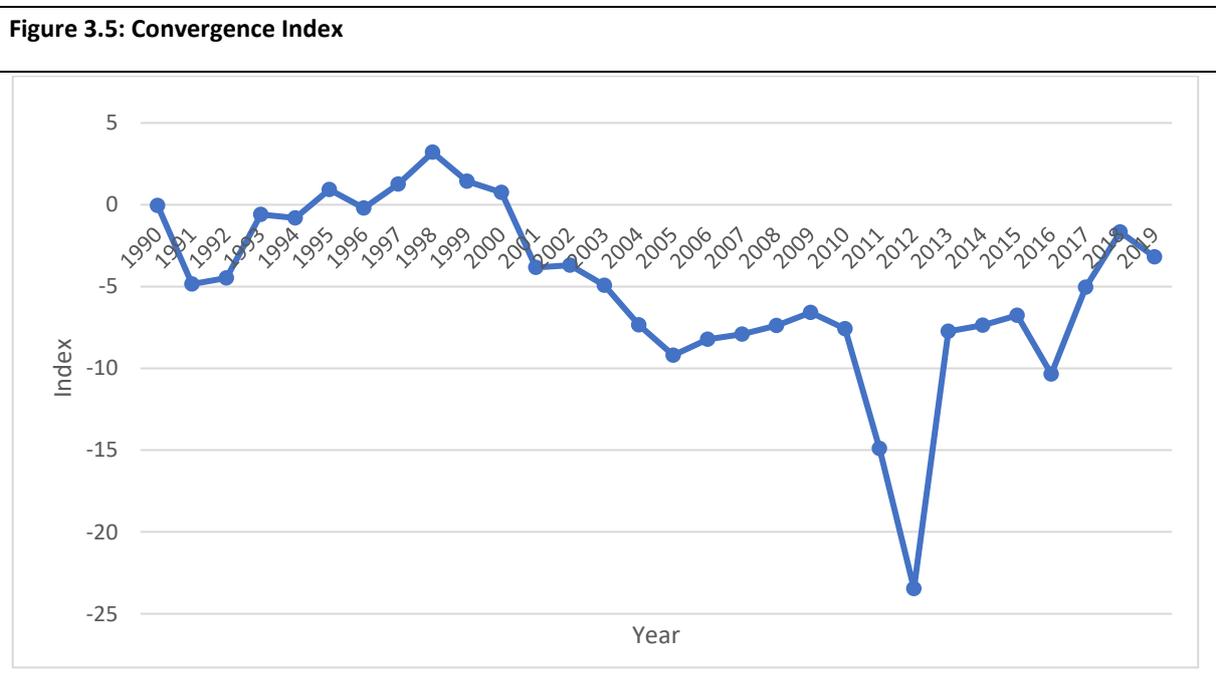
Except for the declines seen in 2007-2009 and 2010-2011, intraregional tourist flows have grown substantially from 17.5 tourists per 1000 citizens in 2003 to more than 40.48 in 2015 and more than 55.38 in 2019.

According to the data, Japan remains the largest recipient of inbound regional tourists, more than 29 million tourists in 2019. Besides Japan, there are five more economies that welcomed more than 10 million tourists, namely, Thailand, Vietnam, China, the United States, and Korea. It is worth noting that the tourists to Vietnam have increased dramatically since 2015: it had 4.7 million intraregional tourists (note that the number did not include those from ASEAN economies) in 2015 and more than 13.4 million in 2019, making it a new 10-million-tourist-economy club member since 2018.

However, as with trade and investment flows, the Covid-19 pandemic will have had a dramatic effect on intraregional tourist flows setting back regional integration significantly. While trade in goods recovered in late 2020 and through 2021, and although FDI flows to the region dropped significantly in 2020 as discussed in chapter 1 there are reason for believing that they may recover in 2021, many restrictions to the movements of people will remain in place due to Covid-19 as well as a reluctance to travel.

**Convergence Index**

The sub-index of convergence shows that economies in the region have overall rebounded since 2015 albeit with a slight decline in 2019. GDP per capita levels in the region had been significantly increasing from its 1990 level. However, the deviation from the regional average has increased even over 1990. This divergence trend slowed during 2012 to 2016 but resumed again until 2019. It should be noted here that GDP per capita accounts for just 12 percent of the weight of this sub-index while education expenditure accounts for 50 percent of the weight. Shifts towards convergence in education, even minor ones, could outweigh much larger shifts in income.

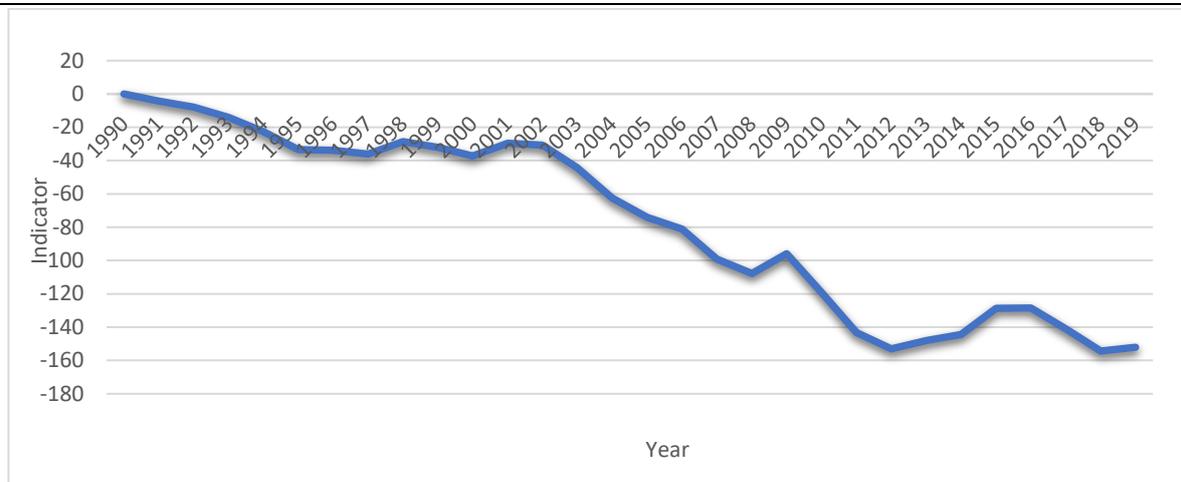


**More Diverging Incomes Again**

Figure 3.6 shows that the convergence indicator of GDP per capita (measured in current US\$) rebound after 2012. However, it becomes less convergent after 2016. The decreasing trend resumed after 2016 since some of

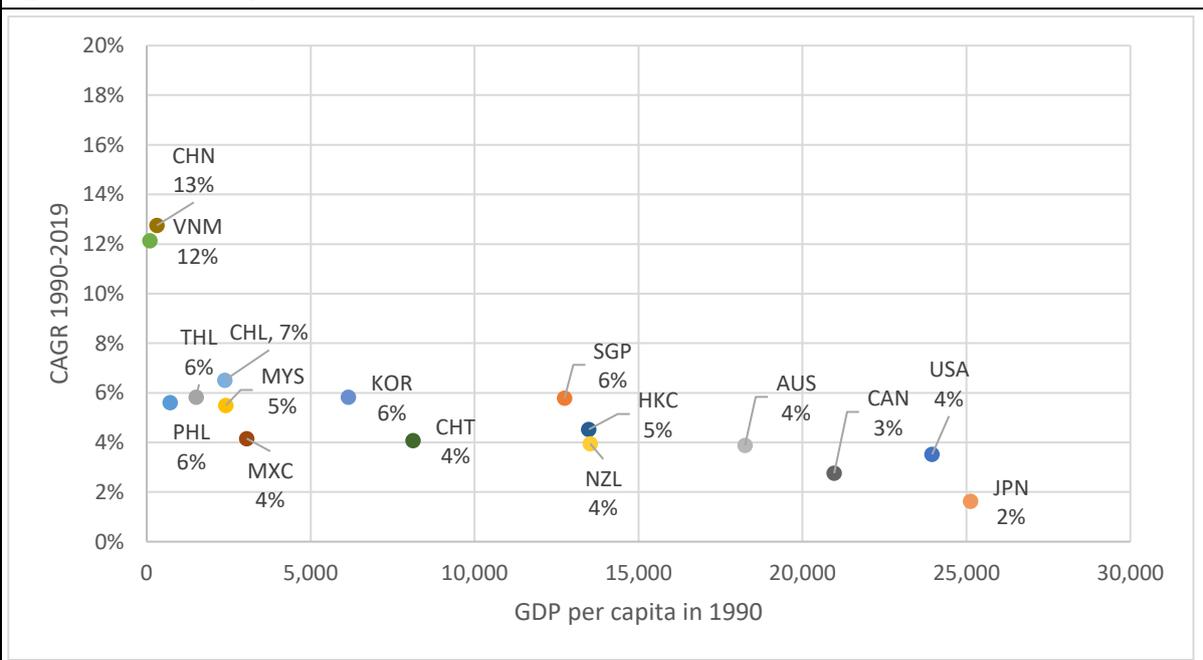
the developed economies such as the United States and Korea performed much better than before and their rising GDP per capita diverged further from the regional average.

**Figure 3.6: Deviation of GDP Per Capita**

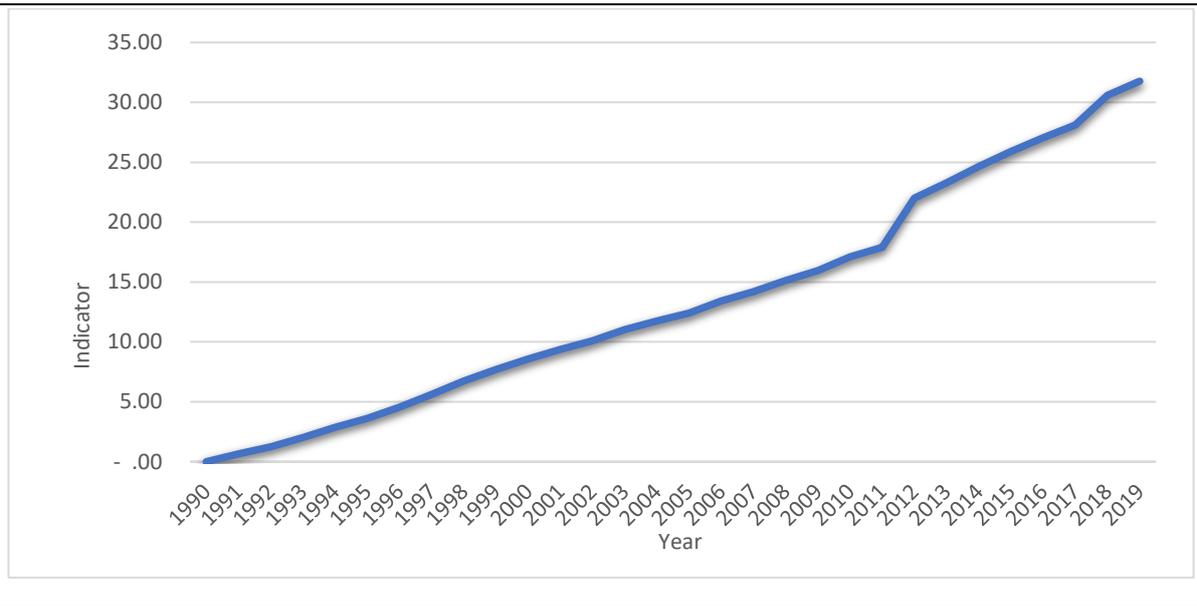


Over the entire index period, the divergence in incomes has been driven by differences in growth rates. Over the 30 years between 1990 and 2019, GDP per capita grew by 216 percent (in nominal terms), or at a compound annual growth rate (CAGR) of about 4.81 percent. However, income levels in some economies have grown at a much higher rate than the average in the region while others under the average. For incomes to converge, economies with lower starting GDP per capita levels would need to grow at a much faster rate than those with higher starting levels. Figure 3.7 shows the GDP per capita levels of regional economies in 1990 and the average growth rate over the past 30 years. For incomes to converge, those economies in the bottom left need to move up towards where China and Vietnam are positioned.

**Figure 3.7 GDP Per Capita Growth**

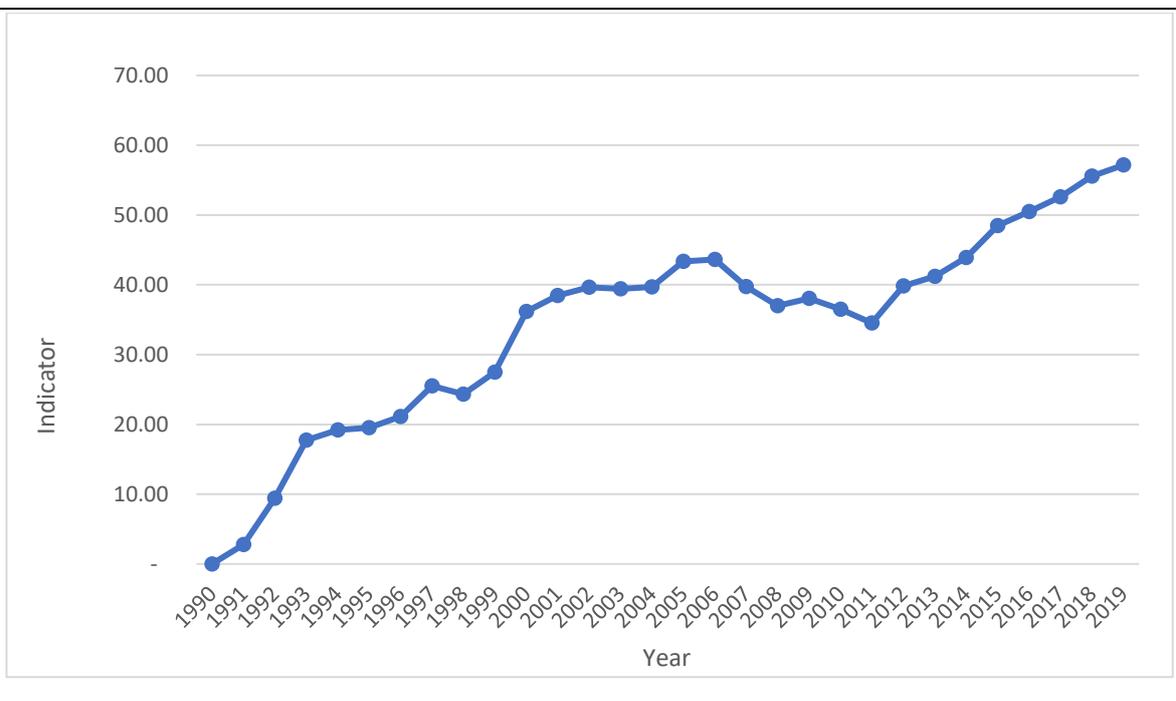


**Figure 3.8: Deviation Indicator: Urban Resident Ratio**



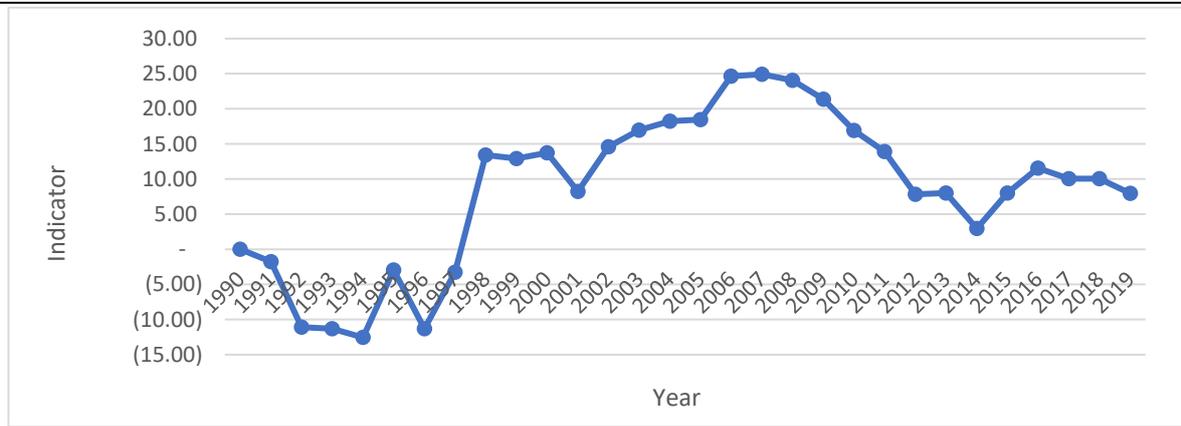
The pace of urbanization in developing economies in the region has been chasing that of the developed ones throughout the period as represented by the deviation indicator of urban population as shown in Figure 3.8. In 1990, the average urban resident ratio of these 17 included economies was 65.2 percent with a standard deviation of 21.9. By 2015, the urban resident ratio had increased to 75.06 percent with a standard deviation of 16.23. In 2019, the ratio further increased to 75.55 with a standard deviation of 14.94. The statistics show that all economies increase in urbanization with developing economies persistently catching up the developed ones. As seen in Figure 3.8, this has been a very linear and consistent trend in the region.

**Figure 3.9: Deviation Indicator: Share of Non-agriculture in GDP**



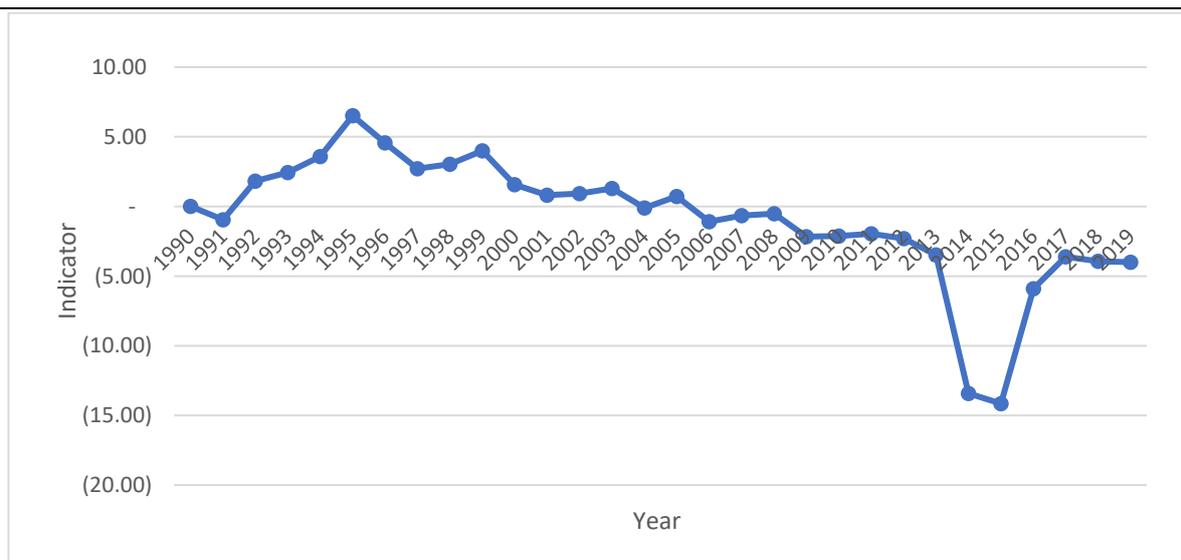
The convergence trend in the pace of urbanization resembles that of the urbanization. The share of non-agriculture in GDP has been persistently increasing after 2011, with the 2019 index reached the all-time height. According to the data, the average share of non-agriculture in GDP was 94.59 in 2015 and increased to 95.30 in 2019 while the standard deviation across the economies shrunk from 4.26 to 3.54.

**Figure 3.10: Deviation Indicator: Expenditure on Education as a Proportion of GNI**



While the proportion of expenditure on education in the region has significantly risen to 4.28 percent in 2019 compared to 3.42 in 1990, Figure 3.10 shows that the convergence of education expense share nevertheless has declined since the 2007 peak. Though there was a modest rebound during 2014-2016, the overall trend still clearly indicates that the education situation in the Asia Pacific region diverged. The economy specific data show that 6 out of the 17 Asia-Pacific economies reduced their share of GNI on education in the past 5 years (i.e. 2015-2019), 8 kept constant shares and only 3 (namely, Chinese Taipei, Korea, and Chile) increased their education expenditure shares.

**Figure 3.11: Deviation Indicator: Life Expectancy**



In 1990, the average life expectancy in the region was 73.6 years with a standard deviation of 3.52. After 20 years of development, in 2019 it had increased by almost 5.6 years to 79.19, with a standard deviation of 3.66. As seen in Figure 3.11, the life expectancy among Asia Pacific economies exhibited the most uneven distribution in 2016. Though it became less so during 2017-2019, the overall discrepancy still remains larger than its initial level in 1990. This means life expectancy is increasing faster in certain economies than others.

When APEC leaders set out the Bogor Goals in 1994, they set out a vision through which the region would not only maintain high growth rates but also narrow development gaps. While the region has done well in integrating and overall incomes have increased at a dramatic pace, the index shows that there is a long way to go in terms of closing development gaps. Integration is not an end in itself but a means to ensuring that all citizens can achieve their potentials. Many negative shocks, such as the Asian Financial Crisis, the Global Financial Crisis, the US-China trade war and the pandemic significantly disrupt the efforts of achieving a more integrated economy in Asia Pacific region. However, the agreements on CPTPP in 2017 and RCEP in 2020 bring us hopes that more liberalized flows of goods and productive factors will effectively maintain and accelerate to integration process.

# ANNEX:

## RESULTS OF ASIA-PACIFIC POLICY COMMUNITY SURVEY

This annex presents the findings of a survey of the Asia-Pacific policy community conducted by the Pacific Economic Cooperation Council from 12 August to 17 September 2021. The survey was disseminated through PECC member committees.

This is not a survey of public opinion but rather, a survey of those whose views influence policymaking, especially at the regional level. As some of the questions tend to be technical, they require a relatively deep knowledge of developments at regional level. However, we do believe that those surveyed include those who are responsible for influencing and often making decisions on various aspects of their economy's positions within different regional groups.

The guidance for identifying panelists is as follows:

### **Government**

Panelists should be either decision-makers or senior advisors to decision-makers. As a guide, the government respondents in previous years included a number of former and current Ministers, Deputy and Vice-Ministers, Central Bank Governors and their advisors for Asia-Pacific issues, current APEC Senior Officials, and a number of former APEC Senior Officials.

### **Business**

Panelists should be from companies who have operations in a number of Asia-Pacific economies or conduct business with a number of partners from the region. This might include each economy's current ABAC members as well as past ABAC members. In last year's survey, these included CEOs, vice presidents for Asia-Pacific operations, and directors of chambers of commerce.

### **Non-government: Research Community/Civil Society/Media**

Panelists should be well-versed in Asia-Pacific affairs, being the type of people governments, businesses, and the media would tap into to provide input on issues related to Asia-Pacific cooperation. These included presidents of institutes concerned with Asia-Pacific issues, heads of departments, senior professors, and correspondents covering international affairs.

### **Respondent Breakdown**

We do not disaggregate results for each economy but rather by sub-regions – Northeast Asia, North America, Oceania, Pacific South America, and Southeast Asia.

- North America: Canada, Mexico, and the United States
- Northeast Asia: China, Hong Kong (China), Japan, Korea, India, Russia, and Chinese Taipei
- Oceania: Australia, New Zealand, and Papua New Guinea
- Pacific South America: Chile, Colombia, Ecuador, and Peru
- Southeast Asia: Brunei Darussalam, India, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam

**1. What are your expectations for economic growth over the next 12 months compared to the last year for the following economies/regions? Please select/tick the appropriate box.**

	<i>Much weaker</i>	<i>Somewhat weaker</i>	<i>About the same</i>	<i>Somewhat stronger</i>	<i>Much stronger</i>	<i>Don't know</i>	<i>Total</i>
<b>The United States of America</b>	3.9%	11.2%	15.1%	42.6%	25.3%	1.8%	100.0%
<b>China</b>	2.3%	13.2%	16.9%	39.5%	26.8%	1.2%	100.0%
<b>Japan</b>	4.2%	16.8%	37.2%	31.0%	7.2%	3.5%	100.0%
<b>India</b>	6.7%	20.3%	26.3%	31.8%	8.5%	6.4%	100.0%
<b>Russia</b>	2.7%	20.4%	37.9%	23.7%	4.5%	10.8%	100.0%
<b>Oceania</b>	2.7%	17.9%	33.8%	30.2%	5.9%	9.5%	100.0%
<b>Southeast Asia</b>	3.7%	18.9%	20.6%	39.4%	14.4%	3.0%	100.0%
<b>Pacific South America</b>	4.2%	24.4%	29.4%	25.2%	4.7%	12.0%	100.0%
<b>Europe</b>	1.8%	14.5%	31.1%	39.2%	10.6%	2.9%	100.0%
<b>The world economy</b>	2.2%	18.6%	23.1%	47.5%	7.0%	1.7%	100.0%

**2. Please select the top five risks to growth for your economy over the next 2-3 years. Please select ONLY five (5) risks, using a scale of 1-5. Please write 1 for the most serious risk, 2 for the next most serious risk, 3 for the next third highest risk, 4 for the fourth highest risk and 5 for the least serious risk.**

	<i>1 - most serious</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5 - least serious</i>	<i>Total</i>
<b>Future waves of Covid-19, new variants</b>	37.0%	13.5%	8.5%	8.5%	5.8%	73.3%
<b>Natural disasters</b>	3.4%	4.7%	4.9%	4.3%	5.1%	22.4%
<b>Climate change/extreme weather</b>	8.7%	9.2%	10.8%	7.0%	7.0%	42.8%
<b>Energy security/high energy prices/energy supply disruptions</b>	0.9%	4.9%	3.8%	4.0%	2.9%	16.4%
<b>Food security</b>	0.4%	2.3%	2.5%	3.1%	4.2%	12.5%
<b>Lack of political leadership</b>	10.5%	9.0%	5.8%	6.9%	6.3%	38.4%
<b>Negative impact of automation on job growth</b>	0.4%	1.8%	2.3%	2.0%	3.6%	10.1%
<b>Shortage of available talent/skills</b>	2.2%	3.1%	5.2%	7.2%	4.3%	22.0%
<b>Lagging infrastructure development</b>	1.4%	2.2%	3.4%	4.5%	4.7%	16.2%
<b>Failure to implement structural reforms</b>	4.2%	6.5%	5.2%	5.1%	5.6%	26.5%
<b>Increased protectionism and trade wars</b>	4.9%	7.9%	8.5%	6.7%	9.7%	37.7%
<b>Increasingly restrictive digital environment</b>	1.8%	1.3%	1.8%	1.8%	1.8%	8.5%
<b>Unfavorable currency realignments</b>	0.5%	0.7%	1.1%	0.9%	2.0%	5.2%
<b>A slowdown in the US economy</b>	4.0%	4.5%	6.5%	5.6%	5.8%	26.4%
<b>A slowdown in the Chinese economy</b>	4.3%	6.3%	4.5%	5.8%	5.4%	26.4%
<b>A slowdown in the Japanese economy</b>	0.9%	1.3%	1.4%	1.1%	0.7%	5.4%
<b>Sharp fall in asset prices</b>	1.6%	3.1%	2.2%	2.2%	2.2%	11.2%
<b>Cyber attacks</b>	2.2%	2.0%	3.8%	4.0%	4.7%	16.6%
<b>Slowdown in world trade growth</b>	3.2%	6.3%	6.9%	8.1%	7.2%	31.8%
<b>Unsustainable debt</b>	3.6%	4.0%	4.3%	6.0%	4.9%	22.7%
<b>Inflation</b>	4.0%	5.4%	6.5%	5.4%	6.1%	27.4%

**3. How important do you think the following are for dealing with the ongoing pandemic and its economic consequences? Please use a scale of 1-5, with 1 being not important and 5 very important.**

	<i>1 – Not important</i>	<i>2 – Slightly Important</i>	<i>3 – Moderately Important</i>	<i>4 – Important</i>	<i>5 – Very Important</i>	<i>Don't know</i>	<i>Total</i>
A WTO agreement on Trade and Health to review and eliminate unnecessary existing restrictions on exports of essential medical goods necessary to combat the COVID-19 pandemic	4.0%	14.3%	19.2%	29.3%	30.3%	3.0%	100.0%
Mechanisms to enhance visibility on input supplies for Covid-19 vaccines	3.7%	10.6%	17.6%	32.2%	31.8%	4.1%	100.0%
Voluntary licensing agreements for vaccine manufacturing	3.7%	10.0%	22.7%	32.4%	26.2%	5.0%	100.0%
A temporary waiver of the WTO TRIPS agreement	9.5%	13.0%	29.6%	23.8%	11.0%	13.0%	100.0%
Common standards and/or mutual recognition of vaccination passports and test results	1.0%	6.7%	11.8%	31.5%	44.7%	4.3%	100.0%
Protocols to facilitate the safe international movement of people starting with those involved in logistics and supply chains – aircrew and seacrew	2.2%	5.3%	13.1%	33.3%	43.4%	2.7%	100.0%
An international framework for moderating developing economy international debt servicing during the crisis period to provide more fiscal space	3.4%	9.6%	24.0%	31.3%	28.1%	3.6%	100.0%
Donations of vaccines to developing economies through Covax	2.8%	5.1%	11.8%	33.1%	42.2%	4.9%	100.0%
The scope and pace of vaccination in your economy	2.0%	3.1%	10.2%	20.3%	57.8%	6.6%	100.0%

**4. Please select which one of these statements best reflects your view on climate change:**

Immediate and drastic action is necessary	59.8%
Some action should be taken now	30.1%
More research is needed before action is taken	8.5%
This is not a serious problem	1.7%
<b>Total</b>	<b>100.0%</b>

**5. How important do you think the following sectors are to your economy's current greenhouse gas emissions? Please use a scale of 1-5, with 1 being not important and 5 very important.**

	<i>1 – Not important</i>	<i>2 – Slightly Important</i>	<i>3 – Moderately Important</i>	<i>4 – Important</i>	<i>5 – Very Important</i>	<i>Don't know</i>	<i>Total</i>
Electricity generation from coal	10.2%	11.7%	13.3%	25.2%	37.2%	2.3%	100.0%
Electricity generation from natural gas	8.1%	15.8%	24.3%	31.6%	17.9%	2.4%	100.0%
Electricity generation from oil	12.8%	11.6%	19.6%	27.8%	25.6%	2.6%	100.0%
Transport	1.0%	3.7%	15.0%	36.1%	43.5%	0.8%	100.0%
Buildings	4.7%	12.6%	32.2%	34.6%	14.0%	2.0%	100.0%
Industry	1.9%	8.1%	18.6%	36.2%	33.9%	1.2%	100.0%
Agriculture	12.0%	14.4%	26.2%	24.5%	20.7%	2.2%	100.0%
Waste	2.8%	10.1%	19.5%	31.4%	31.0%	5.3%	100.0%

**6. How important do you think the following sectors will be to your economy’s greenhouse gas emissions in 30 years? Please use a scale of 1-5, with 1 being not important and 5 very important. Please use a scale of 1-5, with 1 being not important and 5 very important.**

	<i>1 – Not important</i>	<i>2 – Slightly Important</i>	<i>3 – Moderately Important</i>	<i>4 – Important</i>	<i>5 – Very Important</i>	<i>Don’t know</i>	<i>Total</i>
Electricity generation from coal	25.9%	17.9%	14.5%	18.7%	19.8%	3.1%	100.0%
Electricity generation from natural gas	9.8%	19.5%	25.0%	24.6%	18.3%	2.8%	100.0%
Electricity generation from oil	21.7%	18.3%	21.9%	19.1%	16.6%	2.4%	100.0%
Transport	2.6%	10.4%	24.4%	30.3%	30.6%	1.8%	100.0%
Buildings	4.8%	16.7%	32.4%	26.0%	16.7%	3.4%	100.0%
Industry	3.6%	11.5%	21.1%	32.4%	29.0%	2.4%	100.0%
Agriculture	12.0%	17.2%	25.5%	23.8%	18.6%	2.8%	100.0%
Waste	5.8%	12.4%	19.7%	28.3%	28.7%	5.2%	100.0%

**7. Please rate each of the following as policy responses to the challenge of perceived climate change. Please use a scale of 1-5, with 1 being not important and 5 very important.**

	<i>1 – Not important</i>	<i>2 – Slightly Important</i>	<i>3 – Moderately Important</i>	<i>4 – Important</i>	<i>5 – Very Important</i>	<i>Don’t know</i>	<i>Total</i>
Coastal protection and marine conservation	1.8%	7.7%	13.8%	36.2%	38.9%	1.6%	100.0%
Integrating adaptation into disaster reduction plans	1.4%	6.1%	20.2%	34.8%	35.2%	2.2%	100.0%
Strengthening urban planning eg, drainage and infrastructure, and green buildings etc	0.2%	4.5%	15.0%	34.9%	45.0%	0.4%	100.0%
“Smart cities” (smart meters, autonomous electric vehicles, etc)	1.4%	7.0%	18.3%	38.0%	34.4%	0.8%	100.0%
Changes to agriculture, forestry and other land-use, including livestock policies (including new crop varieties)	1.8%	6.3%	19.8%	33.5%	37.5%	1.2%	100.0%
Sustainable forest management and reforestation	1.0%	4.7%	9.9%	33.4%	50.0%	1.0%	100.0%
Integrating climate and adaptation criteria into policy design, management and territorial planning	1.0%	3.7%	16.8%	31.4%	45.7%	1.4%	100.0%
Promotion of circular economy (reuse, recycle etc)	1.0%	3.3%	14.1%	35.4%	45.2%	1.0%	100.0%
Increased use of renewable energy (solar, wind, new biofuels)	0.4%	2.0%	6.9%	20.8%	68.3%	1.6%	100.0%
Energy efficiency	0.2%	1.6%	6.9%	28.0%	62.2%	1.0%	100.0%
Carbon capture and storage	1.7%	5.8%	20.2%	32.2%	37.4%	2.7%	100.0%
Reducing emissions from road transport (promoting use of electric and hybrid vehicles, public transportation etc)	1.2%	2.0%	12.0%	35.5%	48.7%	0.6%	100.0%
Reducing emissions from aviation transport (biofuels)	1.9%	4.7%	20.8%	36.9%	34.4%	1.2%	100.0%
Carbon taxes on domestic production	5.7%	9.0%	24.4%	32.4%	26.3%	2.1%	100.0%
Carbon border taxes on imports	7.4%	10.3%	25.6%	31.8%	21.9%	2.9%	100.0%
Emissions trading schemes for domestic producers	5.7%	8.8%	28.1%	32.2%	21.9%	3.3%	100.0%

**8. How important do you think the following are in driving climate change policy in your economy? Please use a scale of 1-5, with 1 being not important and 5 very important.**

	<i>1 – Not important</i>	<i>2 – Slightly Important</i>	<i>3 – Moderately Important</i>	<i>4 – Important</i>	<i>5 – Very Important</i>	<i>Don't know</i>	<i>Total</i>
<b>Commitments made through international agreements like the Paris Climate Change agreement</b>	3.3%	8.8%	16.4%	37.4%	32.5%	1.6%	100.0%
<b>The views of shareholders in companies</b>	1.6%	9.4%	22.5%	39.0%	26.1%	1.4%	100.0%
<b>Environmental, social and governance (ESG) requirements from international business</b>	2.4%	8.1%	19.2%	40.9%	28.0%	1.4%	100.0%
<b>Pressure from civil society/non governmental organizations</b>	3.4%	12.5%	28.7%	32.9%	21.1%	1.4%	100.0%
<b>Policies in other economies/areas like the proposed EU Carbon Border Adjustment Mechanism</b>	4.3%	9.1%	26.3%	37.4%	18.2%	4.7%	100.0%
<b>Concern about the welfare of future generations</b>	2.4%	10.2%	20.3%	27.5%	38.6%	1.0%	100.0%
<b>Public perceptions of increased climate events and natural disasters</b>	1.4%	5.8%	21.2%	34.5%	35.9%	1.2%	100.0%
<b>Views of providers of credit in capital markets and through financial intermediaries</b>	3.2%	8.1%	24.0%	38.6%	23.2%	2.8%	100.0%

**9. How important do you think the following issues are for APEC to work on to address climate change? Please use a scale of 1-5, with 1 being not important and 5 very important.**

	<i>1 – Not important</i>	<i>2 – Slightly Important</i>	<i>3 – Moderately Important</i>	<i>4 – Important</i>	<i>5 – Very Important</i>	<i>Don't know</i>	<i>Total</i>
<b>Adopt a region-wide set of principles for Environment Social and Governance (ESG) disclosures</b>	3.4%	7.1%	17.5%	37.7%	32.7%	1.6%	100.0%
<b>Reduce/eliminate environmentally harmful, fossil fuel subsidies</b>	2.4%	4.4%	11.7%	30.8%	49.5%	1.2%	100.0%
<b>Reduce barriers to trade and investment in renewable energy components and equipment in the region</b>	0.6%	3.4%	15.1%	34.1%	46.0%	0.8%	100.0%
<b>Facilitate linkages between carbon markets in the APEC region</b>	2.4%	7.0%	20.8%	41.9%	24.8%	3.2%	100.0%
<b>Capacity building to implement structural reforms in the decarbonization process</b>	1.2%	4.8%	16.9%	40.0%	34.4%	2.8%	100.0%
<b>Implementation of Paris commitments of financial support for developing economy climate change</b>	1.0%	3.8%	17.7%	34.2%	40.4%	3.0%	100.0%

## 10. Please state your level of agreement with the following statements.

	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Disagree nor Agree</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>Don't know</i>	<i>Total</i>
Climate change is having a negative impact on my economy/business	3.0%	7.1%	16.8%	45.1%	27.1%	0.8%	100.0%
Climate change policies are having a negative impact on my economy/business	7.8%	31.3%	27.7%	22.8%	8.4%	2.0%	100.0%
My economy should be doing more to support the Paris Agreement to contribute to the reduction of greenhouse gas emissions	1.2%	4.8%	16.0%	41.0%	35.2%	1.8%	100.0%
Carbon border taxes are needed to account for differing climate change policies	3.0%	11.2%	23.8%	41.5%	16.2%	4.4%	100.0%
Sufficient funding is available to assist developing economies to meet both mitigation and adaptation existing obligations under the Paris Agreement.	14.3%	26.2%	12.7%	24.9%	15.5%	6.4%	100.0%

## 11. How important do you think the following areas are for the growth of the digital economy? Please use a scale of 1-5, with 1 being not important and 5 very important.

	<i>1 – Not important</i>	<i>2 – Slightly Important</i>	<i>3 – Moderately Important</i>	<i>4 – Important</i>	<i>5 – Very Important</i>	<i>Don't know</i>	<i>Total</i>
Digital trade	1.4%	1.8%	10.8%	37.3%	46.0%	2.6%	100.0%
Data sharing agreements	0.4%	3.5%	17.8%	44.4%	29.9%	3.9%	100.0%
Interoperable and cross-border digital transactions	0.4%	2.2%	10.4%	43.8%	40.1%	3.1%	100.0%
Cross border data flows	0.4%	2.1%	14.5%	41.8%	37.5%	3.7%	100.0%
Interoperability of platforms through common standards	0.4%	2.1%	13.8%	40.2%	39.0%	4.5%	100.0%
Universal broadband access	0.8%	1.9%	15.2%	35.0%	44.0%	3.1%	100.0%
Holistic (whole-of-government) policy frameworks	1.5%	4.0%	17.1%	38.4%	34.4%	4.6%	100.0%
Regulatory equivalence to promote mutual recognition	1.0%	4.1%	14.5%	46.9%	27.0%	6.4%	100.0%
Maintaining the ongoing WTO moratorium on customs duty for e-commerce sales and purchases	3.8%	6.5%	22.1%	38.8%	19.6%	9.4%	100.0%
Digital IDs	2.9%	6.4%	20.6%	37.8%	21.6%	10.6%	100.0%
Standardized digital economy measurements	1.3%	5.9%	17.8%	41.8%	27.8%	5.4%	100.0%
Open data programmes	1.7%	5.0%	21.0%	40.8%	22.7%	8.8%	100.0%
Digital literacy	1.0%	2.3%	14.1%	29.7%	51.0%	1.9%	100.0%
Online dispute resolution mechanisms	1.1%	6.3%	21.9%	37.3%	28.4%	5.1%	100.0%
Cybersecurity	0.4%	0.8%	5.6%	16.9%	74.3%	2.1%	100.0%
Application of sales tax to digital goods and services (in line with non-digital)	5.8%	8.8%	25.6%	32.1%	19.6%	8.1%	100.0%
Data privacy and protection	0.2%	1.7%	7.2%	21.9%	66.7%	2.3%	100.0%

**12. What do you think should be the top 5 priorities for APEC Leaders to address at their upcoming meeting in November? Please select ONLY five (5) issues, using a scale of 1-5, please write 1 for the issue you think is most important, 2 for the next most important issue, 3 for the third most important, 4 for the fourth most important and 5 for the fifth most important.**

	<i>1st most important</i>	<i>2nd most important</i>	<i>3rd most important</i>	<i>4th most important</i>	<i>5th most important</i>	<i>Total</i>
How to ensure the equitable and affordable access to Covid-19 vaccines	17.7%	8.7%	8.5%	10.8%	7.1%	52.8%
How economies can open up their borders to travel while maintaining adequate safeguards against the spread of the virus	11.0%	11.0%	8.1%	9.6%	6.9%	46.5%
The region's response to climate change including support for successful outcomes at the UN Climate Change Summit.(COP 26, Glasgow 2021)	8.5%	8.7%	7.3%	6.9%	7.5%	39.0%
The China-US trade conflict and rising trade tensions.	11.4%	6.7%	8.5%	6.1%	4.9%	37.6%
Addressing inequality and the promotion of more inclusive growth in the region	7.1%	5.3%	8.1%	7.1%	6.1%	33.7%
The region's progress towards its goals on freer trade and investment and a Free Trade Area of the Asia-Pacific (FTAAP)	6.5%	5.3%	7.3%	6.3%	7.3%	32.7%
How to minimize the risks from diverging recovery rates from the pandemic	5.5%	6.5%	7.7%	4.3%	6.5%	30.5%
The emergence of anti-globalization & protectionist sentiments	5.3%	6.3%	3.7%	5.3%	6.3%	26.8%
Measures to reduce barriers to growth of the digital economy	2.4%	5.3%	5.7%	7.9%	4.5%	25.8%
Combatting cybersecurity	1.8%	5.1%	4.9%	5.7%	7.1%	24.6%
Progress on the region's goals on promoting connectivity (physical, institutional and people to people)	2.6%	4.5%	2.8%	6.1%	5.7%	21.7%
The implementation of structural reforms	3.3%	3.9%	4.9%	5.1%	3.9%	20.9%
The future of work and labor markets	3.0%	4.9%	4.5%	3.9%	4.3%	20.5%
The WTO and multilateral trading system including support for successful outcomes at 12th WTO Ministerial Meeting	2.8%	4.5%	5.7%	2.0%	4.9%	19.9%
Improving women's participation in the economy	1.6%	4.3%	2.6%	3.7%	5.5%	17.7%
Improving the competitiveness of services in the region	2.2%	2.2%	4.1%	3.0%	4.1%	15.7%
An implementation plan for APEC's Putrajaya vision	3.5%	4.3%	3.0%	1.8%	1.6%	14.2%
Expansion of APEC membership	2.2%	0.8%	1.4%	2.2%	3.3%	10.0%
Reform of APEC	1.4%	1.8%	1.0%	2.2%	2.6%	9.1%

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