[ENERGY DIVISION]

A Sustainable Energy-Led Recovery from COVID-19 in the Asia-Pacific Region

WORKING PAPER SERIES

December 2023

ESCAP
Economic and Social Commission for Asia and the Pacific

Please cite this paper as: Williamson, Michael (2023). A Sustainable Energy-Led Recovery from COVID-19 in the Asia-Pacific Region. United Nations ESCAP, Division, 15 December 2023. Bangkok.

Available at: http://www.unescap.org/kp

Tracking number: **ESCAP / 9-WP / 71**

Executive Summary

The COVID-19 pandemic that emerged in early 2020 imposed a severe shock on the Asia-Pacific region and the wider world. The responses to the pandemic by governments across the region, included lockdowns, travel restrictions and suspension of many sectors of the economy, and produced a wave of social and economic fallout. This has impacted on economic growth and set back efforts to achieve the Sustainable Development Goals (SDGs) across the region. Developing countries have borne the brunt of the pandemic and are still struggling to recover in terms of their health, societies and economies.

In response to COVID-19, governments have mobilized an extraordinary effort, not just to tackle the health and social protection aspects of the emergency, but also to launch an economic recovery based on stimulus spending. Given the missed opportunities from the last major crisis, the Global Financial Crisis of 2008-2009, experts and international agencies have warned about the risks of investing in carbon intensive sectors and advocated for investing in sectors that promote sustainable energy and low carbon development; and aligning spending with the framework of the SDGs. Governments responded to the economic downturn with unprecedented spending. According to the Oxford University Global Recovery Project, by August 2022, over $18 trillion had been spent on COVID-19 recovery globally. Included in this expenditure is stimulus spending for long term recovery targeting sectors such as infrastructure.

The purpose of this study is to examine how directing spending towards the sustainable energy sector can help achieve the sustainable energy targets under SDG 7, while at the same time reviving economies and creating jobs. By mapping recovery efforts against the investment categories, it will assess how the region has been able to mobilize a sustainable energy-led recovery to date and highlight and gaps and missed opportunities as well as best practice examples across the Asia-Pacific region. It is intended that this report will assist countries of the region to prepare for future crises by ensuring greater capacity to effectively deploy sustainable energy-based stimulus. Lastly, it will examine how technology and behaviour shifts prompted by the pandemic could assist in the transition to sustainable energy, and how governments could support these changes. The challenges faced by developing countries across all these areas will be a special focus of the report given their fiscal space and developmental challenges.

COVID-19 Energy Stimulus Spending - Experience to date

The Asia-Pacific region has invested in a wide range of energy related recovery measures. Despite a slow start, spending on sustainable energy measures accelerated and by early 2022, had matched the investment in fossil-fuel based industries (Figure ES1).

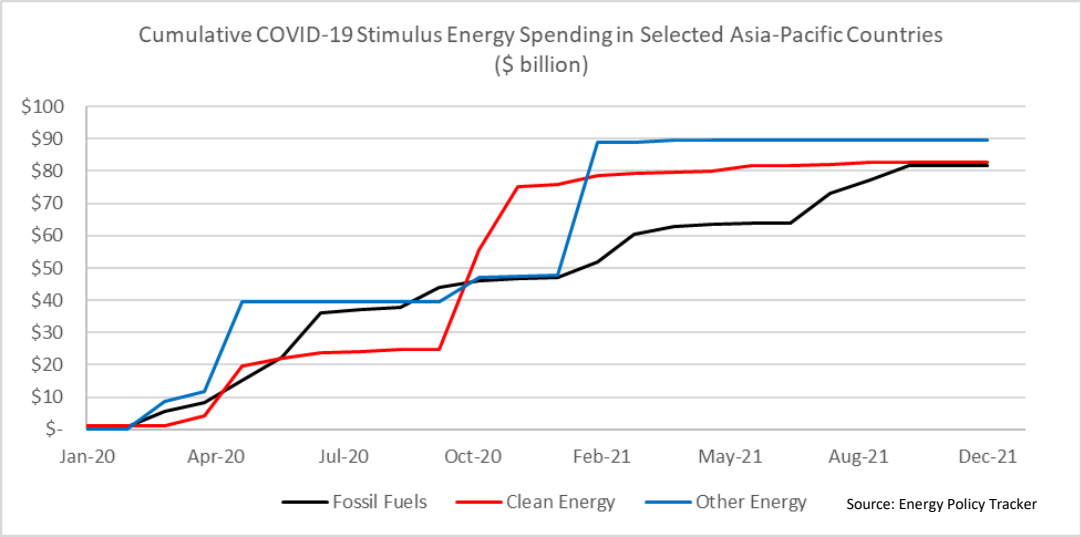

Figure ES1

The considerable focus on fossil fuel spending further entrenches carbon-intensive pathways and is a missed opportunity to direct this spending to sustainable energy sectors, which on balance offer higher job creation multipliers.

A review of literature on COVID-19 recovery uncovered a detailed body of analysis undertaken by the United Nations, the International Energy Agency, the International Renewable Energy Agency and leading think tanks. These analyses covered both the short-term impacts of the pandemic on energy systems and offered detailed recommendation on how to align the recovery process with the Sustainable Development Goals over the longer term, in particular with Sustainable Development Goal 7, and with the Paris Agreement on Climate Change.

Opportunities for a Sustainable Energy Led Recovery

Fiscal stimulus, used to recover from a crisis such as COVID-19 is public funds applied through different channels which can crowd in private funds, raise household incomes and increase consumption. Stimulus directed towards infrastructure development is often directed at

energy infrastructure, both fossil fuels and sustainable energy (Figure ES2).

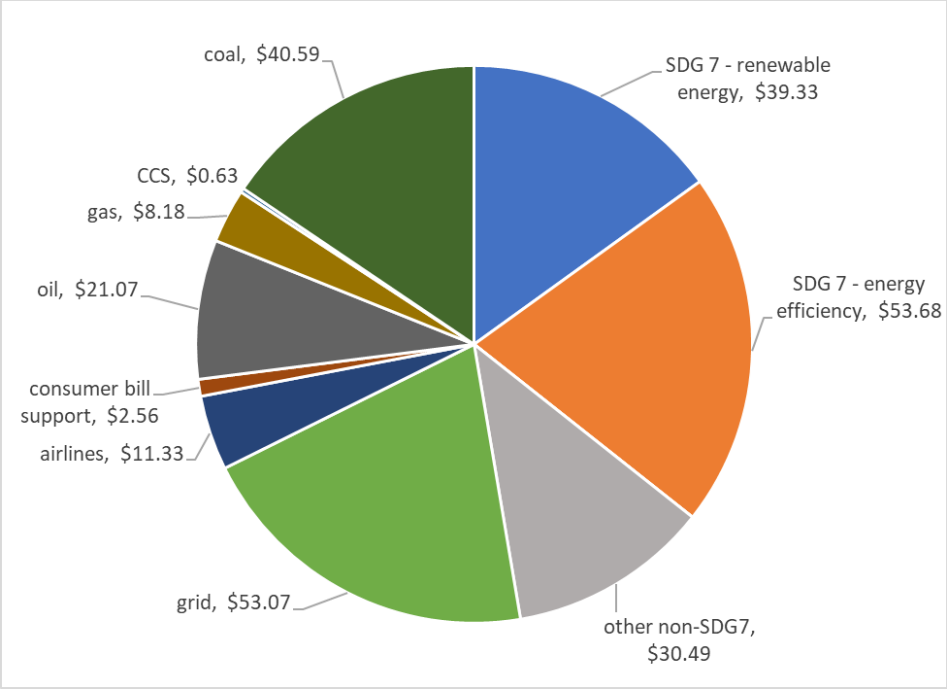

Figure ES2 – Breakdown of energy stimulus measures by sector in selected Asia-Pacific countries

The track record of the region in energy stimulus shows the diverse areas of investment with encouraging levels of spending in renewable energy and energy efficiency. Of the 47 Asia-Pacific countries for which SDG 7 progress data is available, only 29 have launched stimulus measures and 9 of these have supported SDG 7 related sectors. However, no country has invested in clean cooking or electricity access. The significant investment in coal, oil and to a lesser extent gas, is a missed opportunity to transition away from fossil fuels and deliver on the SDG 7 targets. In addition, energy investment in grids, if selective, can support renewable energy deployment and enhanced energy efficiency.

The fiscal and job multipliers for renewable energy and energy efficiency investments are consistently higher than for investment in fossil fuels, indicating a greater advantage in pursuing these projects as part of a comprehensive recovery strategy. The shorter lead times and modular nature of renewable energy projects and energy efficiency building retrofits make these sectors more suited to the rapid economic response needed in the wake of the pandemic. A key barrier to realizing a sustainable energy-led recovery

in developing countries is limited fiscal space, which has been exacerbated by the pandemic. In addition, their industrial capacity to utilize the stimulus may be limited. Overall, the least developed countries of the Asia-Pacific region managed to mobilize just over one per cent of their GDP for stimulus. Addressing this challenge requires long term reforms to "spend smart and tax fairly".

Post-pandemic energy transformation

The pandemic has also accelerated several changes across the region that are potentially beneficial to sustainable energy development. These include working from home, digitization and dematerialization of products and services, and increased active mobility in cities. The shift to work from home modality can reduce transport energy use but in some context these gains can be offset by greater residential sectors energy use. A lack of nationally specific data on these trends and their impacts hinders decision-making

Framing optimal stimulus plans for sustainable energy

The analysis in the report has led to the development of a decision-making framework that can assist policymakers to develop sustainable energy stimulus plans (Figure ES3). While the countries of the region face markedly differing circumstances, this framework suggests a step-by-step approach to ensuring the optimal supportive environment to launch stimulus based on sustainable energy; and then how to undertake evaluation of different sustainable energy stimulus options.

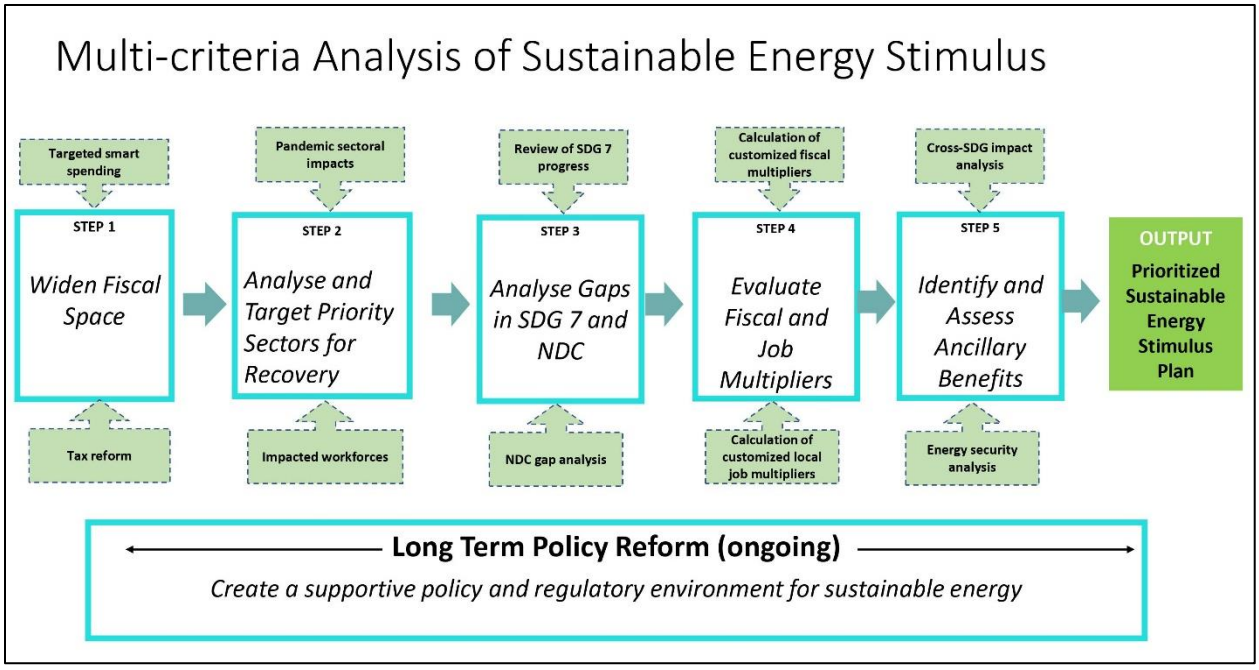

Figure ES3 – Multi-criteria analysis for sustainable energy stimulus

Recommendations

a) An **enabling environment for sustainable energy** needs to be set in place over the long term to maximize fiscal multipliers and local job creation potential. These include supportive policies for renewables, energy efficiency and energy access; rationalizing fossil fuel subsidies and introducing carbon pricing.

b) Decision making on stimulus needs to factor in **multiple considerations – fiscal and job impacts, SDG achievement, impacts on gender and inequality, energy security and realizing the just transition**. More research is needed to evaluate sector-specific and country specific fiscal and job multipliers to inform policymakers on investment choices and channels.

c) Countries should undertake an ***ex post facto*** **review of their COVID-19 recovery packages** to measure their effectiveness and efficiency and draw lessons for future crises.

d) **Prioritize sustainable energy stimulus**. For the current crisis, remaining stimulus measures earmarked for the energy and infrastructure should be directed at sustainable energy technologies and related infrastructure. **Stimulus for carbon intensive sectors should be avoided** wherever possible.

e) Transfers to households to support energy bills should be reframed where possible as **energy efficiency support**, to offer more durable solutions to reduce energy costs and reduce emissions.

f) Given the limited funds available, efforts should be made to **leverage private funds in sustainable energy stimulus**.

g) **Grid investments** can help create long term infrastructure that support renewable energy and energy efficiency while delivering on economic stimulus and job creation. Grid investments that link renewable energy projects to markets, including cross-border grid connections or that increase grid efficiency should be allocated priority.

h) Investing in **hydrogen technologies and infrastructure** can support the long term decarbonization efforts and bring forward renewable energy projects that provide the energy source for green hydrogen.

i) Bailouts to carbon intensive companies can be used to **leverage adoption of low carbon technologies and business models**.

j) **Regional cooperation** can help to prepare a supporting environment for clean energy pathways and therefore enhance the alignment of recovery efforts with sustainable energy development. These include the development of regional carbon markets and regional innovation systems, as well as capacity building and sharing of experiences. Existing intergovernmental platforms such as ESCAP can be utilized for this purpose.

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Acknowledgements

This study was undertaken as part of the United Nations Sabbatical Leave Program, an initiative designed to foster professional growth by United Nations staff by undertaking research relevant to the work of the Organization. It was supervised by Assistant Professor Daniel del Barrio Alvarez of the Graduate School of Public Policy at the University of Tokyo. The author is grateful to the United Nations Economic and Social Commission of Asia and the Pacific for the opportunity to undertake this study and to Dr Alvarez for his continuous support and advice throughout the project.

Particular thanks are due to the experts who participated in the semi-structured interviews as part of the project and contributed their expert insights: Dr Vaqar Ahmed of the Sustainable Development Policy Institute, Pakistan; Dr Blandine Barreau of the International Energy Agency, Paris, France; Dr Bill Hare of Climate Analytics, Australia; Ms. Sichao Kan of the Institute of Energy Economics Japan; Dr Adrian Panow of the Melbourne Energy Institute, Australia; Dr Xunpeng Shi, of the Australia-China Institute, University of Technology Sydney, Australia; and Professor Nobu Tanaka of the University of Tokyo, Japan and former Director of the International Energy Agency. The author is further grateful to the following experts who participated in a seminar to discuss the preliminary findings of the study on 19 August 2022: Mr. David Morgado, Senior Energy Specialist at Asian Development Bank; Ms. Mika Ohbayashi, Director of the Renewable Energy Institute, Japan; and Dr. Venkatachalam Anbumozhi, Director of Research Strategy and Innovation at Economic Research Institute for ASEAN and East Asia (ERIA).

Lastly, the author extends sincere gratitude to Dr Sweta Saxena of the International Monetary Fund for her invaluable review of the study at its final stage.

1. Introduction

1.1. Background and Context

The COVID-19 pandemic which emerged from early 2020 delivered an unprecedented shock to the health, economies and livelihoods of countries around the world. More than just a health crisis, it has prompted a series of overlapping crises that have impacted the economies and societies. It has widened inequalities, set back poverty reduction efforts and slowed progress across the Sustainable Development Goals (SDGs) (ESCAP, 2022).

At the same time the pandemic has had a cathartic effect in many areas. Through dealing with the pandemic and its impacts, many countries recognized the unsustainable nature of their development pathway and the critical but precarious nature of many systems we come to rely on such as healthcare, vaccine delivery, essential workers and supply chains. It has reinforced the value of digitization and internet access, not only as a productivity boosting measure, but as a key element in ensuring resilience for many sectors of the economy. It also became clear that issues like inequality, lack of social protection and universal health care placed countries in a weaker position to deal with the pandemic and that addressing these should become a priority to enhance resilience against future shocks.

The energy sector has also come into focus during the pandemic. Firstly, it has reminded governments and people of its role as essential infrastructure to sustain healthcare, telecommunications and transportation of people and supplies. Secondly, it prompted discussion on the ongoing energy transition and the impact the pandemic could have in accelerating this process. The drop in energy demand noticed from 2020 as a result of lockdowns and travel restrictions lowered energy demand and prices. However, as these measures were phased out, this was rapidly reversed, and demand and prices have since bounced back.

These realizations have prompted deeper thinking about alternative development pathways and paradigms, that address not just pandemics, but the long-term challenges of the 21st Century – climate change, environmental degradation, poverty, inequality and pollution. Two clear themes emerge from the world's collective reckoning with COVID-19. First, it has accelerated some changes in society that were already underway, that if retained, can yield benefits. These include the greater use of digital technologies to offset travel and reinvigorated interest in sustainable mobility in cities using more walking and cycling. The second is that as

countries recover from the pandemic and invest in new infrastructure to support jobs and economic growth, that they should invest in green infrastructure, low carbon development and ecological repair, avoiding carbon intensive, socially divisive or environmentally damaging investments. In this way countries can fulfill the dual need to recover economies and intensify sustainable development pathways.

The title of this report - “A Sustainable Energy-led Recovery from COVID-19 in the Asia Pacific Region” - is to some extent a description of the preferred state of affairs rather than a description of the reality. At the time this report is finalized in mid-2022, the pandemic is not over, as it continues to play out across the globe with new variants of concern emerging. Unfortunately, many developing countries have not managed to reach the levels of vaccination needed to protect their societies, leading to the risk of future flare ups of infection. Economies are still recovering from the shocks experienced in 2020 and 2021. The focus of many countries and development partners has been on how to mobilize a sustainability-led recovery, as embodied in the phrase “build forward better” (ESCAP, 2021). Put simply, this means that there is an opportunity to structure the recovery in a way that reinforces sustainable and low carbon development, while strengthening the resilience of economies and societies against future pandemics. Global actors, including the United Nations, have called for an integrated response to the dual crises – by developing recovery plans that utilize the SDGs as a guiding framework; and by launching "green stimulus" that directs recovery spending to infrastructure and industries supporting decarbonization and sustainability.

1.2. Purpose of the Study

This study will explore how enhancing sustainable energy played a role in the recovery from the COVID-19 pandemic in the Asia-Pacific region. Taking stock of the response to date, it will evaluate how the response of selected countries of the Asia Pacific to the COVID-19 crisis is contributing to the targets under Sustainable Development Goal 7 (Figure 1). It will map the economic stimulus measures and other supporting policies announced by selected Asia-Pacific countries between 2020 and 2022 against the targets of Sustainable Development Goal 7 (SDG 7) – energy access, energy efficiency and renewable energy. By examining datasets of energy-related policies launched post-COVID-19, it will undertake a qualitative and quantitative analysis of these impacts on SDG 7. This analysis will identify to what extent the region has aligned stimulus spending and supporting policies with the transition to clean and universally available energy. In doing so it will highlight major gaps and missed opportunities in the region's collective policy response.

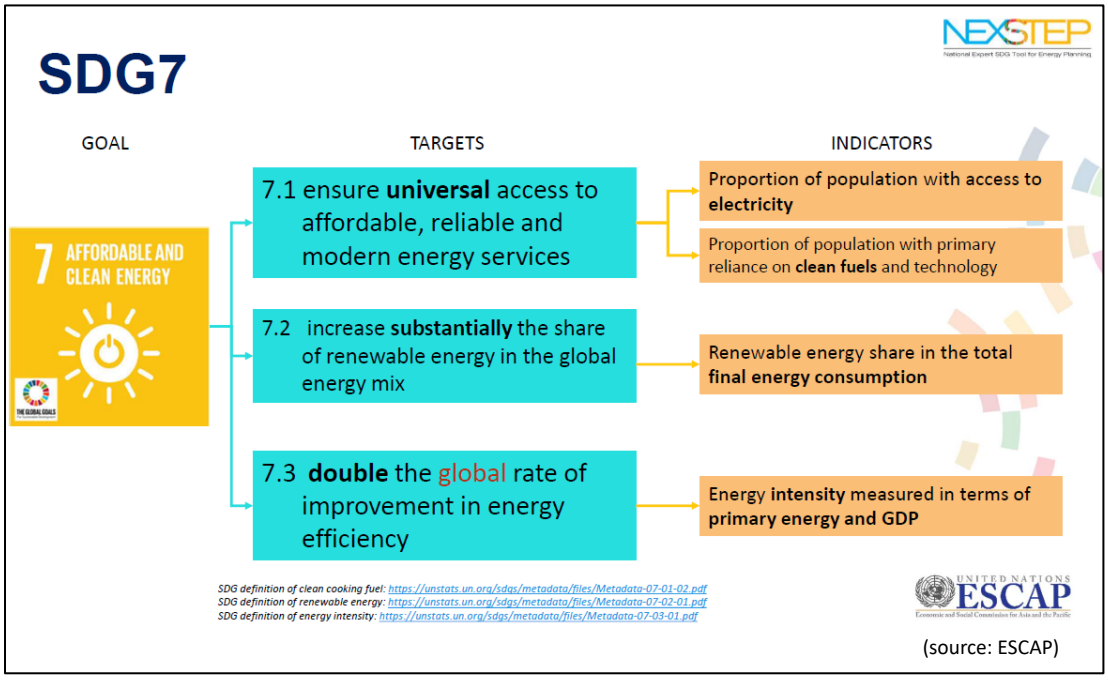

Figure 1 – SDG 7 targets

By categorizing these investments and policies against the SDG 7 components, the analysis will identify the extent to which the stimulus has accelerated progress on SDG 7 and highlight any gaps identified. It will have special focus on the challenges faced by low income developing countries – noting the often-limited recourse they have to finance, and how these tools may be less effective, or unavailable, when applied in developed country settings.

The specific research objectives are:

- Assess how selected Asia-Pacific countries have aligned COVID-19 stimulus and associated policies with SDG 7 and SDG 13, providing a detailed mapping of announced policies and investments against the SDG 7 targets.
- In countries where decisions have favored fossil fuels or high carbon sectors over sustainable alternatives, diagnose the factors underpinning the decision-making processes and develop a hypothesis to explain these cases.
- Identify the steps that countries would need to take to prepare for future crises by mounting an economic recovery based on sustainable energy. This includes the roles of policy reform, creating fiscal space and utilizing regional energy governance and intergovernmental structures.
- Examine the short term societal and technological responses to the pandemic to evaluate their impacts on sustainable energy adoption and climate emissions; and suggest how to incorporate these beneficial approaches in the "new normal" of Asia-Pacific societies.

Further, the analysis seeks to better understand the decision-making processes for national policy, the opportunity costs and trade-offs within the energy sector, with a focus on the "lock in" effects of incumbent technology and barriers to structural transformation. The study is therefore intended to create a knowledge resource that can guide regional efforts on the twin tracks of pandemic recovery and SDG achievement.

> "You never want a serious crisis to go to waste. And what I mean by that is an opportunity to do things that you think you could not do before."
>
> **Rahm Emanuel, 2008**

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This is not the first crisis to hit the Asia-Pacific region or the world. But it is the most complex, multi-faceted and far-reaching crisis in living memory. Sadly, it may not be the last crisis of its type. The risk of zoonotic transfer of new viruses to humans is growing as activities such as land degradation and urban sprawl lead to increased interaction between humans and animals. Our increased interconnectedness means that once transmitted to a human reservoir, a virus can spread around the world at an astonishing speed.

Therefore, the COVID-19 experience can reoccur with future as yet unknown viruses. It is essential that the region uses this experience to increase its preparedness and resilience against future more acute pandemics. Hence while many of the decisions regarding investment of stimulus have already been made and funds committed, a detailed analysis of these issues is still important. Recovery may need to continue for several years, requiring further economic recovery measures. But most importantly, if future pandemics or other similar crises emerge, this type of analysis is critical to tackle these subsequent crises with maximum effectiveness. Therefore, this report emphasizes a twin track approach – recovering from the current crisis; and setting in place the foundations of resilience and preparedness to better handle future crises. The ongoing geopolitical crisis between the Russian Federation and Ukraine, which has upended energy prices and energy security is just one example of a new crisis that adds to the turmoil in the wake of COVID-19. This is also prompting reassessment of energy choices and a more rapid move to renewables and energy efficiency as a response to supply interruptions and higher prices has been a common theme in the response of countries in Europe and beyond.

Finally, a word on definitions. There are several terms in the energy lexicon that are linked to the overall concept of sustainable energy. It is useful to clarify these and define them for the purposes that are applied in this report.

- ***Sustainable energy*** – generally understood as energy resources, technologies and end uses that do not compromise the needs of future generations. These needs include a safe climate, the absence of pollution and ecosystem damage, and the need for people to access safe and modern energy services such as electricity and clean cooking. The inclusion of some technologies as "sustainable" is contested such as nuclear power and some categories of biofuels which reduce biodiversity. Additionally, as sustainability is better thought of as a continuum, not an end point, there may be a comparative aspect to defining a technology as "sustainable", for example if it offers improvements on the technology it is replacing. The SDG 7 targets of energy efficiency, renewable energy and access to electricity and clean cooking offer a framework for countries to advance the sustainable energy agenda in a comprehensive manner.
- ***Clean energy*** – this term has come into popular usage in industry and investment circles with "clean" relating to both greenhouse gas emissions and pollution. It is generally understood to mean renewable energy and energy efficiency technologies.
- ***Low-carbon energy*** – this term implies a broader inclusion of energy technologies that reduce emissions vis-a-viz incumbent technologies beyond renewables and energy efficiency such as replacing coal with gas, cogeneration of heat and power and heat pumps.
- ***Renewable energy*** – energy from sources which are natural replenished such as wind, solar, biomass, tides, waves and geothermal.
- ***Energy efficiency*** – interventions through technology choices, systems or mode shifts that allow the same energy service to be delivered for lower energy inputs. This includes improved building design, advanced lighting, more efficiency motors; and for the purpose of this report investments in public transport infrastructure and shifting freight from road to rail which reduce energy inputs for mobility needs.

2. Tackling the COVID-19 Recovery – Experience to Date

2.1. Background

The COVID-19 crisis has necessitated the use by governments of economic stimulus to help drive the recovery. Principally, measures have been aimed at increasing household spending and investing in infrastructure. Examination of the policies and investments launched as part of stimulus packages at the onset of the pandemic in early 2020, indicated that Asia-Pacific policymakers largely turned to technologies and industry sectors based on fossil fuels. By the end of 2020 and early 2021, investment in clean energy had accelerated and caught up to fossil fuel investments. At the time of publication of this report in mid-2022, clean energy stimulus I the region accounted for 32 per cent of the total energy related stimulus, compared to fossil fuel investments at 34 per cent (Figure 2).

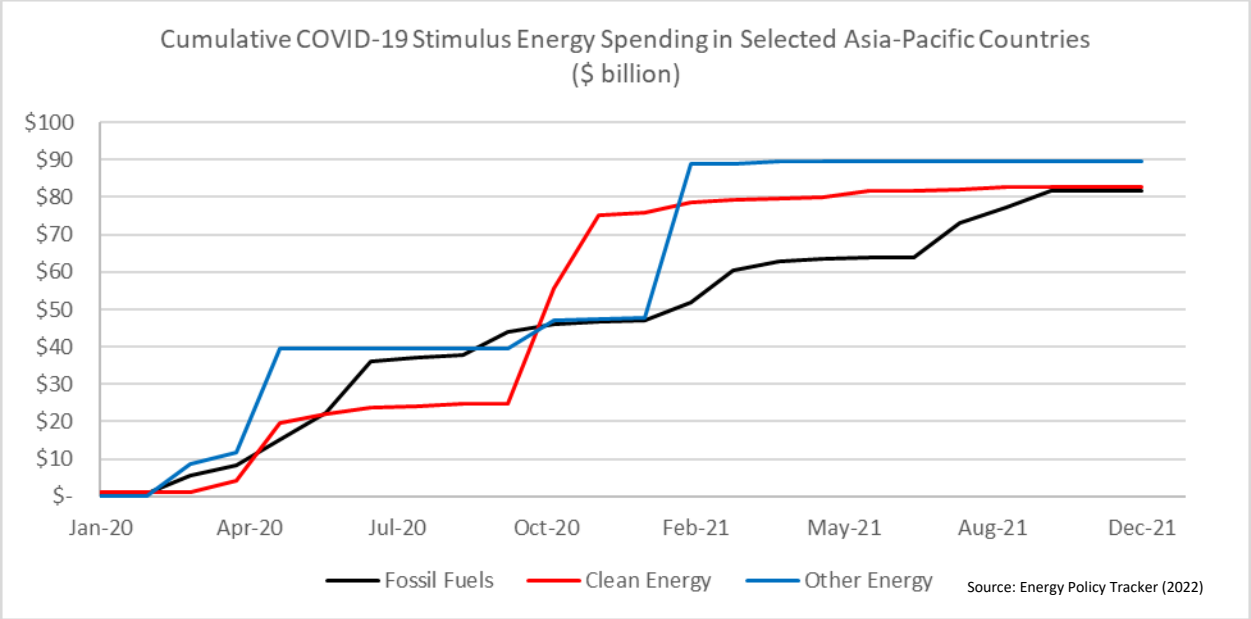


Figure 2 - COVID-19 Stimulus Spending 2020-22 ($ billion)

The IEA noted in April 2022 the significant acceleration of clean energy spending globally, pointing to a 50 per cent increase in spending in the previous five months (IEA, 2022). Asia Pacific countries experienced a similar surge from late 2020 (Figure 1). By this time, the $710 billion investment has surpassed the post Global Financial Crisis investment by 40 per cent. The IEA emphasizes that this is a small proportion of the $18.2 trillion in total COVID-19 stimulus (Figure 3), but it could "support over $6 trillion worth of sustainable investments by mobilizing higher levels of private sector participation" (IEA, 2022).

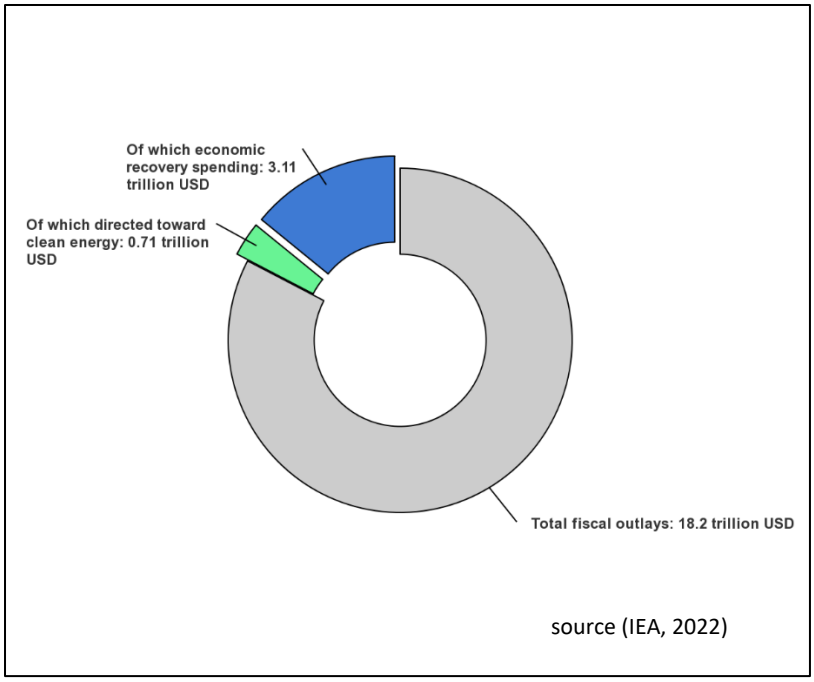


Figure 3 – Breakdown of global fiscal outlay on COVID-19 to end March 2022

However, a significant proportion of energy related stimulus was directed to fossil fuels. This raises questions on the decision-making calculus employed, and which long-term strategic goals were considered. For example, what weight was given to sustainable energy or climate concerns? As many countries have incumbent energy systems dominated by fossil fuels, on one level this may be an unsurprising result. The urgency of the crisis demands rapid responses and a tendency to invest in the pre-existing high carbon infrastructure and industrial structures. Further, there are few historical experiences that provide guidance for countries to achieve these goals. However, as the crisis moved from the emergency response to the recovery phase, it was important to include long-term strategic goals in the policy decisions. Moreover, given the risk of further pandemics or other crises that lead to economic shocks, there may be benefits in undertaking reforms that address the underlying barriers to launching clean energy stimulus. In this way the impacts of these future crises may be cushioned with advance preparation.

The Global Financial Crisis (GFC) of 2008-09 which predated the SDGs, saw fiscal recovery funds poured into incumbent technologies and high carbon sectors. In response to that crisis, only about $520 billion or 16 per cent of the total stimulus was directed at green investments in 2008–09 (Jaeger, Westphal, & Park, 2020). The ensuing recovery saw a return to business as usual in terms of greenhouse gas emissions, pollution and resource use. This is not the example the Asia-Pacific region should seek to replicate.

However, there are differences between the economic crisis triggered by COVID-19 and the GFC that make direct comparisons elusive. The current crisis is deeper with global economic output shrinking by 3.3 per cent over 2020.[1] The fiscal stimulus of $17 trillion mobilized for COVID-19 recovery globally in 2020 alone was larger than that for the entire GFC. It is important to note two further points of difference are observed in the energy and climate dimensions of the current response compared to the GFC. First, climate change has greater prominence now than in 2008 and the Paris Agreement provides a framework for national emissions commitments that are being progressively ratcheted up. Secondly, renewable energy and related enabling technologies such as energy storage, electric mobility and energy efficiency have undergone a profound transformation since 2008. New technologies have been developed and renewables costs have plummeted, resulting in an array of commercially feasible clean energy investments on offer. Moreover, there are important lessons to be learned from the GFC recovery experience. Green stimulus on its own is insufficient to effect a structural transformation in the energy sector – it must be accompanied by supportive policies, such as removal of fossil fuel subsidies, encouragement of private sector investment and carbon pricing (Jaeger, Westphal, & Park, 2020).

Thus, for the COVID-19 crisis, the recovery journey will be longer and steeper; and the imperatives for dealing with climate change and sustainable development are greater than in previous crises. But focusing on the SDGs, including SDG 7, offers possibilities to generate jobs, spur economic activity and speed up progress on decarbonization. Achieving SDG 7 requires structural transformation of energy systems to lock in low carbon technologies, behaviors and systems; and extending modern energy to remote regions. Definitive analysis that links COVID-19 stimulus spending to job creation or fiscal multipliers is elusive. Enormous

[1] Growth has rebounded strongly to 5.9 per cent in 2021 (with a forecast 2022 growth of 4.9 per cent) in part due to fiscal measures and pent-up demand, based on IMF figures.

variations exist between countries, for example in the mix of renewable energy technologies or the degree of localization of renewable energy value chains. These variations prevent definitive regional judgements. A quantitative analysis would require limiting the study to one specific country where these factors could be properly assessed.

2.2. Summary of Literature on COVID-19 Recovery and Energy

In the wake of the COVID-19 pandemic, a detailed body of literature dealing with different aspects of the crisis has emerged. Beyond the enormous body of epidemiological work undertaken, other researchers have explored the economic and societal repercussions of the pandemic. To help guide the preparation of the report, an initial literature survey was undertaken to help understand the existing research into the issues surrounding COVID-19 recovery and sustainable energy investment.

The initial impact of the pandemic through reducing demand for electricity and transport fuels saw energy prices drop in an unprecedented manner. The short-term effects of this on issues such as greenhouse gas emissions and air pollution were the subject of many research efforts among the published literature. However, understanding of the long-term implications was more complex and this raised debate among scholars on the impact the pandemic would have for the growth of renewables, the phase out of coal and the energy transition more broadly. As the pandemic entered different phases of severity and accompanying restrictions, focus shifted more to the recovery from the pandemic and the role that investing through fiscal stimulus in the SDGs and in sustainable and low carbon energy could play in the economic recovery. This long-term aspect of the interplay between COVID-19 recovery, the SDGs and climate action has not been the focus of as much research effort as its short-term impacts. Figure 4 illustrates the number of research papers published under different combinations of keywords, revealing the relative interest in overall impacts on the energy sector and on the energy transition, compared to the stimulus aspect.

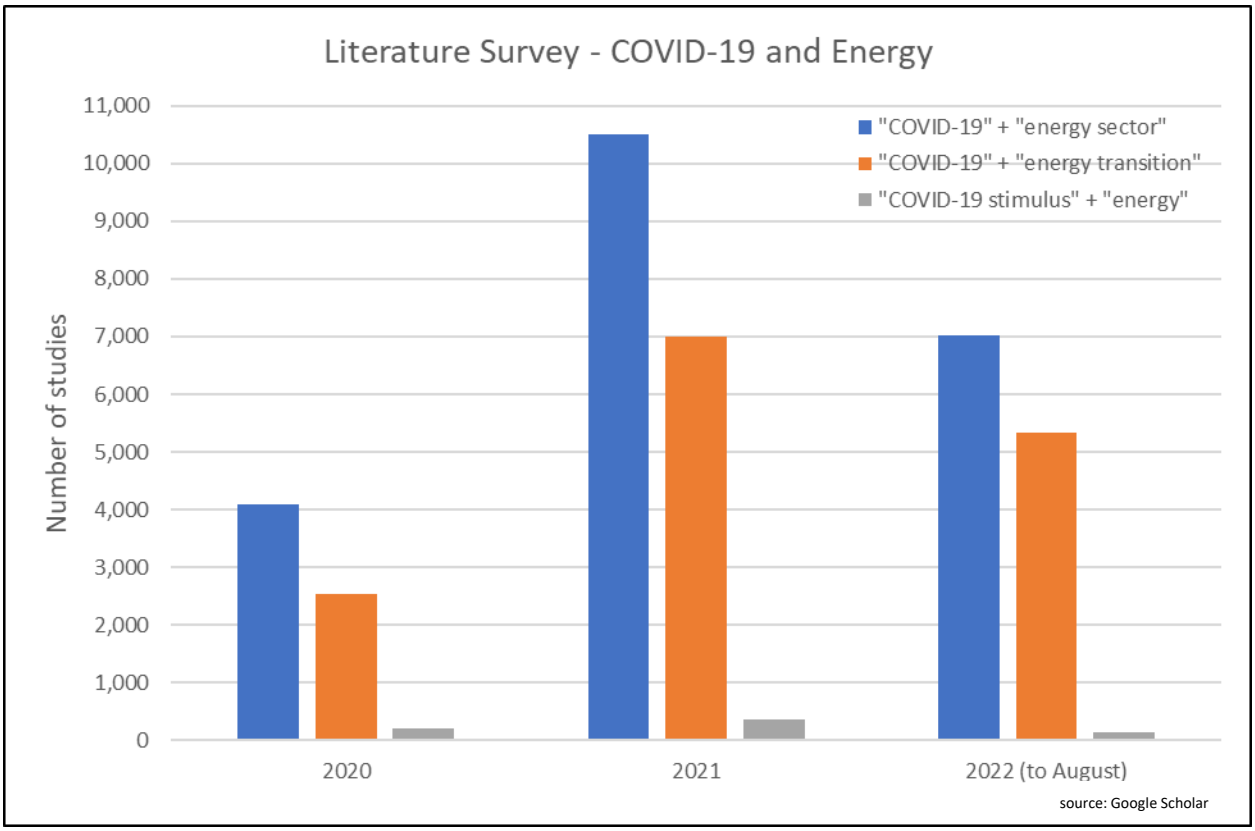


Figure 4 - Literature survey of research papers on COVID-19 and energy by keyword

However, a number of leading international agencies have raised their voices to advocate for a sustainability-led COVID-19 recovery, offering a diversity of viewpoints and angles of inquiry in their published reports. To understand this body of research, a selection of 19 studies dealing with the issues of COVID-19 recovery and sustainable development were examined (for full details see Annex 1). The key themes and findings of several of these are summarized below.

a) In 2020 the **International Energy Agency** (IEA) published a recovery plan from COVID-19 based on sustainable energy which set out a blueprint for economic recovery through targeted investment in selected clean energy sectors (IEA, 2020). It has followed up by providing a tracking database of clean energy policies, *the Sustainable Recovery Tracker* (IEA, 2022).

b) The **United Nations Department of Economic and Social Affairs** (DESA) and the **United Nations Framework Convention on Climate Change** (UNFCCC) secretariat conducted a series of webinars in 2020 on *Strengthening Synergies between the Paris Agreement and the 2030 Agenda for Sustainable Development*. The conclusions delineated several important messages, including: 1) climate and SDG synergies are critical for the COVID-19 response; 2) innovative, integrated and far sighted strategies are needed to maximize the climate and SDG co-benefits of the pandemic response; and 3) the pandemic has brought new opportunities for financing, partnerships and technologies to drive these synergies (UNDESA, UNFCCC, 2021).

c) Other research followed this including a series of databases tracking the national policy responses for COVID-19 stimulus including the ***Energy Policy Tracker*** (Energy Policy Tracker, 2022), Oxford University's ***Global Recovery Observatory*** (O'Callaghan, 2021), the IEA's ***Sustainable Recovery Tracker*** (IEA, 2022) and the OECD's ***Green Recovery Database*** (OECD, 2022). These allow analysis of the policy responses to date that relate to COVID-19 stimulus and will be analyzed further in Chapter 3.

d) The **United Nations Economic and Social Commission for Asia and the Pacific** (ESCAP) has proposed a COVID-19 recovery framework for its member States named "build forward better" (ESCAP, 2021). This sets out a framework for recovery which embodies 3 sub-packages – social services, digital access and green development. This framework is aligned with the SDGs and proposes making essential investments in social protection, digital connectivity and green development that help build resilience against future shocks. Further work by ESCAP has outlined a pathway for developing countries to address the fiscal crunch following the pandemic and how to broaden fiscal space for an effective recovery (ESCAP, 2022)

e) The **G20** has set out a pandemic recovery framework based on a series of interlinked strategies: 1) Coordinate the response; 2) Grow the Green; 3) Transition the brown; and 4) Transform the rest (Alam, et al., 2020). This offers a more nuanced view of how the COVID-19 recovery can be positioned to support the overall energy transition.

f) The **World Resources Institute** and the **Institute for Global Environmental Strategies** have advocated a framework for recovery along three transformations – decarbonization, circular economy and decentralization that could provide a blueprint for an SDG-aligned recovery (Finch, et al., 2021).

g) The **International Renewable Energy Agency** in its analysis of the post-COVID recovery highlights the case for a transformation of the energy sector and notes the enhanced job creation for clean energy stimulus compared to investments in fossil fuels. It sets out a series of short- and long-term measures to stimulate economies and accelerate the energy transition, including recommendations on energy access (IRENA, 2020).

There are many common threads that run through these analyses and their recommendations. These include the imperative to invest in SDG achievement in a manner that values social and environmental protection alongside economic recovery. The literature also highlights that current stimulus plans have an unwelcome focus on fossil fuel-based investments which are better directed towards clean energy. The role of COVID-19 stimulus to accelerate the energy transition, including the need for addressing structural impediments such as fossil fuel subsidies is a common theme among many studies. The advantages of investing in sustainable energy over fossil fuels from the standpoint of job creation and generating multiple benefits are highlighted. In some studies, more strategic opportunities such as investing in skills and innovation are canvassed, including in strategic energy technologies such as energy storage and hydrogen.

2.3. Gaps in the Literature

Analysis of the selected studies showed a series of gaps in the understanding of the interplay between of COVID-19 stimulus and sustainable energy. These gaps are summarized below.

a) A substantial focus was placed on the efforts of **developed rather than developing countries**. The datasets used - such as those compiled by the OECD - dealt primarily with OECD member countries (OECD, 2022) while others such as Energy Policy Tracker analyzed a selection of developed and larger developing countries (Energy Policy Tracker, 2022). This lack of focus reflects the ground reality that the developing countries, particularly low-income countries face tightened fiscal space that mean they may not have the means to launch stimulus programmes.[2] Understanding the opportunities for developing countries to drive COVID-19 recovery alongside the transformation of their energy systems is vital as the COVID-19 crisis is widening the gap between the developed and developing world. This will be examined further in Chapter 3.

b) While many studies cited multipliers for **job creation** stemming from different energy technologies, a detailed analysis of the **global distribution** of where these jobs would be created was lacking. This is critical as national policymakers are focused on creating jobs within their own countries rather than along global supply chains and is an important distinction as job creation is a key driver in decision making. It may be that some technologies are more effective than others at creating national level, or sometimes even region-specific employment. The absence of a detailed understanding of this factor can hamper countries' ability to optimize their stimulus plans.

c) Investments in **energy access,** i.e., clean cooking and electrification, are completely absent from the surveyed stimulus measures. This is a direct result of the issue already noted that there is a lack of fiscal space in developing country settings. However, exclusion of energy access puts universal energy access targets further behind and presents missed opportunities in terms of job

[2] In addition to this, data on post-pandemic spending in developing countries is less readily available.

creation, gender equality and poverty reduction.

d) The majority of the papers reviewed did not include a **gender dimension** of the impacts of stimulus in their analysis. However, while not specifically examining energy stimulus, there have been some useful research efforts on gender and the broader recovery efforts. Policy guidance has been issued by the International Labour Organization (ILO) and UN Women that sets out a framework for assessing and including gender equality as part of COVID-19 Fiscal Stimulus (ILO, UNWOMEN, 2021). The OECD has developed a report to guide recovery policies in OECD countries that take account of the gender-differentiated impact of the pandemic and allow for fuller participation of women in the economic recovery (OECD, 2021). These provide some insights to assist in developing gender equalizing stimulus efforts.

e) Impact on **inequality**. While several studies have pointed out the overall impact of the COVID-19 pandemic on widening inequalities both within and between countries (ESCAP, 2021), a detailed assessment of the role of stimulus in closing this gap is absent. In understanding inequality, it is important to recognize two dimensions that can be impacted by the pandemic – inequality of income and inequality of opportunity. It can be seen across the region how the pandemic has impacted both of these dimensions with marginalized populations losing income and being more vulnerable due to lack of access to health services, digital technologies and information. There is a risk that large scale injection of stimulus has a negative impact by ensuring wealth accumulation by those already well off (ESCAP, 2021). Factoring inequality objectives into a stimulus strategy is complex task for which little supporting analysis exists.

Following the literature review and the gap analysis it is useful to delineate some additional research questions that could be pursued.

a) What is the role of **grid investment** in accelerating sustainable energy?
b) Where are jobs created along **global value chains** in different sustainable energy sectors and how can more jobs be localized in each country?
c) What are the impacts of different sustainable energy stimulus measures

on tackling inequality and addressing gender issues?

3. Opportunities for Sustainable Energy through Post-pandemic Job Creation and Economic Recovery in the Asia-Pacific

3.1. Introduction

Before a detailed analysis of the Asia-Pacific region's opportunities, a description of the role of fiscal stimulus in the recovery from a shock such as COVID-19 is required. Governments generally utilize fiscal stimulus to raise economic output and create jobs. The priority, however, is to fund critical healthcare and vaccine delivery to deal with the initial effects of the pandemic. Assuming this priority can be satisfied, then consideration can be given to the subsequent priorities such as wage and liquidity support and the long-term economic recovery. The issue of fiscal space is a key limitation and is discussed in the following section of this chapter.

Stimulus is applied through a series of "channels" - spending increases, transfer payments, tax cuts or a combination of these. While the stimulus spending itself adds to GDP, its purpose is to create additional synergistic impacts across the economy by leveraging private funds, raising household incomes through wages and increasing consumption. The broadly accepted guidance for fiscal stimulus is that it should follow the rule of "3 T's" – *timely*, *targeted* and *temporary*. However, the special nature of the COVID-19 crisis requires some flexibility in applying these, particularly because our understanding of the duration and severity of the crisis keeps shifting as the virus evolves (Steele & Harris, 2021). As new variants and successive waves of infection emerge, the end of the crisis seems to edge further away, and the approach to economic recovery needs to be flexible.

The selection of sectors and channels for the stimulus can offer opportunities to deliver a range of outcomes in both short- and long-term horizons. Stimulus can be broad-based (tax cuts, transfers, bill support), or sector specific (targeting energy projects, airlines or auto manufacturers). A distinction is made in the analysis between short term stimulus through cash transfers and tax cuts; and longer-term stimulus such as infrastructure investment (new and augmentation of existing) intended to rebuild the economy. The latter category is the key opportunity to advance SDG 7. The stimulus applied to infrastructure can be "above the line" measures such as capital grants that are reflected in the fiscal

balance of the country; or "below the line" measures where equity investments are made, or loans are given to firms. The below the line measures do not add to fiscal deficits but may increase debt (International Monetary Fund, 2020).

The most detailed energy policy dataset available has been developed by Energy Policy Tracker (www.energypolicytracker.org). This allows an examination of the energy related stimulus of selected Asia-Pacific countries from the beginning of the pandemic in early 2020 up until March 2022 (Energy Policy Tracker, 2022). Figure 5 illustrates the amounts allocated to energy stimulus and the split between SDG 7 and non-SDG 7 related investments. With limited exceptions (Japan, Australia), most countries have focused more resources on areas unrelated to achievement of SDG 7, reflecting their priorities and current industrial structures.

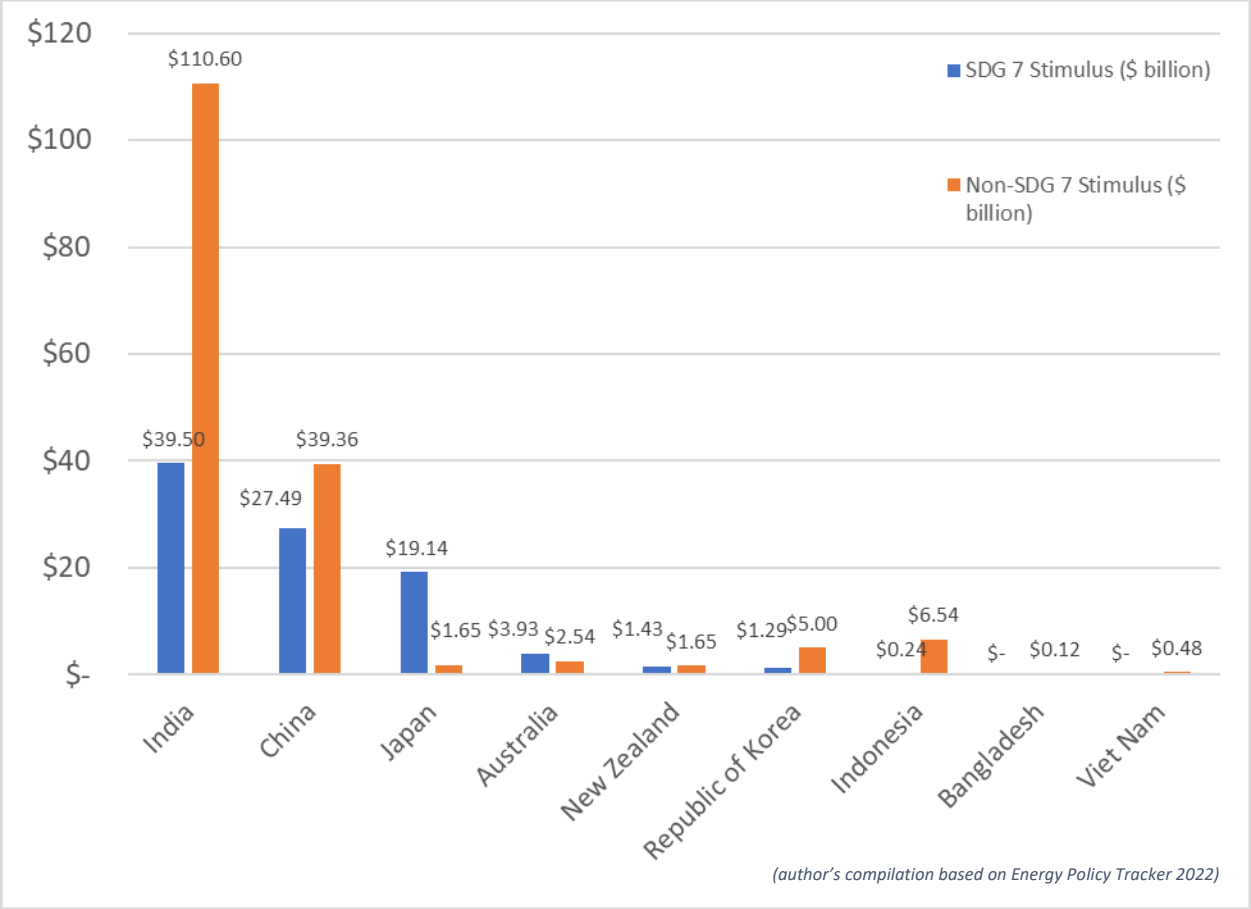


Figure 5 – Breakdown of energy stimulus measures in selected Asia-Pacific countries

Examining further the allocation of stimulus (Figure 6), it can be seen the key sectors targeted (in order of magnitude) are grid, coal, energy efficiency, renewable energy, other non-SDG 7 investments and oil with the balance made up by support to airlines, consumer bill

support, oil, gas and carbon capture and storage (CCS). A variety of channels were used, principally transfers (either budget or off budget), but also tax breaks, government procurement or equity injection.

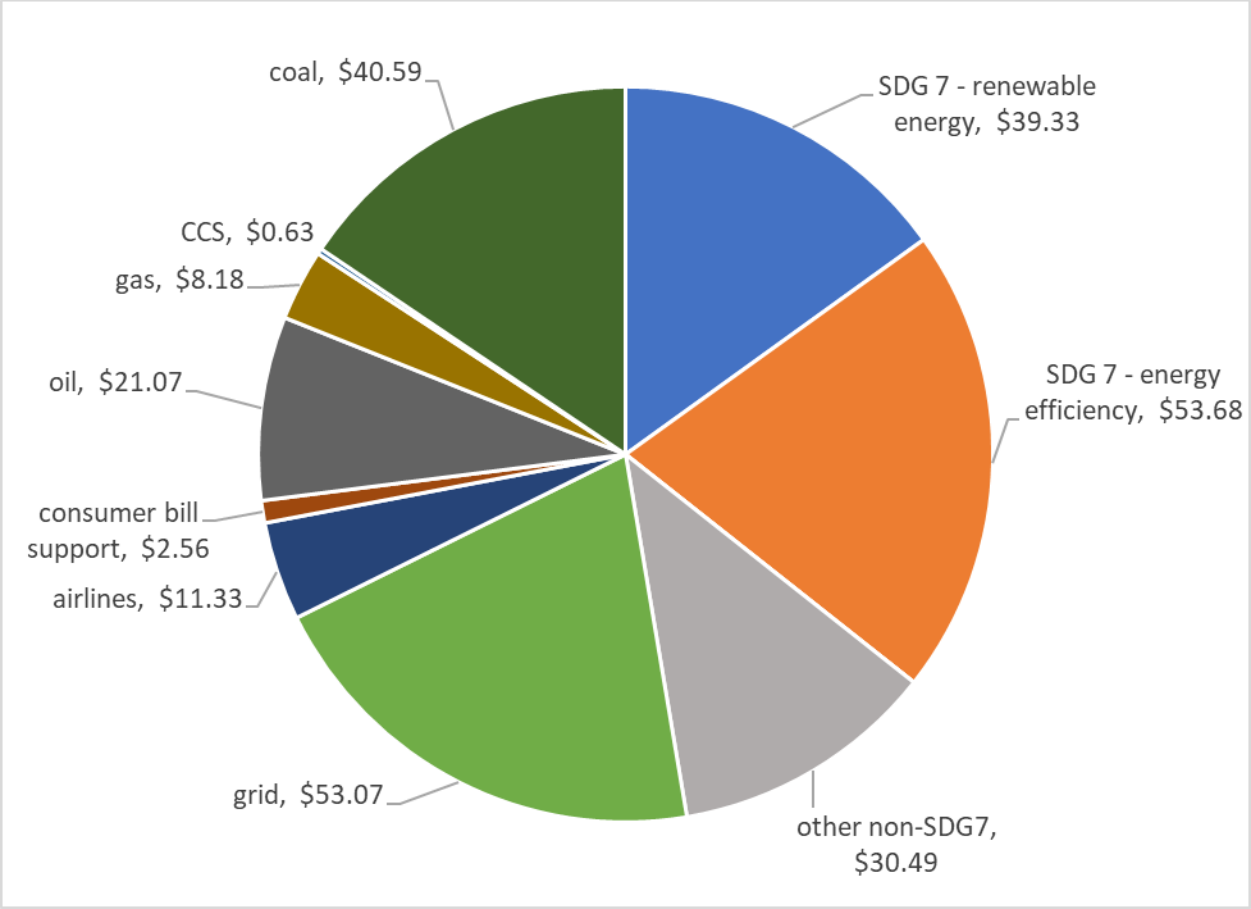


Figure 6 - Breakdown of energy stimulus measures by sector in selected Asia-Pacific countries - $ billion

This data offers encouraging news that sustainable energy, particularly the often-overlooked area of energy efficiency, has received much needed investment. However, it also reveals significant missed opportunities to accelerate SDG 7 as significant investment has been made in fossil fuels, notably coal.

Investments in ultra-high voltage DC power grid infrastructure have been made in countries such as India and China. This infrastructure can be an enabler of renewable energy deployment to assist the flow of power from new renewable power stations and to relieve grid congestion, thereby reducing power losses and enhancing energy efficiency. The prioritization of grid investments that enhance renewable energy generation or reduce power losses would be one means to ensure that these investments are supportive of SDG 7. Box 1 provides an example of one such investment in grid infrastructure

from China that was part of the COVID-19 stimulus.

Box 1 – Grid infrastructure Investment in China - Northern Shaanxi-Hubei UHV DC Project

Investing in High Voltage Direct Current Transmission Infrastructure in China

The Chinese State Grid Company Ltd. has set out a new strategy titled "Four Revolutions, One Cooperation". As part of this approach, it has realized the construction of the northern Shaanxi-Hubei UHV DC project. This was the first major infrastructure project launched by the State Grid Company following the COVID-19 pandemic and aims to restart economic activity

The purpose of the project is to connect the renewable energy rich Northern Shaanxi Province with energy hungry provinces along its route, terminating in Hubei Province, with a total length of 1127 kilometers. The technology employed is UHV technology, with a rated voltage of 800 kV, a rated capacity of 8 GW, at a total investment of 18.5 billion yuan or $2.9 billion.

Northern Shaanxi is the focus for new clean power projects and will reach an installed capacity of more than 40 GW by the end of the 14th Five-Year Plan in 2025. Moreover, it is closely interconnected with the Northwest Power Grid, itself dominated by clean energy generation. Accordingly, the construction of this project facilitates renewable energy resource development at large scale as well as dealing with anticipated future power shortages.

It is estimated the project can offset the burning of 18 million tons of coal per annum, thereby reducing the emissions of 29.6 million tons of CO_2 each year.

(source: https://www.seetao.com/details/147581.html)

None of the packages provided to airlines in the selected Asia-Pacific countries ($11 billion) are linked to enhanced environmental performance, as some of the European countries have opted to do.[3] This is a missed opportunity to enhance energy efficiency in the aviation sector as aviation is a growing source of emissions and energy demand in the Asia-Pacific region.

[3] France and the Netherlands tied the bailout of their national flag carriers to a requirement to halve passenger CO_2 emissions by 2030 (see https://fortune.com/2020/06/27/airline-bailouts-green-pandemic-recovery/). Austria linked its airline bailout to the condition that the airline cease flights to destinations that are within 3 hours travel time by train and Switzerland linked its airline bailout to CO_2 reductions.

Consumer bill support ($2.5 billion), while needed as an emergency measure, can effectively become a fossil fuel subsidy (albeit temporary), propping up incumbent fossil fuel technologies and discouraging investment in energy efficiency. While several countries offered more innovative approaches to energy poverty by providing funds for energy efficiency retrofits (Australia, China, New Zealand, Republic of Korea), there is an unrealized potential to leverage this for energy efficiency improvements.

Notable in its absence is investment in hydrogen infrastructure. Relatively few countries have included green hydrogen in the recovery spending (Japan, Australia) by comparison to Europe and the US. This sector is of strategic importance for the energy transition. As hydrogen is an energy carrier for renewable energy it can have a large knock-on effect by incentivizing new renewable energy generation capacity to be constructed with associated job creation benefits.

3.2. Fiscal and Job Multipliers

A further concept that is needed for the discussion of stimulus is fiscal multipliers and job multipliers. Fiscal multipliers are the ratio of stimulus inputs to changes in the resulting output of the economy - in other words, the resulting change in GDP resulting from government injection of finance. These fiscal multipliers vary across sectors and countries.[4] Hence, their quantification and comparison are key to developing well targeted stimulus policies. Detailed modelling using real world data of stimulus measures has resulted in high confidence estimates of multipliers for stimulus directed to renewables compared to fossil fuel infrastructure (Batini, Di Serio, & Fragetta, 2021). From this work, it emerges that renewable energy, to choose one element of SDG 7, offers more than double the economic stimulus per dollar compared to investing in fossil fuels. Table 1 below[5] summarizes these results.

	Renewable Energy Investments	Fossil Energy Investments
Overall Impact	**1.4**	**0.62**
1 year	1.46	0.58
2 year	1.49	0.54
3 year	1.51	0.51
4 year	1.53	0.48
5 year	1.54	0.47

Table 1 – Economic multipliers for renewable energy and fossil fuel investments (Batini, Di Serio, & Fragetta, 2021)

This result is reflective of the greater labour inputs required for renewable energy, and that on average these jobs are higher paying than in the fossil fuel sector (ibid).

This information needs to be complemented by the fiscal multipliers for energy efficiency and energy access investments. Unfortunately, most research on fiscal multipliers has focused on broader economy wide multipliers and not on the specific subsectors of energy efficiency and energy access. While these two categories can be viewed as infrastructure, fiscal multipliers for these are not available in any of the literature reviewed for this report.

[4] For example, developing countries tend to exhibit lower fiscal multipliers compared to their developed counterparts.

[5] These coefficients are global averages rather than specific to the Asia-Pacific region.

On the other hand, there is much more information available on job multipliers. The impacts of job creation form a component of the fiscal multipliers, as the impact of incremental job creation is captured within GDP increases. Job multipliers are an important driver in stimulus policies as governments seek to address unemployment created by the pandemic. The political pressure created by jobs, or the lack of them, translates into higher political priorities attached to job-friendly investments. There are variations across the different renewable and fossil energy sectors as some are more labour intensive while others are more material intensive. It is likely there is also variation between countries, depending on the degree to which automation and mechanization are employed to replace labour inputs.

Table 2 highlights the strong job creation potential of clean energy, particularly energy efficiency, in creating jobs in comparison to fossil fuels.[6] In addition to the stronger multiplier effect on capital invested, many of these jobs are created early in the project cycle, a key requirement of post-pandemic stimulus. There is anecdotal evidence that renewable energy and energy efficiency projects can be implemented rapidly. Industrial energy efficiency and building retrofits can be launched with minimal lead times. Renewable energy projects such as solar and wind are more modular in nature and not subject to the same implementation lead times as fossil fuel or nuclear energy projects. This implies greater usefulness in the rapid response required to generate new jobs after COVID-19.

[6] These coefficients are global averages rather than specific to the Asia-Pacific region.

Sector	Job Creation per $ million		
	Direct FTE[7]	Indirect FTE	Total FTE
Renewables			
bioenergy	5.22	2.44	**7.65**
hydro	4.55	2.98	**7.53**
wind	4.06	3.46	**7.52**
geothermal	4.67	2.73	**7.40**
solar	4.26	2.98	**7.24**
Energy Efficiency			
mass transit & freight rail	6.16	2.77	**8.93**
home weatherization & commercial retrofits	4.55	3.22	**7.77**
industrial energy efficiency	3.98	3.43	**7.41**
smart grid[8]	3.66	3.10	**6.76**
Fossil Fuels			
coal	1.18	1.92	**3.10**
oil and gas	0.70	1.49	**2.20**

Table 2 – Job creation from energy investments: source (Garrett-Peletier, 2017)

The multipliers in Table 2 reflect jobs created in the manufacturing and installation, but do not include the long-term maintenance and operation. This exclusion may alter the values of the multipliers. For example, the IEA offers estimates that differ to those in Table 2 (IEA, 2020). The IEA estimates for wind and solar are lower, while for energy efficiency they are higher. The choice of short term vs. long term horizons may be a key difference, or perhaps the selection of OECD vs. non-OECD countries.[9]

[7] Full time equivalent.
[8] Modernization of electricity transmission and distribution systems with a focus on applying information technology.
[9] The calculation methodology of Garrett-Peletier is very detailed and is elaborated from first principles (Garrett-Peletier, 2017). Further analysis of the different modelling results is available in (World Resources Institute, 2021)

The examination of short-term impacts rather than longer term job creation, which relies on continued operation of fossil industries in a carbon constrained future appears more appropriate.

Hence greater weight is given to the latter estimates as provided in Table 2. The wind energy sector is one growth area where there is greater job creation potential than relying on business-as-usual approaches. The Global Wind Energy Council developed a study examining the in-depth potential of five countries – Brazil, South Africa, Mexico, India, the Philippines - and modelled the additional job creation and economic uplift of an accelerated wind energy deployment strategy as part of the COVID-19 recovery (Blanch, Pettersen, & Hodgkinson, 2022). In one example for India, this model predicted an additional 1.15 million jobs created over the life of the wind farms constructed.

3.3. Challenges of Limited Fiscal Space

The application of stimulus assumes that countries have the fiscal space to do this. Developing countries, particularly those that are in the least developed category, had limited room to manoeuvre even before the pandemic. The impact of the pandemic has been to weaken their fiscal standing. Remittances from overseas in many cases have dried up and fiscal deficits and public debt have increased due to the economic downturn from COVID-19. (Steele & Harris, 2021).

Indeed, the limited fiscal space may mean that developing countries had to increase taxes to fund the stimulus measures, which can offset the initial impact of fiscal stimulus (Sheremirov & Spirovska, 2019). It is clear that fiscal space will continue to shrink over the coming years as a consequence of COVID-19 (Figure 7). The experience of the pandemic to date (for least developed countries in particular) is that the fiscal space problem is compounded by a need to invest in health systems and social protection measures, leaving fewer resources for stimulus relating to SDG 7 (Lee, 2020).

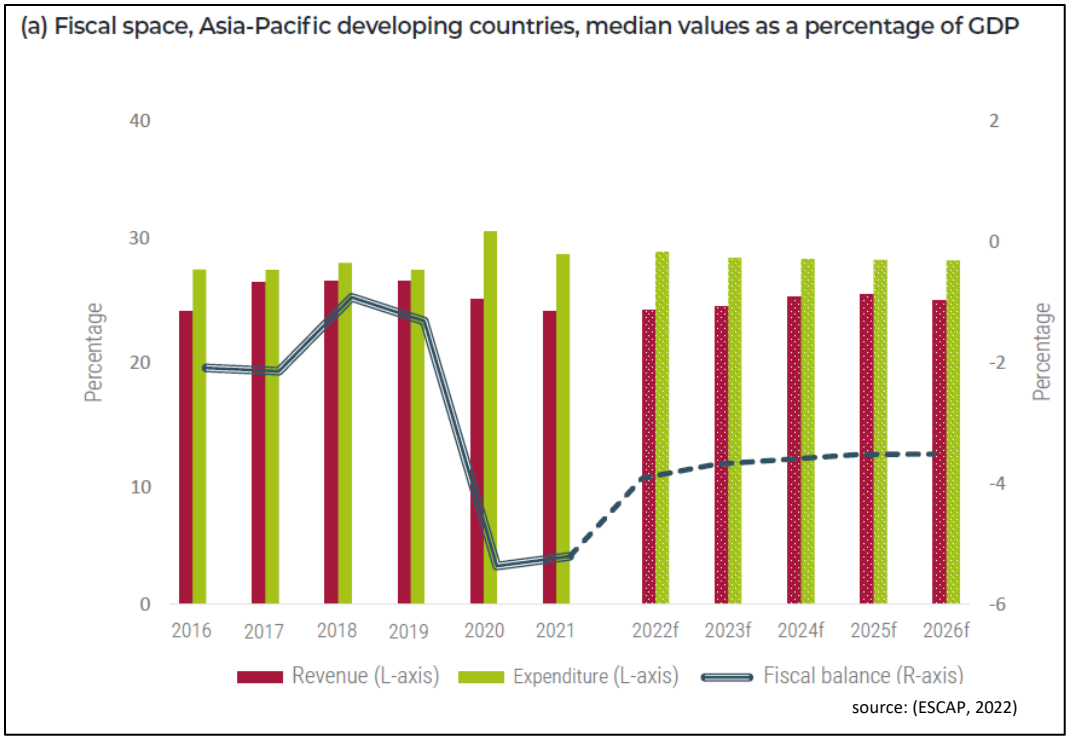


Figure 7 – Declining fiscal space of Asia-Pacific developing countries

The challenge for developing countries is how to create additional fiscal space without taking on excessive debt. The United Nations has advocated that governments re-examine budget policies and address "fiscal termites". These are barriers to widening fiscal space that include tax competition, tax evasion, transfer pricing, and fossil fuel subsidies (United Nations, 2020).

The ongoing process of tax reform in many developing countries to increase the often-low tax to GDP ratio gained new urgency as COVID-19 has shrunk national tax receipts. Some researchers have suggested approaches such as solidarity taxes on sectors of the economy more able to afford them, that are temporary and redistributive; or taxing windfall gains that occurred during the pandemic (ILO, UNWOMEN, 2021). ESCAP devoted the 2022 edition of its *Economic and Social Survey of Asia and the Pacific* to the subject of sustaining a nascent recovery from COVID-19, focusing on the challenges faced by developing countries (ESCAP, 2022). This report advocates "spending smart and taxing fairly" to address the fiscal squeeze. Investments in health care, social protection and education are critical for long term sustainable development and future resilience but will consume significant resources. This needs to be balanced by better tax collection efficiency and a broader tax base.

These reforms, even if embraced wholeheartedly, will take many years to be implemented and will not rapidly create the fiscal space needed for energy or other investments to recover from the current crisis. Other forms of support are increasingly needed. The International Monetary Fund (IMF) has instituted a program to offer COVID-19 financial assistance and debt service relief. From March 2020 to March 2022 this totaled $2.62 billion across the Asia-Pacific (International Monetary Fund, 2022). The Asian Development Bank in 2021 alone committed $13.5 billion to developing member states for COVID-19 recovery out of which $9 billion was for green and inclusive recovery (Asian Development Bank, 2021). Notwithstanding the value of these investments and of ODA commitments, they are insufficient to close the fiscal gaps of developing countries in the region. To put this in perspective ESCAP estimates that for 42 developing Asia-Pacific economies "an average new investment of $434 billion per year would be needed to achieve Goal 7 between 2018 and 2030, including $10 billion in universal access to electricity (renewable energy), $2 billion in clean cooking solutions, $242 billion in renewable energy and $180 billion in energy efficiency." (ESCAP, 2019)

The evidence of the limited ability of least developed countries to respond to the crisis with stimulus is highlighted in Figure 8 (ESCAP, 2021). This underscores the disparity between the least developed countries, other developing countries and advanced economies of the region, with the least developed countries only committing just over 1 per cent of GDP to stimulus.

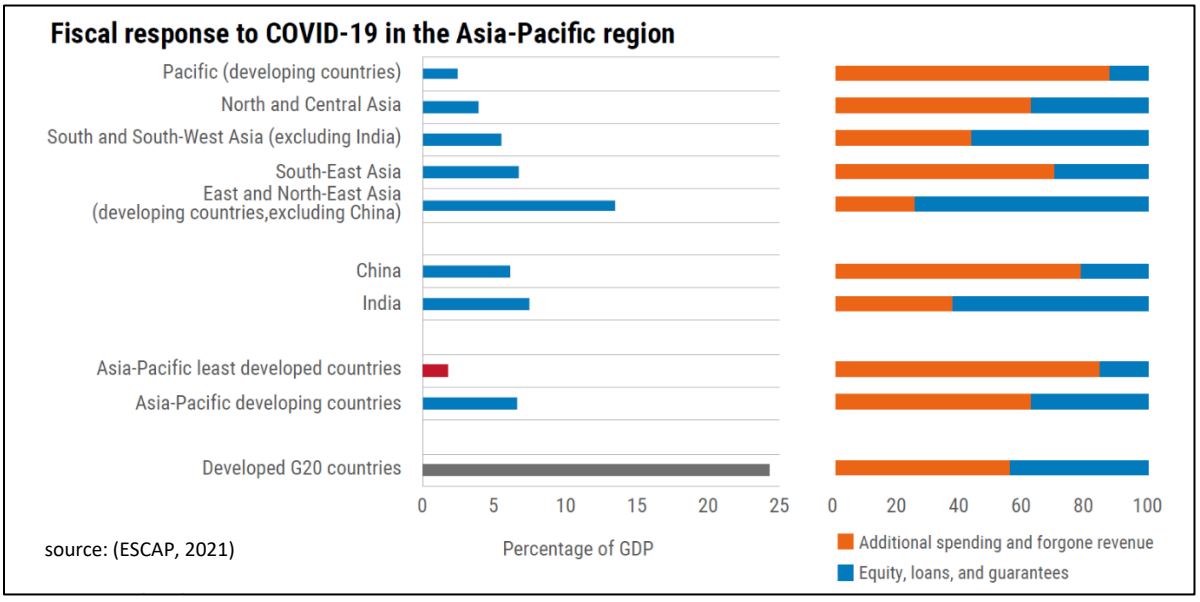


Figure 8 – Fiscal response of Asia Pacific countries to COVID-19, until March 2021

A further challenge that may affect the ability of developing countries to leverage stimulus is in their absorptive capacity for stimulus investment. In applying energy sector stimulus, countries require a pipeline of "shovel-ready" projects, which require mature industries, established regulatory settings and trained workforces. These may be absent or cannot be rapidly constituted in the rapid response needed for COVID-19. Other research points to structural factors in developing countries that impact fiscal multipliers. For example, a higher level of trade openness and high public debt can reduce the size of multipliers; while a fixed exchange rate regime and a higher proportion of "hand to mouth population" can increase the value of multipliers (Raga, 2022). The absence of energy stimulus measures applied by low-income countries in the Asia-Pacific region analyzed in Chapter 5 demonstrates the reality that developing countries have not been able to mobilize stimulus as easily as their developing country counterparts.

ESCAP has set out a series of recommendations for developing countries to increase fiscal space in order to better deal with COVID-19, that include debt service suspension, issuance of public bonds, debt swaps, the increased use of risk transfer instruments and the relaxation of investment restrictions for sovereign wealth funds and pension funds (ESCAP, 2021). Further ESCAP recommendations (in the 2022 *Economic and Social Survey of Asia and the Pacific*) are on "spending smart and taxing fairly" to support immediate health and social protection needs and to increase tax collection efficiency (ESCAP, 2022). The full analysis of these options fall beyond the scope of this study. However, the successful implementation of these measures is needed to be able to create the capacity to direct stimulus funds towards sustainable energy.

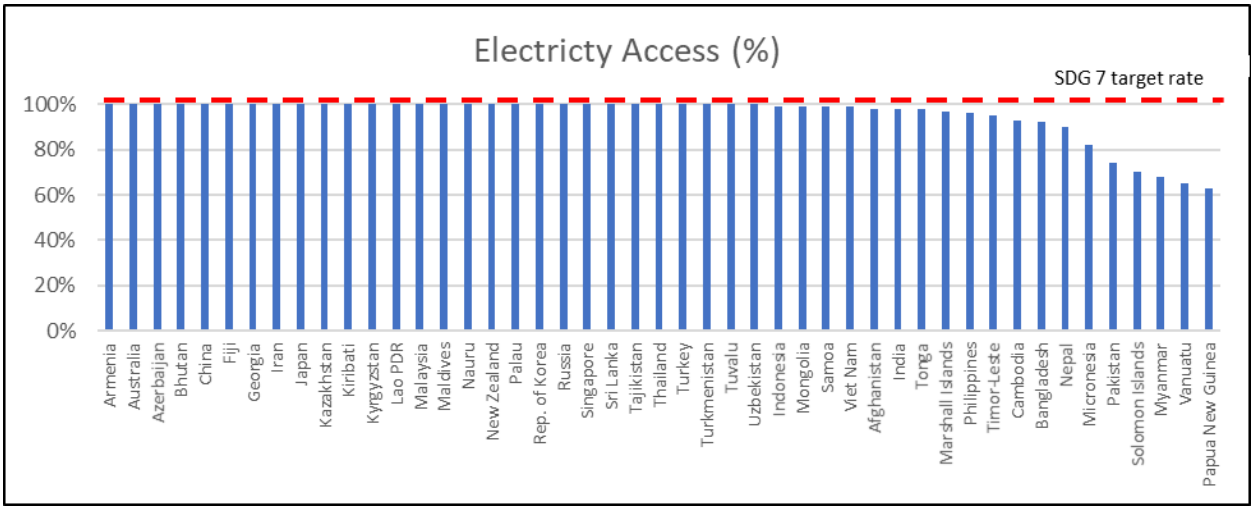
3.4. Sustainable Energy-based Fiscal Stimulus – Experience to Date

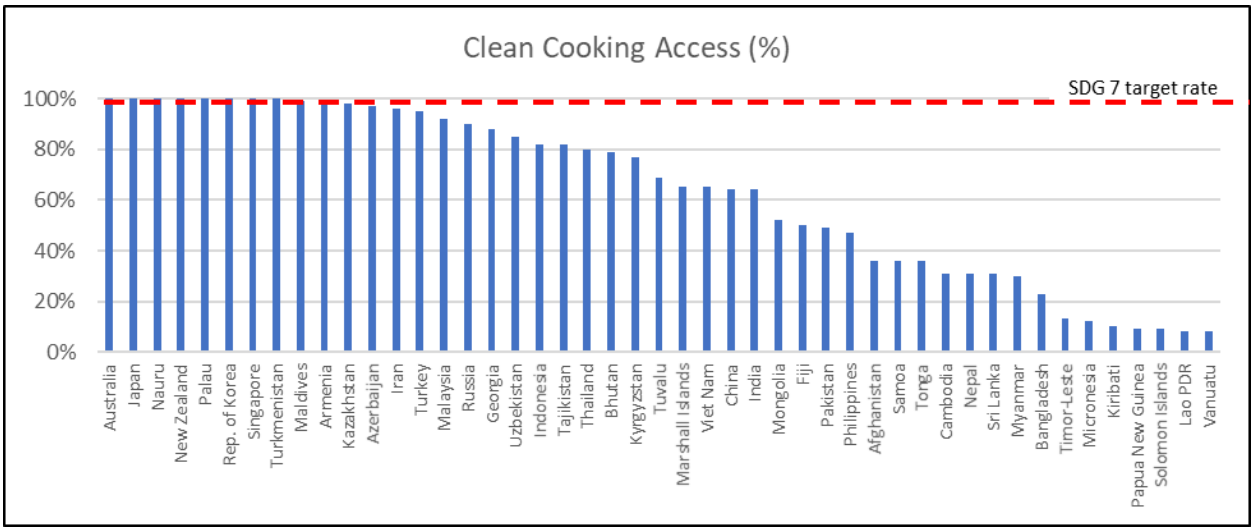
Creating sufficient fiscal space is an essential precondition to mobilizing a sustainable energy-centred COVID-19 recovery. As noted in the previous section, many developing countries have significant barriers to creating this space and their fiscal situation is expected to deteriorate in coming years as the impacts of the pandemic continue. The expansion of fiscal space following the recommendations made by ESCAP and other international organizations should be a top priority and is a prerequisite for mobilizing a sustainability-led recovery.

Notwithstanding the competing demands on funds for emergency support measures, it is clear that investment in sustainable energy, particularly energy efficiency, offers higher returns than investing in fossil fuels. These returns can be seen through the lenses of economic recovery and progressing the SDGs

and decarbonization targets under the Paris Agreement. Despite an initial rush to fossil fuel-based stimulus in early 2020, clean energy investments have caught up, and at the time this report is finalized, they hold an equal share to fossil fuels as outlined in Chapter 1. However, the investment in fossil fuels as part of the recovery to date totaling $70 billion in the Asia-Pacific region represents a massive opportunity cost and fails several tests. First, it is further entrenching a high carbon development pathway. Second, it does not yield the same levels of economic uplift and job creation. Third, it is adding to the future risk of financial instability from stranded assets as the world moves to net zero emissions by mid-century.

SDG 7 progress across the regions falls well below the pace needed to reach the majority of the targets by 2030. While substantial progress has been made in reaching universal energy access, much more progress is needed on clean cooking, boosting the share of renewable energy and enhancing energy efficiency. Figure 9 shows the progress for countries of the region across the SDG 7 targets.





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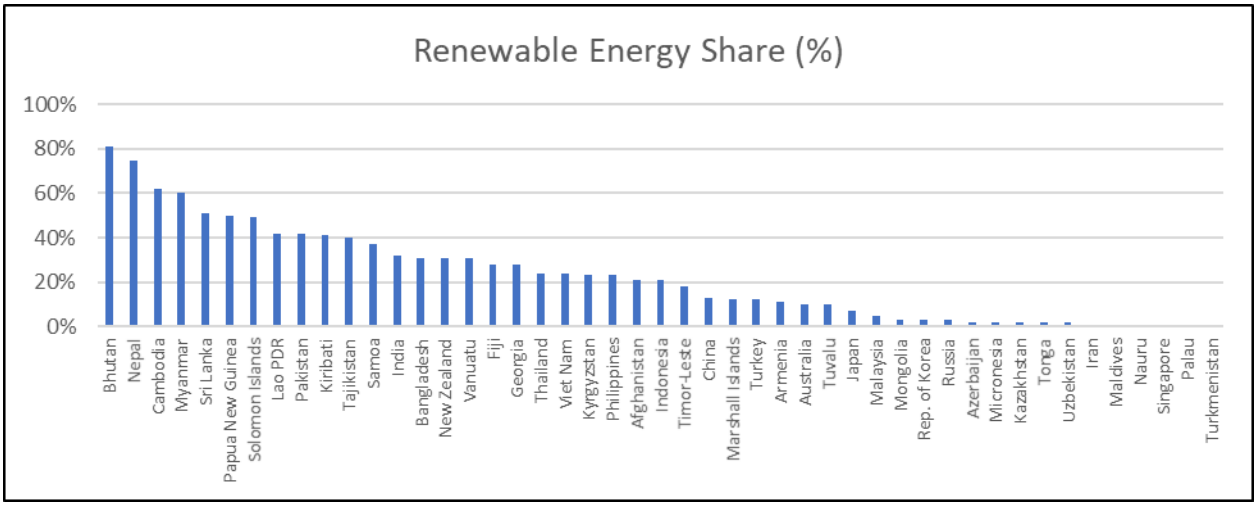
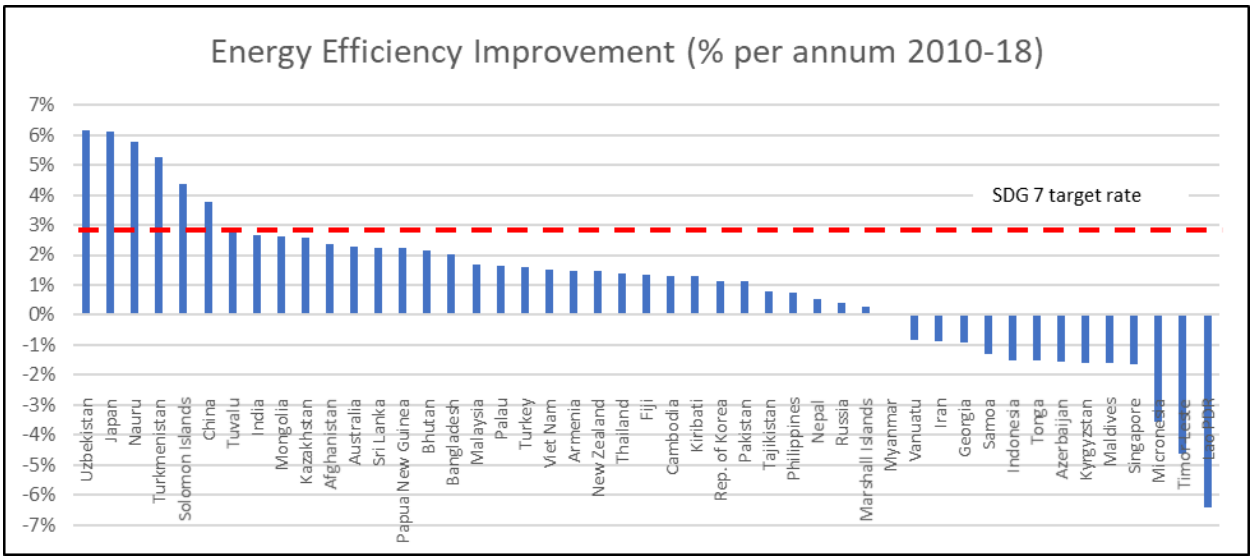




source: (IEA; IRENA; UN Statistics; World Bank; WHO, 2022)

Figure 9 – SDG 7 progress across countries of the region

Large gaps exist in the attainment of at least three of these four targets,[10] with only universal access to electricity appearing to be on track for achievement by 2030. While many developing countries are struggling to reach universal access for clean cooking, the Asia-Pacific countries that are falling short of the targets for renewable energy and energy efficiency fall into both developed and developing country categories.

[10] The renewable energy component of SDG 7 does not have a fixed target, aiming instead for "a substantial increase in renewable energy".

In addition, of the 47 Asia-Pacific countries for which complete SDG 7 data is available, only 29 of these (principally developed countries) have mobilized a stimulus response based on equity and grants. Of these only 9 have directed funds to projects that support SDG 7. No country has directed stimulus towards clean cooking or electricity access.

New Zealand energy efficiency stimulus – expansion of the "Warmer Kiwi Homes" program

In response to the COVID-19 pandemic the Government of New Zealand responded with a NZ$50 billion (US$35 billion) rescue fund in 20202. This included a number of measures to stimulate economic activity. One of these was to expand funding for the existing "Warmer Kiwi Homes" program by injecting an additional NZ$56 million (US$39 million) to cover an extra 9000 homes and increasing the subsidy level to 90%.

The "Warmer Kiwi Homes" program targets low-income households and provides them with high performance floor and ceiling insulation, and efficient heaters for homes already well insulated. This achieves a dual purpose of reducing bills for low-income citizens and reducing energy consumption and associated emissions.

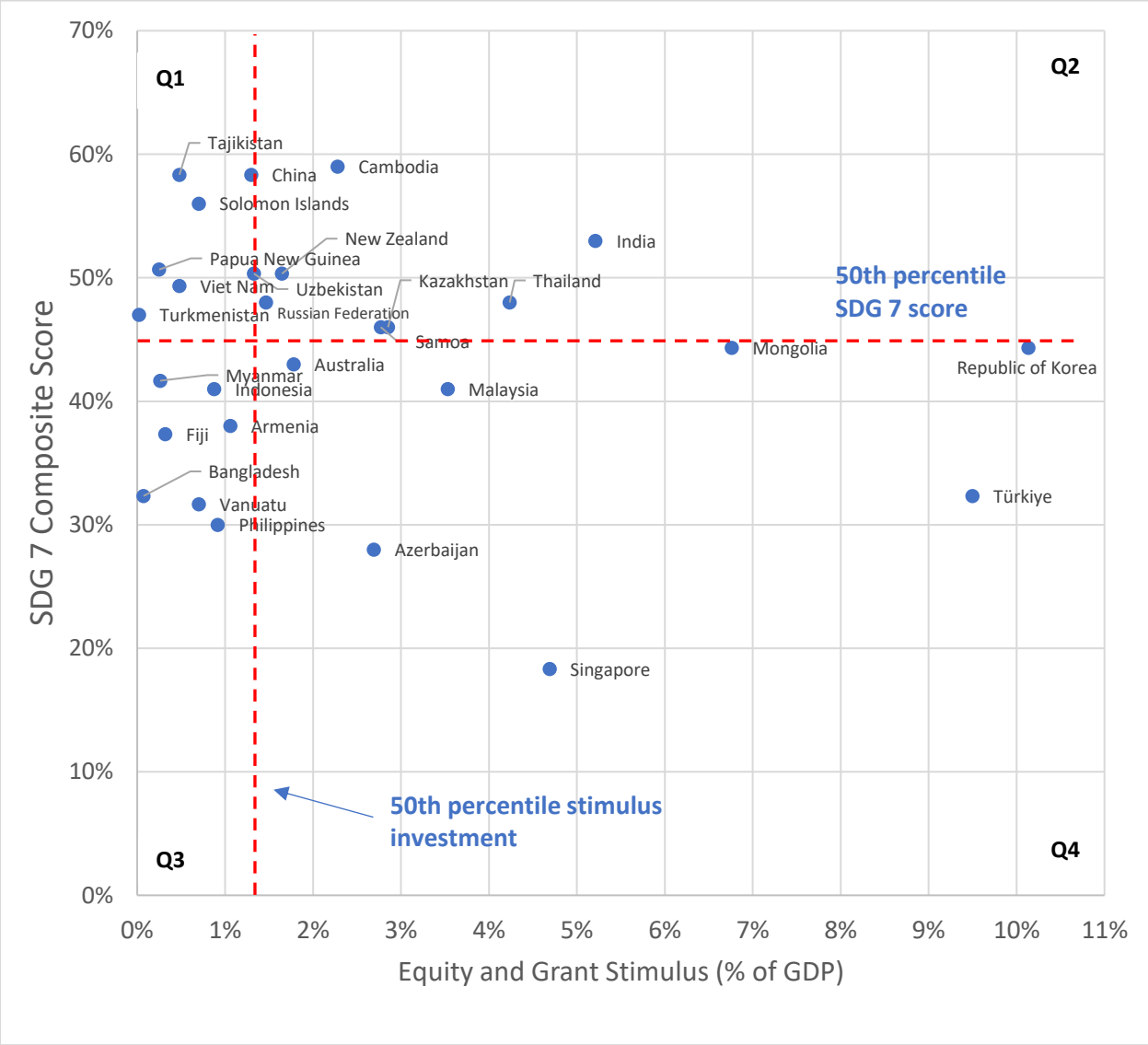
The advantage of this approach by the New Zealand Government was to utilize a program that was already established so that the impacts could be realized rapidly in response to the sudden downturn induced by COVID-19. It takes advantage of an already established labour-intensive sector so that the stimulus investment creates a high level of jobs relative to the investment, typically within New Zealand small to medium enterprises. International research indicates that the job multiplier for home energy retrofits is in the region of 7.77 jobs per $ million invested. Therefore, this initiative indicatively could generate 300 additional jobs - in addition to the estimated 770 jobs created since the program was launched in 2018.

Sources: https://www.rnz.co.nz/news/budget-2020/416633/budget-2020-50bn-rescue-fund-in-once-in-a-generation-budget, https://www.eeca.govt.nz/co-funding/insulation-and-heater-grants/warmer-kiwi-homes-programme/

Box 2 – Best practice example of energy efficiency stimulus from New Zealand

To better understand their position, Asia-Pacific countries can be mapped against two axes – SDG progress and stimulus invested (Figure 10). The

SDG 7 composite score[11] used in this representation is derived from performance across the three SDG 7 dimensions – access to modern energy, energy efficiency improvement and renewable energy share of consumption. For clarity, countries with zero stimulus invested in grants and equity have been omitted from the charts but are included in the following statistical analysis. More details are given in Annex 2.



Note: countries with zero stimulus omitted

Figure 10 – Asia-Pacific countries mapped by equity and grant stimulus against SDG 7 composite score

[11] For each country, its percentile of each SDG 7 target against the 47 countries analyzed is calculated. Then the percentiles are averaged to create the SDG 7 composite score. Bhutan sits at the top of the ranking.

The countries can be categorized by their location on the four quadrants separated by the 50th percentile line for each variable on this plane as illustrated in Table 3.

Quadrant 1 – High SDG 7 Progress, Low stimulus	**Quadrant 2 – High SDG 7 Progress, High stimulus**
Palau	Viet Nam
Lao PDR	Solomon Islands
Kyrgyzstan	China
Marshall Islands	Uzbekistan
Nepal	Russian Federation
Kiribati	New Zealand
Bhutan	Cambodia
Turkmenistan	Samoa
Papua New Guinea	Kazakhstan
Tajikistan	Thailand
	India
	Japan
Quadrant 3 – Low SDG 7 Progress, Low stimulus	**Quadrant 4 – Low SDG 7 Progress, High stimulus**
Maldives	Vanuatu
Tonga	Azerbaijan
Federated States of Micronesia	Philippines
Timor-Leste	Turkey
Afghanistan	Singapore
Bangladesh	Armenia
Fiji	Indonesia
Tuvalu	Malaysia
Iran	Australia
Myanmar	Rep. of Korea
Georgia	Mongolia
Nauru	
Sri Lanka	
Pakistan	

Table 3 – Categorization of countries by SDG 7 progress and stimulus investments

This categorization allows some insights to be gleaned into the situation facing each country as they address both COVID-19 recovery and the development of their sustainable energy sector. Given the multi-dimensional nature of SDG 7 across access, efficiency and renewables, the averaging of different SDG 7 targets can obscure some important aspects, which are further discussed in the analysis of each grouping below.

Quadrant 1 – High SDG 7 Progress, Low stimulus

Palau
Lao PDR
Kyrgyzstan
Marshall Islands
Nepal
Kiribati
Bhutan
Turkmenistan
Papua New Guinea
Tajikistan

The Quadrant 1 countries are typically small developing countries which score very well on SDG 7 progress but do not have the fiscal space to mount a stimulus. Their progress in SDG 7 reflects their strong renewable resource base, particularly hydro, and high levels of electricity access. However, except for Turkmenistan, all are below the pace of energy efficiency improvement required. They have mixed progress on clean cooking with Lao PDR, Kiribati and Nepal all at levels below 50 per cent access. **The key recommendation for these countries is to enact measures to widen the fiscal space and focus on energy efficiency; and for selected countries on clean cooking, as the principal SDG 7 gaps.**

Quadrant 2 – High SDG 7 Progress, High stimulus

Viet Nam
Solomon Islands
China
Uzbekistan
Russian Federation
New Zealand
Cambodia
Samoa
Kazakhstan
Thailand
India
Japan

The Quadrant 2 countries are a mixture of small and large developing countries as well as advanced economies which score very well on SDG 7 progress and also have invested in stimulus. Their progress in SDG 7 reflects a mixture of drivers – strong renewable energy resource bases, improvements in energy efficiency and in ensuring energy access. However, with the exception of Turkmenistan, all are below the pace of energy efficiency improvement required for SDG 7. They have generally achieved complete or near complete energy access with only Cambodia, Samoa and the Solomon Islands have a clean cooking level less than 50 per cent. While this group's energy efficiency performance is strong relative to other countries, only Uzbekistan, Japan, the Solomon Islands and China have met the benchmark energy efficiency improvement needed to meet SDG 7. **The key recommendation for most of these countries is to enact measures to use the fiscal space they have mobilized to invest in energy efficiency and renewable energy. The countries in this group with acute clean cooking deficits can consider clean cooking as an important investment area to support grassroots local economies.**

Quadrant 3 – Low SDG 7 Progress, Low Stimulus

Maldives
Tonga
Federated States of Micronesia
Timor-Leste
Afghanistan
Bangladesh
Fiji
Tuvalu
Iran
Myanmar
Georgia
Nauru
Sri Lanka
Pakistan

The Quadrant 3 countries represent the most unenviable category. Most of the countries in this grouping are smaller developing countries which have neither progressed strongly on SDG 7, nor have they been able to mobilize a strong stimulus in response to the pandemic. Nine out of the 14 countries in this quadrant are small island states. A further three are least developed countries. Georgia is perhaps an outlier in this group in terms of its SDG 7 progress. Sitting close to the 50th percentile on the composite SDG 7 score, it has a strong renewable energy resource base, but its energy efficiency has worsened since 2010, and a small clean cooking access gap remains. **The key recommendations for these countries are to enact measures to widen the fiscal space and focus on all SDG 7 targets to close the remaining gaps.**

Quadrant 4 – Low SDG 7 Progress, High stimulus

Vanuatu
Azerbaijan
Philippines
Turkey
Singapore
Armenia
Indonesia
Malaysia
Australia
Rep. of Korea
Mongolia

The Quadrant 4 countries represent an interesting opportunity. They have shown the capacity to launch stimulus measures, but at the same time they need to accelerate progress on SDG 7. The countries in this group are a mixture of advanced economies (Australia, Singapore, Republic of Korea), larger developing countries (Azerbaijan, the Philippines, Turkey, Armenia, Indonesia, Malaysia), and one small island state (Vanuatu). The SDG 7 deficits vary across different targets. All are below the target improvement rate for energy efficiency with four countries showing a worsening energy efficiency (Vanuatu, Azerbaijan, Singapore and Indonesia) and most of these countries have less than 10 per cent renewable energy share. Vanuatu has large gaps in terms of access to electricity and clean cooking. Some of these countries have used stimulus to drive sustainable energy investment (Australia, Republic of Korea) but **much more needs to be done to address direct stimulus towards SDG 7 related investments.**

3.5. Opportunities for Driving a Sustainable Energy-Led Recovery

The recovery from COVID-19 is still ongoing and much more needs to be done to revitalize economies and repair the damage done. The Asia-Pacific countries were analyzed in the previous section to examine to what extent (a) they were able to mobilize a stimulus; (b) how much of this was devoted to energy; and (c) how much of the energy-related stimulus was used to support SDG 7 achievement. The results of this analysis leave room for both pessimism and optimism. Almost all countries need to accelerate progress on their sustainable energy journey. Many lack the financial resources to tackle the challenge, some are faced with inherent challenges from resource allocations or geography, while others lack political will or are constrained by incumbent fossil dominated energy infrastructure. However, technology learning curves for clean energy have progressed and many renewable and energy efficiency options are now both technologically mature and fiscally prudent.

Many global experts and international agencies have stressed the need for a green recovery and put forward analysis to buttress their policy advice (Chapter 2). It is in no doubt that there are synergies to be developed by pursing sustainable energy development in tandem with COVID-19 recovery. Moreover, using all 17 SDGs as a framework to guide investments is a more ideal approach, through which issues such as inequality, poverty reduction, climate change mitigation, environmental protection and gender equality can be factored into decision making.

The diversity of countries across the Asia-Pacific region poses a challenge and makes generic broad-based recommendations less useful for policymakers. The complexity of national policymaking on issues such as stimulus investment is accentuated by competing vested interests, incumbent industries and different subnational interests such as rural/urban divides and provincial disparities.

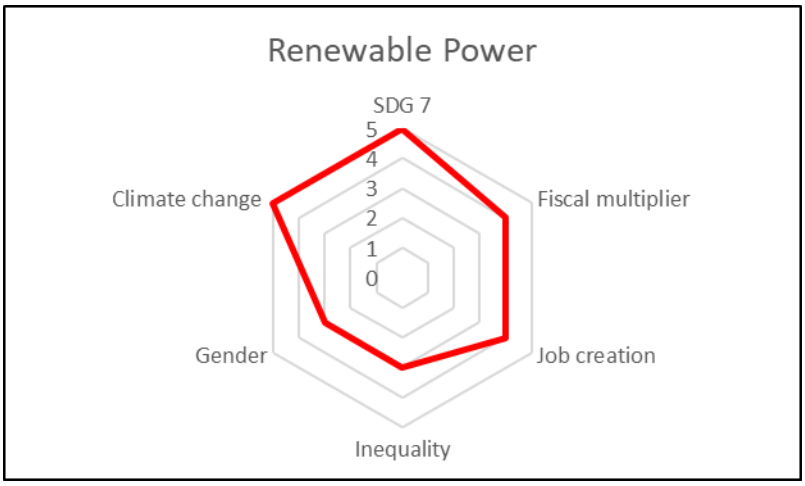
To help clarify the opportunities for sustainable energy-led recovery the following section outlines the opportunities for different investment categories. It attempts to weigh up the benefits from a variety of standpoints – economic stimulus, job creation, SDG 7 progress and climate action (SDG 13). It also factors in two additional elements which are often placed at the periphery of energy policy making – inequality and gender. The selection of scores for each of these attributes is indicative only, but in part draws on the figures provided earlier in this chapter. Ultimately the individual policy prescriptions for each country depend on the weighting given to each of these drivers.

This is perhaps best decided by a consensus at national level.

It is important to add a note on job creation. The clean energy sector, like many other global industries relies on global value chains. These value chains, which result in an internationally fragmented approach to producing goods, have evolved to maximize the efficiency of labour and material inputs. Investment in this sector is going to create jobs along these value chains in different countries. The extent to which jobs are created in the country that has invested the stimulus will vary by subsector and country. For example, the solar photovoltaics (PV) manufacturing industry is concentrated in China, where a total of 2.2 million people work in this sector. Therefore, investment in solar PV will create jobs in China as well as local jobs in the design, installation and maintenance. This phenomenon creates a potential disconnect that can dissuade investment in sectors that lead to a greater proportion of job creation outside the country.

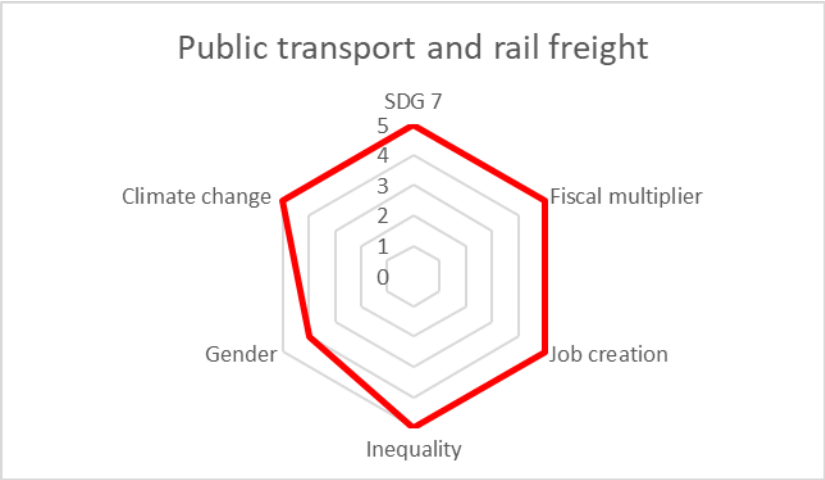
The shock wrought by COVID-19 on global value chains has prompted debate about reversing this process, referred to as "reshoring" production. However, the OECD's research indicates that reshoring would reduce economic efficiency in all countries, hamper diversification and result in countries being less able to absorb shocks (OECD, 2021). Similarly, some countries (notably India) prior to the pandemic had tied their renewable energy support mechanisms to a requirement to reach a certain level of local content. This too is not without its limitations as it can decrease the efficiency of the industry to deliver the stated policy goals efficiently as part of a market supply and demand system. Alone, local content measures may not be enough to build local capacity and jobs and will need to be accompanied by other long-term stable policy measures that offer a long-term development pathway for the sector (Bazilian, Cuming, & Kenyon, 2020). This lesson must be applied to stimulus investments to avoid a boom-bust cycle of employment and then downturn.

1. **Renewable power**



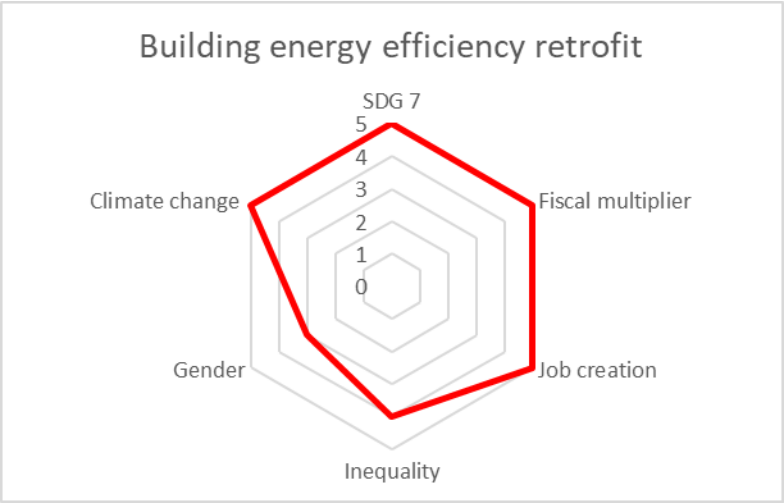
Investment in renewables is critical for all countries of the region to close SDG 7 gaps and help meet the Paris Agreement emission reductions. This sector can deliver strong job creation and economic uplift compared to fossil fuel investment. Many developing countries may face an absence of a supportive policy and regulatory environment that may limit the number of "shovel ready" renewables projects. The impact on gender and inequality is less clear. Evidence cited from the literature review in Chapter 2 indicates that stimulus for large infrastructure can accumulate to the wealthier segments of society, limiting the ability of this investment to impact on inequality. It may be argued that by displacing fossil fuels many of the inequalities driven by pollution and land degradation and reduced which makes a positive contribution to reversing inequality. On gender, it is clear there is a large gender gap in the renewable energy workforce, with only 32 per cent of jobs held by women (IRENA, 2019). This needs to be addressed before this investment can support greater gender equality.

2. **Public transport and rail freight**



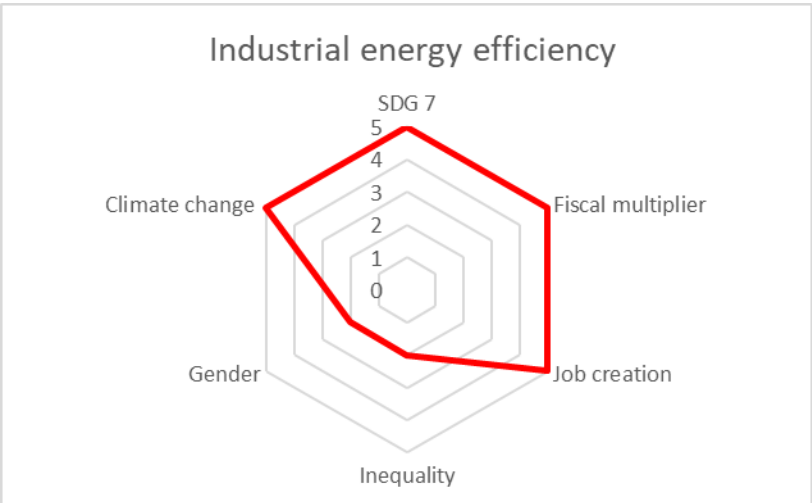
Investment in this sector is an important avenue to enhance energy efficiency and hence contribute to this critical area of SDG 7 and address the Paris Agreement requirements. This infrastructure allows a mode shift from private vehicles to public transport and moving freight from road to rail. As well as strong job creation and economic uplift compared to fossil fuel investment, this sector enables broader and more cost-effective access to mobility, boosting its gender and equality impacts. This investment category is better aligned with countries that have growing urban centres suitable for implementation of mass transport systems and/or the scope to build or extend their rail networks.

3. **Building energy efficiency retrofit**



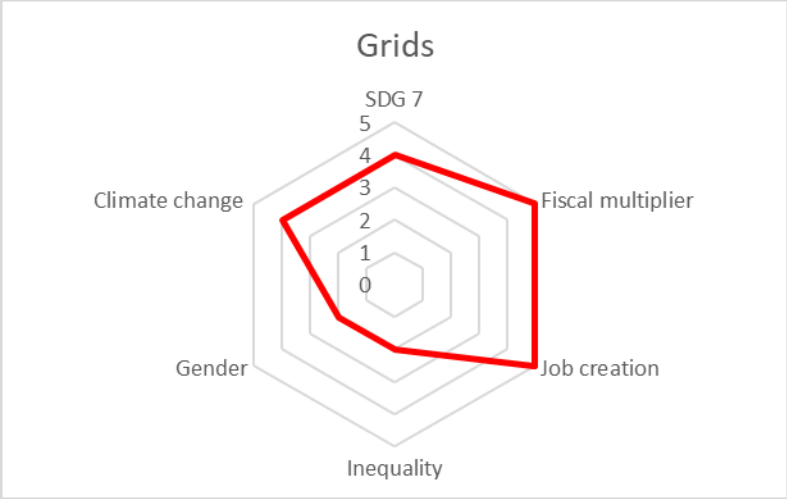
Given the large existing stock of buildings and their often-poor energy performance, retrofits of both residential and commercial buildings are a key plank in national energy efficiency strategies to help save energy, costs and meet the SDG 7 target. The impact in terms of job creation is among the highest of all energy sector investments. There are significant opportunities to use this measure as a means of reducing energy costs for low-income citizens and therefore address inequality. Mobilizing these projects may be easier than large infrastructure projects owing to the regulatory simplicity and large number of buildings that can be targeted as part of a government scheme.

4. **Industrial energy efficiency**



Like other energy efficiency interventions, this sector offers strong job creation while reducing energy use and input costs for businesses. As with renewable power projects, the principal benefits from stimulus can accumulate to the business owners as the wealthier segments of society, limiting the ability of this investment to address inequality. On gender, there is a limited way in which this type of investment can support greater gender equality. The broader issue of participation of women in the clean energy workforce needs to be addressed before inroads can be made into gender inequality with these stimulus investments.

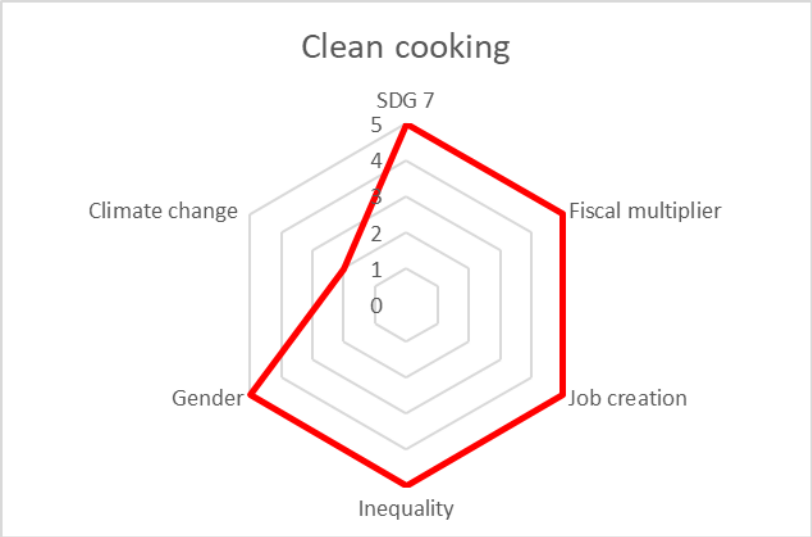
5. **Grid Investments**



As the region moves increasingly towards electricity as the principal energy carrier, upgrading and modernizing grids is key. This has some links with SDG 7 - principally as an enabler of more renewables and to reduce losses in the network. It is a labour-intensive sector and can result in strong job creation[12] and fiscal multipliers. More limited however, are its impacts on gender and inequality. These results may be transferrable to the related category of power grid construction, which has been discussed earlier in this report, but for which no information is available on job or economic multipliers.

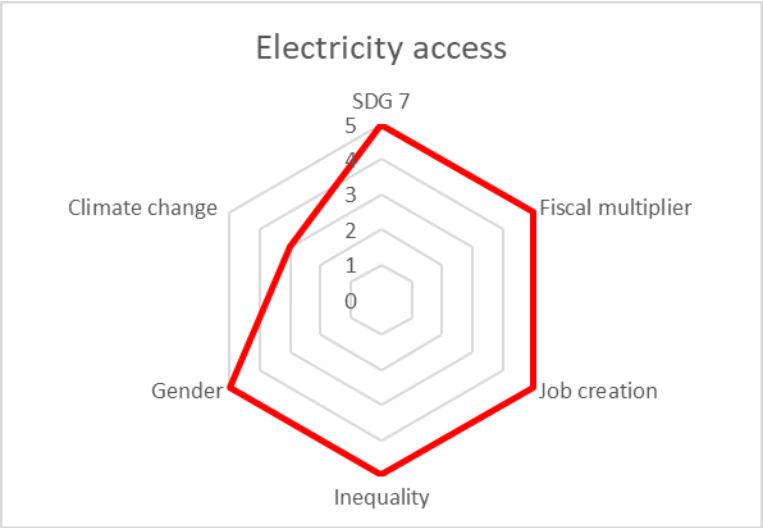
[12] The IEA estimates job creation multipliers of 5.5 jobs per $ million invested in new grids and 7.2 for each $ million invested in existing grids.

6. **Clean cooking**



The previous section of this chapter has highlighted the significant lag in the region on clean cooking and the absence of any investment in this sector as part of COVID-19 recovery. It's clear that clean cooking has a pivotal impact on SDG 7 achievement as one of the highest priority areas for improvement. As a technology intervention at grassroots levels, it has clear positive impacts in terms of inequality and gender. While job creation and fiscal multipliers are not readily available, there are several indications that this area is labour intensive and can lead to strong economic benefits in terms of avoided healthcare costs. As clean cooking technologies may not be renewable or climate neutral there is less of a direct positive linkage to climate change.

7. **Electricity Access**



Despite rapid progress in connecting people to electricity across the region, many countries still suffer from a significant access deficit. As with clean cooking, no identifiable stimulus has been directed to electrification efforts. Notwithstanding this, countries of the region have been devoting resources to electrification over many years, both through grid extension, mini grids and stand-alone renewable energy systems. This sector offers strong fiscal multiplier and job creation impacts as well as being key to reversing both income and gender inequality through the benefits of electricity in homes. Evidence from Africa suggests that the job creation impacts reverberate beyond the direct employment generated by the provision of electricity to other productive sectors, with an additional 5 jobs created in other sectors for each job in energy (IRENA; ILO, 2021). The link to climate change is stronger when renewable energy-based interventions are made compared to grid extensions. However, the majority of electrification efforts across the region have been realized with grid extensions.

One important avenue for countries to consider in post-pandemic recovery is regional cooperation**.** In order to prepare a supporting environment for clean energy pathways and therefore enhance the alignment of recovery efforts with sustainable energy development need to be exploited. These include the development of regional carbon markets, development of regional innovation systems, as well as capacity building and sharing of experiences.

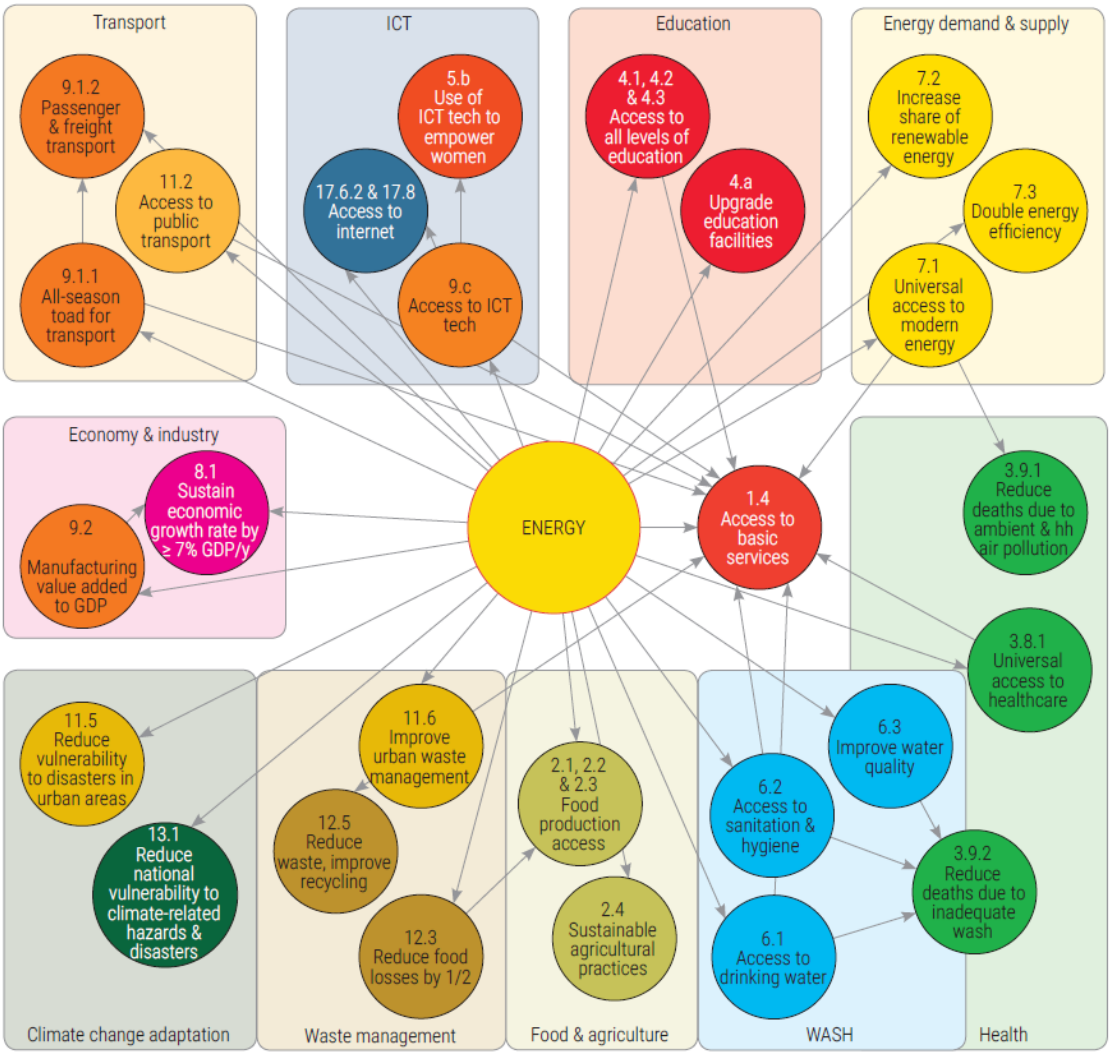
4. Accelerating Positive Energy Transformation Post-pandemic – Sustainable Development, Energy Security and the New Normal

4.1. Advancing the 2030 Agenda - Cross SDG Benefits

The literature review has revealed a significant level of interest in the topic of how the COVID-19 recovery can drive achievement of all 17 SDGs. For the Asia-Pacific countries, ESCAP has advocated an SDG-centred approach to recovery from the pandemic in its "build forward better" framework (ESCAP, 2021). The analysis in this report has focused on how stimulus efforts can be structured to support SDG 7. It is important to suggest that SDG 7 progress also advanced many other targets and indicators under the 2030 Agenda. SDG 13 (climate action) is the most obvious one as the renewable energy and energy efficiency targets are one of the key avenues for climate change mitigation. However, there is a web of interactions with other SDGs best captured visually, as presented in Figure 11. For example, sustainable energy contributes to poverty reduction, water and sanitation, education and transport.

Investments that support SDG 7 can play a role in achievement other critical targets of the 17 SDGs. Interestingly, many of these cross-SDG linkages stem from the energy access targets of SDG 7, the most underinvested area in the context of COVID-19 recovery. This highlights the missed opportunity of energy access investment. As mentioned earlier in the report, this is a consequence of the limited fiscal space of the countries facing energy access shortfalls.

In developing a stimulus plan, countries need to consider these interlinkages in order to optimize the investments against SDG achievement beyond SDG 7. One example is chronic air pollution that many cities of the region are suffering from, which is covered under SDG target 3.9.1. Here the stimulus investment in energy efficiency through public transport or investing in electric vehicles can make a direct impact on this issue. Energy access investments can progress on multiple SDGs relating to education, water and sanitation and healthcare.



source (Santika, et al., 2019)

Figure 11 - Interactions between SDG 7 and other SDGs

4.2. Building Energy Security and Resilience Post-Pandemic

This report has outlined opportunities for countries in the Asia-Pacific region to align their recovery plans with sustainable energy development. However, in the wake of the COVID-19 experience and more recent geopolitical developments, concerns have been raised about ensuring energy security and the related concept of energy resilience in the face of crises such as COVID-19. It is, therefore, useful to overlay the concepts of energy security and resilience with the sustainable energy-led pandemic recovery approach outlined in this report.

Energy security is a dynamic concept that varies according to the circumstances faced by each country. The standard energy security constituent elements of supply side availability and affordability are being augmented by considerations such as climate change impact and sustainability (Ang, Choong, & Ng, 2015).

The quest for enhanced energy security cannot be separated from the profound changes to the energy system as part of the energy transition. This is a process through which older centralized fossil fuel systems are giving way to systems based on higher shares of renewables, advanced energy efficiency, decentralized energy generation and management, along with energy storage and electric vehicles. As well as increasing the share of clean generation, the energy transition will see greater use of electricity for end uses such as cooling, heating and transport; as well as the emergence of new energy carriers such as hydrogen. Already, many countries of the region have cemented this process in national policy by announcing net zero emissions targets by mid-century. The extent to which other technologies may play a role is being debated. Despite two decades of optimistic signals emerging from technology proponents, the deployment of new modular nuclear power COVID-19 has added to this complexity by bringing additional concerns to the foreground stations and carbon capture and storage technologies (deployed on existing or new coal fired power stations) has not been realized regionally or globally. The emergence of these technologies at large scale seems less likely as renewable energy and energy storage technologies continue their rapid growth. While the key aspects of the energy transition such as cleaner and more climate friendly energy are positive and beneficial, it is also important to recognize new energy risks and vulnerabilities that emerge such as cybersecurity and the availability of critical raw materials for renewable energy, batteries and smart energy devices.

of policy conversations. It has led to resilience[13] becoming more prominent aspect for consideration alongside security. Resilience can be seen as a precondition for energy security. As the pandemic rapidly spread in 2020, the movement of people and materials was hampered. A beneficial side effect was the reduction in demand for energy as movement of people and commercial activities slowed down following lockdowns and border restrictions. Fortunately, critical energy systems were maintained, and supplies of fuels and electricity were unaffected in almost all countries. This prompted some reflection on how a more serious future pandemic could affect the ability of essential workers to support the operation of energy infrastructure. A degradation of the ability to supply energy represents a serious risk as many other types of infrastructure essential for pandemic management, from healthcare to telecommunications, depend on it.

In considering a future acute pandemic scenario, there is evidence that renewable energy infrastructure such as wind and solar are more resilient and less prone to disruption compared to fossil fuel systems. The scores presented in Figure 12 draw on five vulnerabilities – revenues, costs, financial, political and regulatory environments and costs (Foresight Group, 2020). The renewable energy sectors presented score better in part as they rely on naturally occurring energy inputs rather than physical supplies and can be operated automatically (ESCAP, 2021). In particular, energy sources such as coal are particularly vulnerable.

[13] A useful definition is of resilience is "… the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions." – *United Nations Office for Disaster Risk Reduction.*

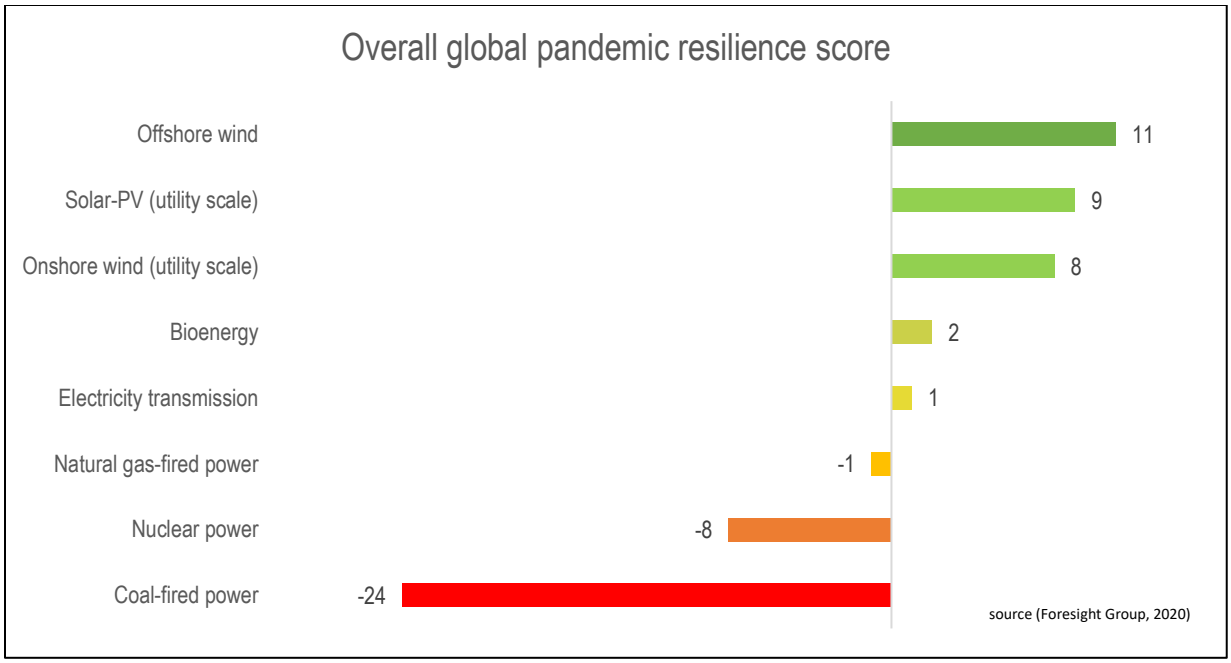


Figure 12 – Global Pandemic Resilience Scores for energy technologies

Complementing this is the evidence on how the renewable energy sector continued deployment during the pandemic. In 2020, an additional 260 GW of renewable power capacity was added, compared to 180 GW in 2019 (IRENA; ILO, 2021). This points to some resilience in terms of the supply chain and workforce in this sector. Looking at the growth data of the renewable power sector for 2021, this resilience seems to be confirmed. Renewable electricity generation was estimated to grow by 8 per cent, the fastest growth rate since the industry's embryonic days of the 1970s (IEA, 2021).

In response to COVID-19 many of the stimulus efforts analyzed in this report that support SDG 7 can also enhance resilience and security. Energy efficiency is essential to reducing overall demand for energy, reducing the vulnerability of countries to price spikes and supply interruptions. In addition, renewable energy for the reasons mentioned previously can reduce imports and operate effectively despite pandemics and geopolitical disruptions. Linked to both efforts is grid investment. Modernizing and extending power grids can provide the infrastructure for large scale renewable energy use, trading renewable power across borders and reduce network energy losses.

It is clear these "new" energy security concerns emerged long before COVID-19. However, it is likely that the pandemic will shape thinking on energy security. As the transition is guided across multiple country contexts by respective governments, the existing and emerging strategic vulnerabilities must be continuously evaluated and mitigated. What is important to note is that moves by countries to shore up sustainable energy progress post-pandemic can also have dividends in preparing the system for future shocks. These include pandemics and geopolitical crises that interrupt the flow of energy.

4.3. Relationship with the "Just Transition"

The ongoing transformation of the energy system which is guided by sustainability and energy security objectives must also consider the just transition. This term has been coined to capture the need to protect communities and workers who are disproportionately affected by the move away from fossil fuels. As many countries reduce coal use and shutter mines and power stations, the impacts on workers and communities can be significant and the impacts may be concentrated in specific geographic regions. The impact of COVID-19 is then superimposed on these broader societal impacts.

The parties to the United Nations Framework Convention on Climate Change (UNFCCC) through successive declarations have recognized the importance of ensuring a just transition by transitioning workers to decent work opportunities. The challenges of reskilling and transitioning workers from brown jobs to green jobs are significant. There will be a mismatch both of skills and of geographic location of the old and new industries. The International Labour Organization (ILO) has developed "Just Transition Guidelines" which set out a comprehensive framework to guide countries through this process (ILO, 2015). This framework links the just transition to three overarching policy goals – decent work, poverty eradication and environmental sustainability. The framework for just transition should involve dialogue between governments, employers and workers (Figure 13).

Figure 13 – Just Transition Framework

Thus, stimulus plans launched in response to COVID-19 should also be compatible with the framework set out in the just transition guidelines. Opportunities to support the transition of workers from brown jobs into green jobs should be maximized. The key question is how can this be done? The ILO Just Transition Guidelines (ILO, 2015) provide some useful provisions that are directly applicable to the use of green stimulus, as follows (italics added):

- "explore and identify an appropriate combination of taxes, *subsidies*, *incentives*, guaranteed prices, and *loans* to encourage a transition towards economically sustainable activities";
- "improve policy effectiveness, where necessary, by using targeted fiscal policy measures, market-based instruments, *public procurement and investment policies*";
- "use *public investments* to develop infrastructure with the lowest possible adverse environmental impact, to rehabilitate and conserve natural resources and to prioritize resilience in order to reduce the risk of displacement of people and enterprises"; and

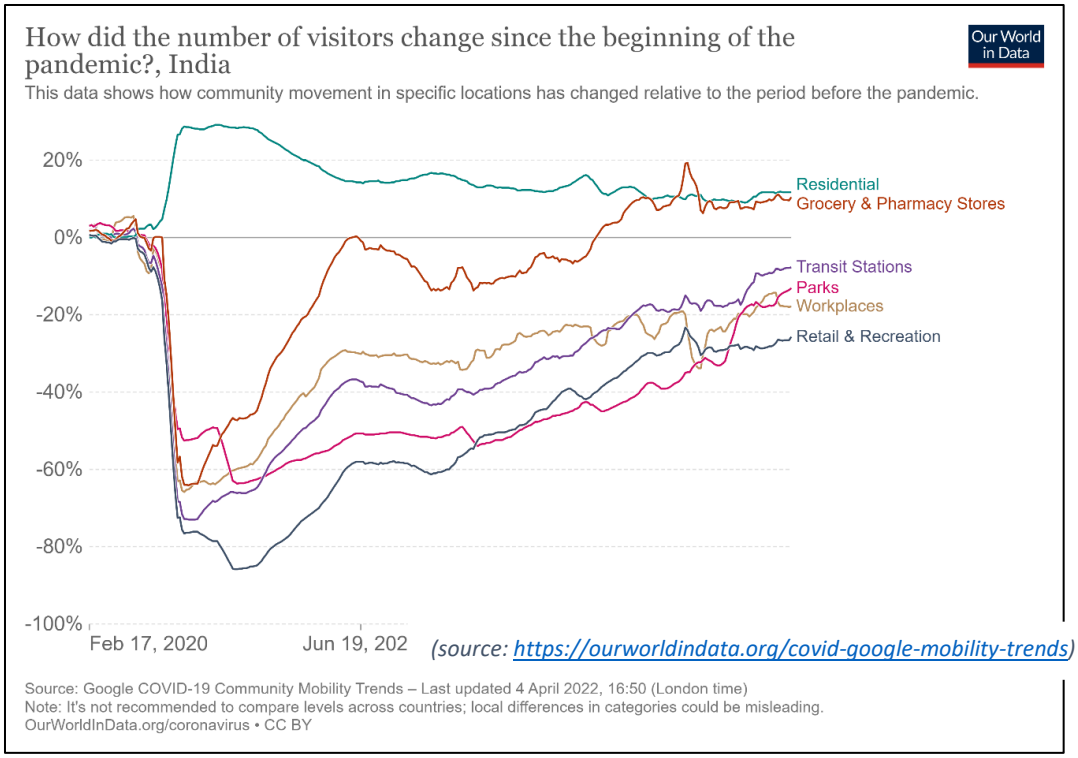
- "use *public procurement* to incentivize a shift to environmentally sustainable goods and services and promote social inclusion by ensuring that enterprises, in particular MSMEs and disadvantaged groups, are able to apply for public purchases".

4.4. The New Normal – Locking in Sustainable and Low Carbon Pandemic Response Measures

The analysis thus far has focused on the role of post-COVID-19 recovery measures on shaping the energy transition. However, the pandemic has kick started many changes in behaviour and technology use which can have positive benefits for sustainable energy and SDG 7. The interesting aspect of this shift is to ensure that the most beneficial of these changes can be retained in the longer term.

As COVID-19 emerged in early 2020, governments responded with a series of measures designed to slow the spread of the virus. These included restrictions of movement, closure of hospitality venues, work from home mandates and border closures. This effort was backed by strong cooperation between citizens and governments to follow these requirements and to engage in other preventative measures such as mask wearing and social distancing. At the time this report is published these restrictions have been lifted in most countries of the region, although there are some instances of re-imposition in response to new waves.

The impact of these measures can be seen in movement data collected by Google. Figure 14 shows the rapid drop in mobility for India in the months following the emergence of the virus, and almost all countries of the region followed this pattern (Ritchie, et al., 2022). This enormous slowdown caused grave economic and social consequences as have been discussed in Chapter 1. However, there is a positive story in the adaptability and resilience of workers and industries through the way in which they were able to sustain key sectors though alternative means of delivery, often through digital technologies. The ability of many jobs to be decentralized and of employees to work from home or other locations had been discussed for many years but the magnitude of the COVID-19 shock accelerated this shift almost overnight by virtue of necessity.



(source: https://ourworldindata.org/covid-google-mobility-trends)

Figure 14 – Data on movement in India following the COVID-19 outbreak

It is important for any analysis on the new normal beyond the pandemic to make the following two key differentiations:

1. *Transient impacts* from *long-term impacts*.
2. *Economic downturn impacts* from *long-term structural changes*.

As noted in Chapter 2, a great deal of attention has been devoted to the first of these points - the short-term dip in energy use and emissions during the initial phases of the pandemic in 2020. Similarly, the economic downturn has come at a severe cost of lives and livelihoods and does not substitute for the long-term structural transformation of the energy system that the world needs. If a "bounce back" scenario is realized following the pandemic, these short-term impacts linked to the economic shocks may have limited longer term implications and may be limited to academic interest only. Modelling of different pandemic pathways outlined in Figure 15 shows that a return to business-as-usual emissions post-2022 is likely without a decisive adoption of green stimulus (Shan, Ou, & Wang, 2021).

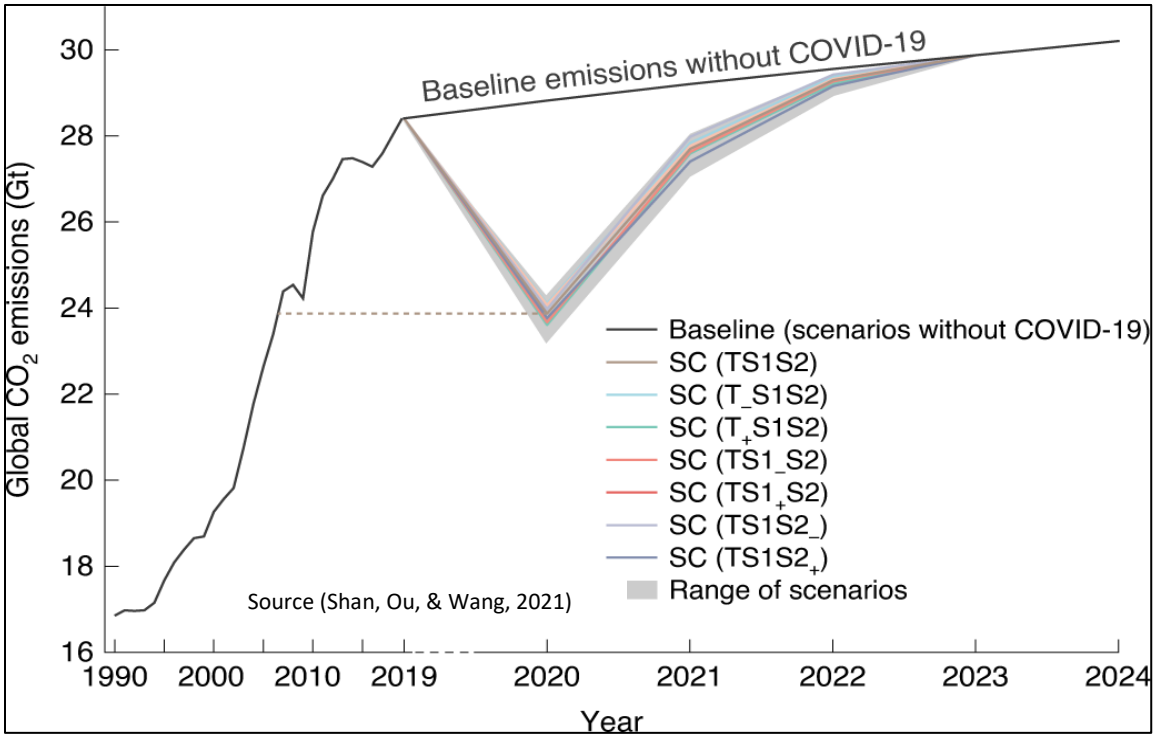


Figure 15 – Emissions trajectories post-COVID-19 modelled for 79 countries

Undoubtedly, the drop in movement and economic activity reduced energy use, pollution and led to improvements in air quality. In power markets, the reduced electricity demand primarily affected fossil fuel generation, while the shares of renewable energy soared. However, these changes were transient – as a direct result of the lockdown and restrictions - and unless long-term behavioural and technological shifts are embedded, most likely a swift return to business as usual will ensure, as can be seen across the region already. For example, while global energy demand dropped by 4 per cent in 2020, it was estimated to increase by 4.6 per cent in 2021, leaving global consumption 0.5 per cent above the 2019 level (IEA, 2021). The pandemic has caused a global downturn and emissions will drop in line with reduced economic output. The real test is if the pandemic accelerates the decoupling of GDP and emissions, a process that has been underway for some time.[14] Making a definitive judgement on this is premature, as it will take more time for emissions data to be published for 2021 and 2022, the years in which any post COVID-19 structural changes will be more evident.

[14] In 2016 the IEA announced it had observed CO_2 emissions remaining flat over the previous two years despite rising GDP - https://www.iea.org/news/decoupling-of-global-emissions-and-economic-growth-confirmed

The COVID-19 experience has led many analysts to pose the question - how the positive changes made to modes of living and working through COVID-19 can be sustained to realize sustainable energy benefits? Answering this question is complex. Much hinges on cultural adaptability, the availability of infrastructure and the willingness of governments to embed these changes through enabling policies. Table 4 sets out some of these changes, their impacts and the supportive environment needed to enable it.

COVID-19 Induced Change	Sectors Impacted	Enabling Factors	Opportunity for Long-Term Adoption
Positive changes			
Work from home & virtual meetings	Reduced road and air transport demand. Reduced commercial building energy use.	ICT connectivity; cultural shifts.	Strong
Digitization and dematerialization	Reduced demand for materials.	ICT connectivity, cloud computing.	Strong
E-commerce	Reduced private transport demand.	ICT connectivity, smartphones.	Strong
Active mobility – walking and cycling in cities	Reduced demand for car transport.	Provision of walking and cycling infrastructure.	Medium
Reduced discretionary air travel[15]	Reduced demand for air transport.	Cultural shifts.	Low
Negative changes			
Increased use of single use PPE, plastic and packaging	Increased production energy costs.	COVID-19 mitigation.	Medium
Reduced public transport patronage	Increased use of less sustainable modes of transport.	COVID-19 mitigation.	Medium

Table 4 – Impacts of COVID-19 induced changes on sustainable energy

It may be that the biggest impact of COVID-19 on sustainable energy is the green stimulus itself. Maximizing the opportunity for long term adoption of the beneficial measures for sustainable energy depends heavily on supportive government policy. For example, incentives can be provided to industry to encourage hybrid modes of work. Encouraging more use of the active transport modes that cities embraced during the pandemic, supported by provision of walking and cycling infrastructure is another example. The tourism sectors in many

[15] For example, replacing international holidays with domestic holidays. The reduction in discretionary air travel such as holidays may result in lower economic output. This could be partly recovered by increased local spending by domestic tourists. The net spending diversion could be from air travel, leading to less energy use per dollar spent.

countries can be reconfigured to rely more on domestic than international tourists as a return to pre-pandemic levels of leisure travel may still be some way off.

5. Qualitative Survey of Asia-Pacific Policymakers and Think Tanks

As part of the research methodology, a series of semi-structured interviews were held with seven leading experts from think tanks, international organizations and with policymakers from across the region. A seminar was held with students and staff of the Graduate Institute for Public Policy of the University of Tokyo on 17 May 2022 to discuss the preliminary research findings. A further seminar was held on 19 August 2022 in collaboration with the University of Tokyo to enable a focused discussion among experts from the Asia-Pacific on the preliminary research findings. The research questions and the experts consulted are provided at Annex 3.

The results of the interviews and the seminar are summarized below in narrative form.

The Role of Sustainable Energy in the COVID-19 Recovery in the Asia-Pacific

Experts were in unanimous agreement that across the region, the recovery process missed opportunities to focus more on green recovery. At the time this report is published, over two years into the crisis, investments are starting to level off and the major task is to ensure implementation of projects under the funding programs. The different phases of the pandemic impact were highlighted as 1) shock, 2) socioeconomic fallout, and 3) a gradual recovery.

Experts noted multiple country examples of where the level of stimulus toward low carbon and sustainable energy infrastructure was not as great as that invested in carbon intensive infrastructure and projects. Some governments had established task forces to guide the recovery, but in the case of one country this was dominated by fossil fuel interests. Balancing this viewpoint, one expert contrasted the COVID-19 experience with the GFC, pointing to a much stronger role for renewable energy with decreasing prices. Many experts highlighted the European Union as a best practice policy example of stimulus for sustainable energy and in the Asia-Pacific region, the case of Viet Nam was cited as exemplary, building off its recent expansion of renewable energy capacity.

The diversity of countries in the region was highlighted by one expert, pointing to the effect of large countries being able to skew the regional picture. However, the role of regional cooperation was also highlighted, given the opportunities for regional approaches to carbon markets, innovation development, pooling of experiences and capacity building.

There were many innovative investments made as part of the stimulus, notably energy efficiency, a sector highlighted by many experts interviewed. While R&D was not a significant part of recovery efforts, one country had a program as part of its recovery to support universities by placing energy postgraduate students in industry that was extremely productive, by providing energy expertise to large energy consuming companies.

Structural barriers to investing in renewable energy-based recovery were mentioned by several experts, including the challenge of connecting to the grid. Labour shortages were also cited by one expert as a barrier to deploying rooftop solar projects.

One expert highlighted the link between the green stimulus and the net zero target by mid-century that several countries have set in place and other voluntary commitments by companies to have zero carbon supply chains by 2030. Also, the need to tackle hard to abate sectors - such as steel, cement and fertilizer – through government investment was highlighted by several experts. This was not evident in the Asia-Pacific's recovery spending. Without action on these long-term strategic areas through investment and market development, it will be difficult to reach climate goals. The link to green hydrogen and ammonia to creating green steel and fertilizer was mentioned, reinforcing the value of developing these technologies.

Challenges of Mounting a Sustainable Energy-led Recovery in Developing Countries

Experts made a series of interesting points about the challenges experienced by developing countries. Generally, it has been a difficult period for developing countries since COVID-19 emerged. One expert described it as "three years of firefighting" for the government of his country. Another expert presented the green recovery challenge as threshold issue. If developing countries can't mobilize funds for economic recovery in the first place, it becomes a moot point whether they have the tools and skills to optimize the channels and destinations for stimulus funding into sustainable energy. One expert pointed to a country in the region which is spending 30 per cent of its budget just to service its debt. With the pandemic driving currency devaluation this level is set to rise. After accounting for defence spending this left only 10 per cent for public investment. For countries like this, they are a long way from being able to mount a stimulus or economic recovery spending program. The emerging and developing economies are spending ten times less per capita on recovery than the OECD countries. There is a need for greater support for these countries, not just for finance but capacity building.

On the issue of widening fiscal space, the recommendations made by the international community on tax reform are well known and understood by policymakers in developing countries. They are aware of "low hanging fruits" in closing tax loops but these also come with political considerations. Hence, implementing them is extremely challenging given the vested interests and political economy issues they face.

Support for energy bills through bill credits or energy efficiency measures should be targeted to less well-off segments of society. However, many developing countries lack the information management systems to be able to offer this targeted support.

Even if fiscal space could be created, some experts point to issues of private sector capacity limitations, absence of standards and regulations for energy equipment and management issues within energy utilities as barriers to launching these types of measures. These would need to be addressed over the longer term through policy support, technology transfer and South-South cooperation.

While the key reports and recommendations of international agencies on green recovery are well known in developing countries, not so well know are many of the studies developed within developing countries using local experts. Many of these studies are better attuned to the local context and issues.

Investments, inclusion energy investments in developing counties can be skewed to regions with high population densities driven by the "vote bank" in these regions. While not specifically inferred by experts, this could dissuade investment in clean cooking and rural electrification in more remote regions with fewer voters. A further point made by one expert interviewed is the need for developing countries to invest in renewable and decentralized energy technologies and avoid adopting the high carbon centralized model followed by established economies.

South-South cooperation was viewed as an important means of supporting the recovery, including sustainable energy development. Sharing experiences between countries of the South can help understanding of approaches to climate change, natural disasters and law and order. Capacity development of policymakers and technical staff in developing countries is needed.

A further point made was on how developed countries could use Overseas Development Assistance to sustainable energy projects to support COVID-19 recovery to win political influence in strategically important parts of the Asia-Pacific region.

Impact of the Pandemic on the Phase-out of Coal

A key issue that was identified during the research is what is the overall impact of the pandemic on the phase out of coal? Experts tended to agree that the ongoing recovery has seen energy demand bounce back and coal-fired power plants return to operating normally. Many countries that are large coal consumers such as China and India are back to business-as-usual settings. The changes underway to the coal sector were a continuation of the trends that emerged before COVID-19 rather than any impact brought about by the pandemic. This is in contrast to some of the early reaction to the slowdown in coal use in 2020, which was driven by lockdowns and travel restrictions. At this time predictions were made that coal was set for a longer-term decline because of the economic impact of the pandemic.

Investing in Hydrogen

The issue of hydrogen infrastructure investment is an interesting topic given the relative scarcity of funds directed to this sector in the Asia-Pacific compared to Europe and the United States. Experts pointed to hydrogen technology as a key part of the energy transition and an energy carrier that will enable more renewable energy usage. Its impacts on jobs and the economy can be a multiplier as hydrogen projects will have the effect of pulling forward many wind and solar installations. Unfortunately, investment in hydrogen as part of pandemic recovery was very limited in the Asia-Pacific region when compared to Europe and the United States.

Locking in Positive Changes brought about by COVID-19

The experts interviewed noted the rise of many changes wrought by COVID-19 including the work from home shift. Experts noted that the benefits of this are contested as reduced travel emissions are possibly offset by increased energy consumption in large homes with single occupants and for electricity networks, it brings the challenges of managing new peak loads in residential areas during working hours. Experts from different countries expressed doubts about whether the energy savings attributed to working from home were achieved in reality and noted the need for nationally specific data on this to support decision making.

An interesting point made by one expert about the pandemic was to highlight the role of science and technology in evidence-based decision making. The complexity of the COVID-19 public health response exposed some gaps in the science-policy interface that meant less than perfect decisions were made on managing the virus. This has echoes in the fight against climate change and the transition to sustainable energy where decisions can be made without due reference to the science. It serves as a reminder to make science a more central element in decision making.

6. Framing Optimal Stimulus Plans for Sustainable Energy-led Recovery

6.1. Background

The analysis thus far in the report has highlighted the progress of countries across the Asia-Pacific, in mounting an economic response to COVID-19 that advances SDG 7. It has highlighted the challenges of creating fiscal space for stimulus and of directing stimulus in a way that optimizes short term recovery as well as long term sustainability. The enormous diversity of countries across the Asia-Pacific region means that providing standardized recommendations is not possible. However, by contextualizing the challenge for different types of countries, it can be possible to outline analytical approaches that can help craft stimulus investment plans that balance multiple objectives – economic recovery, job creation and long-term structural transformation towards sustainability and low carbon economies.

By drawing comparisons with the 2008 GFC, the IEA has proposed a five-step guidance to countries in developing a clean energy stimulus which is useful in considering clean energy stimulus design (IEA, 2020). This is summarized in Box 3. This reinforces some key messages already outlined in this report. A pre-existing supportive policy environment for clean energy is needed to be able to rapidly deploy stimulus in this area. If this environment exists, many of the clean energy technologies are poised for rapid growth owing to their declining costs and technological maturity. In addition to well established solar and wind, emerging technologies such as batteries are well positioned for strong growth. The leverage offered by stimulus to make contribution the bigger picture should be capitalized upon, such as enhancing energy security and cross-SDG benefits. Untested technologies such as CCS, or projects with long gestation periods should be avoided. While noting the very useful insights, however this analysis is more focused on the settings in OECD countries rather than developing countries, particularly low-income developing countries. The latter category of countries generally has narrower fiscal space, and they may lack an established industrial base and workforce for clean energy. The following section suggests some adaptions to the approach taken to account for these differing circumstances.

Lessons from the 2008 financial crisis for stimulus packages today

1. *Build on what you already have – and think big*

Given the size of today's economic shock, the clean energy investment push will need to be done on a major scale. Policies that have an existing legal and institutional structure are the easiest to scale up.

2. *Choose technologies that are ready for the big time*

Today, wind and solar are cost-competitive in large parts of the global energy system in their own right, but their continued growth still needs supportive policy frameworks, especially in the case of offshore wind, which is now ready for massive investment. Accelerating wind and solar PV can be pillars of post-pandemic stimulus efforts, making a vital contribution to efforts to accelerate clean energy transitions. Meanwhile, two important emerging technologies for clean energy progress – lithium-ion batteries and hydrogen electrolysers – are at the stage in their development where wind and solar were in 2008-2009. They have the potential to be the coming decade's breakout technologies.

3. *Be wary of large, highly complex projects*

The lessons from these past experiences are being integrated into some of the approaches to scaling up technologies today. For example, support for carbon capture, utilisation and storage needs to focus on the infrastructure required for transporting CO2 and on high-density sources such as the petrochemical industry, whose activity – and emissions – have not been hit hard by the current crisis…. One way forward is for policymakers to focus on projects that are relatively simple to implement but where access to financing is constrained. Energy efficiency projects in the residential and municipal sectors are a good example. A high number of standardised, small efficiency projects – such as retrofitting municipal buildings and replacing electric engines used by small businesses – are less likely to get bogged down than a single large and complex development.

4. *Make sure your industrial policy plays to your strengths*

The competitive global market for such equipment played a major role in driving down the costs of clean energy technologies, with some clusters benefitting significantly from comparative advantages and technology spillovers. But these intertwined manufacturing hubs didn't always emerge as policy makers intended. In Europe, for example, very similar deployment policies for wind and solar PV led to the rise of a competitive, export-orientated wind energy cluster, particularly in offshore wind – but not of a solar panel equivalent. Wind turbines are based on mechanical engineering in which European countries, especially Germany, have a comparative advantage. But solar panels are an extension of semiconductor electronics, an area where China already had a competitive edge.

5. *Consider the bigger picture*

By distributing funds on a project-specific basis following the 2008 crisis, policy makers triggered an intense competition for resources that required a delicate balancing of regional interests. The interpretation of those regional interests was often too narrow and focused only on the geographical location. This neglects the broad benefits of energy infrastructure development for energy security and the achievement of wider sustainability objectives – and the economic benefits of investment. Also, if an industry needs bailouts, this gives governments the opportunity to attach conditions linked to its broader policy objectives.

(source: commentary by Dr Fatih Birol, Executive Director IEA, (IEA, 2020))

Box 3 – IEA guidance on designing stimulus packages

6.2. A Candidate Framework for Sustainable Energy Stimulus Planning

The policy formulation process to develop stimulus plans is undoubtedly complex. It must address the crisis at hand created by COVID-19 with its nuanced effects on different sectors of the economy and on different types of workers. This process must navigate the complexity of narrow fiscal space, while balancing short-term and long-tern objectives which requires the immediate needs of health and social protection to be accorded priority over economic recovery. Lastly it needs to consider the over-riding objective to align expenditure with sustainable development, and within the frame of this study, with sustainable energy development.

As this process evolves it is hampered by several issues. The emergency nature of the crisis and the unpreparedness of many countries in planning for this can compress decision making timeframes. Low income developing countries may be facing a bleak fiscal outlook, as revenues shrink, and costs associated with managing the pandemic balloon. The incumbent industry structures present in many countries and the voices of vested interests can sway decision making towards investment towards carbon intensive sectors of the economy that frustrate sustainable development objectives. These factors mean that an idealized policy development process that yields an optimum mix of policies may never be realized. Given these challenges, it is useful to set out the steps that an idealized process would follow.

Foundational Step: *Create the enabling environment*

An effective program of stimulus that can help to recover the economy while promoting sustainable development is predicated on the presence of a supportive enabling environment. This refers to the existing policy and regulatory framework - national strategies for economic and social development, energy development and greenhouse gas emission reductions, in line with the framework provided by Agenda 2030. For the sustainable energy sector, these supportive elements include factors such as technical standards and grid access for renewable energy equipment, minimum energy performance standards for buildings and appliances, and addressing impediments to sustainable energy such as fossil fuel subsidies. It is rare in any country that all the supportive elements are in place, nor can they be constituted rapidly in the face of the shock posed by COVID-19. Rather, the creation of the enabling environment requires longer term efforts that must continue in parallel with, and beyond the COVID-19 crisis. Among these are the creation of a circular economy, pricing carbon, the phase out of coal and

providing transition support to emissions intensive industries, including to workers and communities affected by the transition.

Step 1: ***Widen the fiscal space to enable mobilization of stimulus***

This step is particularly important for low income developing countries. The recommendations made by ESCAP in its 2022 *Economic and Social Survey of Asia and the Pacific* are central to this (ESCAP, 2022). This report advocates the approach of "spending smart and taxing fairly" to target priority investments and increase tax collection efficiency. Many countries can free up resources by redirecting inefficient subsidies such as fossil fuel subsidies, which amounted to $129 billion across the region in 2020 (IISD, OECD, 2022). This is particularly important for countries such as China, Indonesia, Malaysia, Thailand and Viet Nam. Phasing out fossil fuels must be accompanied by measures to balance their effects by supporting low-income households,[16] ideally though clean energy support.

Step 2: ***Analyze and Target Priority Sectors for Recovery***

The pandemic's impacts on the economy need to be carefully analyzed in each country to understand their impacts on different income groups (low-income households) types of workers (particularly informal workers), sector-specific impacts and any specific geographic distribution of impacts. In this manner, priority groups or sectors could be identified which could be linked to specific clean energy initiatives. Importantly there may be gender specific impacts that could be identified where women have been disproportionately impacted by the pandemic which could be redressed by specific investments.

Step 3: ***Analysis of Gaps in SDG 7 Progress and Decarbonization Targets***

Chapter 3 provided an analysis of countries in the region and categorized them according to SDG 7 progress. Each country, across the different SDG 7 targets (renewables, energy efficacy and energy access) will have specific and persistent gaps in progress. It is important to assess stimulus policies against these gaps. Under the Paris Agreement, each country has its Nationally Determined Contribution (NDC), setting out emissions reduction targets in support of the Paris Agreement. Similarly, the contribution of each candidate policy to the NDC needs to be assessed for its role in meeting these requirements.

[16] In many cases subsidies aim to support low-income households but have a tendency to be regressive, supporting the better-off segments of society than consume more.

Step 4: ***Estimation of Fiscal and Job Multipliers for Candidate Stimulus Investments***

Each proposed stimulus investment offers fiscal multipliers, that are specific to the investment category and the country. Chapter 3 outlined the basis for these multipliers and highlighted the advantages of clean energy investment over carbon intensive investment in terms of economic upliftment and job creation. Given the variability of these multipliers across different country settings,[17] it may be useful to undertake country specific modelling to better quantify these. For example, the local component of job creation needs to be distinguished from the international component to understand better the job creation potential within each country.

Step 5: ***Identify and Assess Ancillary Benefits***

Chapter 4 detailed the opportunities to leverage other benefits from clean energy stimulus. These include, but are not limited to, energy security and progress across many of the other SDGs - through effects such as poverty reduction, addressing inequality, air pollution mitigation and promoting the circular economy. These benefits require quantification and inclusion in the decision-making framework.

Step 6: ***Multi-Criteria Optimization of Stimulus Investments***

Given the preceding steps outlined, this candidate framework for clean energy stimulus planning would involve a multi-criteria optimization. There are many criteria that are proposed to develop a priority list, and the relative weighting associated with each criterion is a matter for debate. For example, should economic uplift rather than job creation be the primary consideration? Should energy efficiency be a focus rather than renewables? Here the choice of channels for the stimulus such as grants, concessional, or conditional loans also needs to be decided upon. Ultimately the weighing applied to different criteria is best arrived at by multi-stakeholder consultation within each country. This process is summarized in Figure 16.

[17] As noted in Chapter 3, the lack of clean energy industrial structure and enabling environment can cause these multipliers to be lower in some countries. Conversely improving the enabling environment can boost the multipliers and ensure stimulus is more effective in reaching its goals.

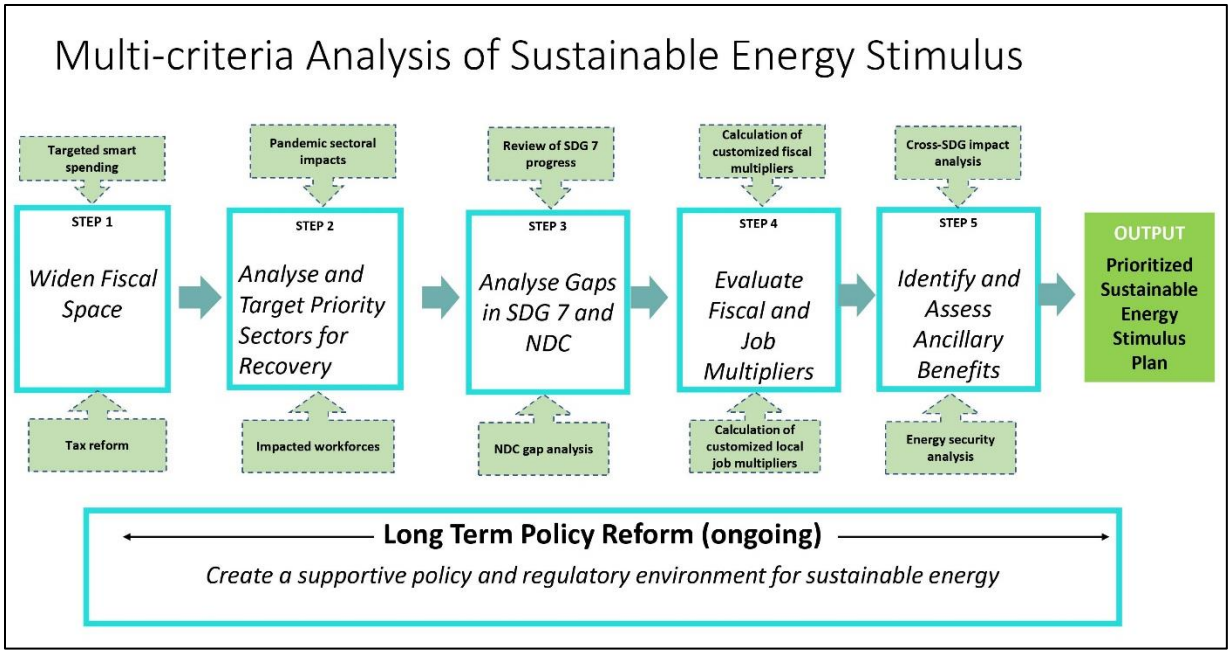


Figure 16 – Multi-criteria analysis framework for sustainable energy stimulus plan (adapted from Dr. Anis Zaman - ESCAP's NEXSTEP analysis framework)

7. Conclusions and Recommendations

The experience of the Asia-Pacific region to date in managing the complex and multi-faceted challenge of COVID-19 provides scope for many lessons to be learned. This report has documented how the region collectively turned its focus to sustainable energy stimulus after an initial fossil fuel dominated recovery. However, many countries have overinvested in fossil fuels as part of the recovery and missed opportunities to recover better.

Expert views collected as part of this research, both through semi-structured interviews and the seminar, provided many interesting insights into this challenge. Looking at the region's response to date, experts were in agreement that much more could have been done on the clean energy component of the stimulus, despite an improvement in the response recorded during the GFC a decade ago. Expert perspectives from developing countries indicated the difficulty of widening fiscal space and creating readiness for domestic clean energy sectors to realized projects. The relative absence of hydrogen from Asia-Pacific stimulus plans was commented upon as a gap in the region's response. The relationship between coal phase out and the pandemic response was explored. The experts' common conclusion was that COVID-19, after the initial dip in energy use, did little to dent the prospects of coal in the region. However, many of the pre-existing trends to reduce coal financing and development pipelines that were evident in the region pre-COVID-19 have continued.

In framing the conclusions and recommendations of this report, there are two key purposes. The *first* is to respond to the short- to medium-term need to support Asia-Pacific countries in the ongoing recovery from the current COVID-19 crisis, in tandem with a sustainable energy transition. This recognizes that the crisis is not yet over and much more remains to be done to recover economies and livelihoods. COVID-19 is "long tail" event, where the impacts persist several years after the emergence of the virus. While much has been done already in terms of stimulus, more support needs to be mobilized for countries to continue the recovery process.

The *second* purpose is to address the longer-term future preparation, by sharing insights on how countries in the region can take the lessons of the COVID-19 crisis and use them to increase readiness for the next pandemic or similar crisis. This implies a long-term positioning to enhance the resilience of economies and societies, and to prepare a more supportive enabling environment for the application of sustainable energy-based stimulus that results in economic growth and job creation.

The complexity and diversity of the Asia-Pacific region means that overly simple policy prescriptions will not add significant value. There are 53 Asia-Pacific member States in the region covered by ESCAP. These range from the largest and most industrialized countries in the world to tiny Pacific Island states. Each of these countries must tread a different path in its COVID-19 recovery based on its intrinsic strengths, resource allocation and development status. However, there are principles that can be elaborated, that can be contextualized for each country's circumstances to support the decision-making process.

The analysis in this report has drawn together multiple lines of evidence on the opportunities for countries to launch green stimulus plans that fulfil the dual requirements of economic recovery and SDG 7 achievement. This has examined the state of play with regard to existing stimulus measures; the theory underpinning economic stimulus; the conditions required for sustainable energy stimulus to work; and the region's progress on SDG 7. At a very fundamental level, the analysis finds that these two agendas are not only compatible, but mutually reinforcing. However, there are a series of core challenges to contend with in realizing this vison. One is that mobilizing a green stimulus requires fiscal space. Given the astronomical costs of healthcare and social protection wrought by the pandemic, many of the developing countries in the region do not have the luxury of launching any kind of stimulus, green or otherwise. Key opportunities lie in mobilizing private sector capital.

Another challenge is that the sustainable energy sector in each country must be in a state of readiness for stimulus to be applied. This requires a long-term policy agenda to put in place supportive policy frameworks, regulations and incentives, train skilled workforce, rationalize fossil fuel subsidies and ideally, establish a price on carbon. Without these measures in place, stimulus will not realize its full potential. The following recommendations are presented, categorized as "long-term" and "short to medium term" actions.

Long-Term Recommendations

The effectiveness of Asia-Pacific countries' response to the COVID-19 crisis hinged on how well they prepared in the years leading up to the outbreak, i.e., the effectiveness of their long-term efforts to strengthen health systems and social protection measures which acted to cushion the impact of the pandemic. Now in the recovery phase, the extent to which each country has developed its fiscal space and set in place a supportive policy environment for clean energy will determine the effectiveness of clean energy stimulus. Accordingly, an indispensable element of the response to the current crisis for countries will be to cast an eye on the long-term horizon to consider how the next crisis can be managed. As well as ensuring the success of the recovery over the longer term and it is incumbent on all countries to prepare themselves to handle the next crisis much better than the current one. The following recommendations are offered:

l) To realize the full potential of sustainable energy-based stimulus, an **enabling environment for sustainable energy** needs to be set in place over the long term to maximize fiscal multipliers and local job creation potential. These include supportive policies for renewables, energy efficiency and energy access; rationalizing fossil fuel subsidies and introducing carbon pricing. Capacity development support needs to be extended to developing countries to better enable them to develop their sustainable energy sectors and to prioritize stimulus spending. These reforms, if undertaken in countries which have relied on carbon intensive sectors for their economic recovery, will offer them increased opportunities for the use of sustainable energy stimulus in future crises. Accompanying these measures should be the phase down of coal in countries that have coal-fired generation in line with the Glasgow Climate Pact of 2021. This needs to be part of a wider framework of industry development that extends over the longer term to help enhance preparedness for sustainable energy stimulus in order to recover better from future crises.

m) Decision making on stimulus needs to factor in **multiple considerations – fiscal and job impacts, SDG achievement, impacts on gender and inequality, energy security and realizing the just transition**. More research is needed to evaluate sector-specific and country specific fiscal and job multipliers to inform policymakers on investment choices and channels.

In particular, there is a need to better understand multipliers of different energy subsectors notably energy efficiency; and to identify the local components of job creation multipliers to be able to better optimize stimulus plans.

n) The impacts on gender and inequality of investments requires better data and analytical approaches so that complementary policies can be instituted to advance gender equality and reduce other inequalities in society through sustainable energy development.

o) **Regional cooperation** can help to prepare a supporting environment for clean energy pathways and therefore enhance the alignment of recovery efforts with sustainable energy development. These include the development of regional carbon markets and regional innovation systems, as well as capacity building and sharing of experiences. Existing intergovernmental platforms such as ESCAP can be utilized for this purpose.

p) Countries should undertake an ***ex post facto*** **review of their COVID-19 recovery packages** to measure their effectiveness and efficiency and draw lessons for future crises. In particular, the extent to which stimulus packages have succeeded in stimulating sustainable energy development should be examined and any gaps highlighted.

Short and Medium-Term Recommendations

The following recommendations are offered to address pressing short- and medium-term issues.

a) **Prioritize sustainable energy stimulus**. For the current crisis, remaining stimulus measures earmarked for the energy and infrastructure should be directed at sustainable energy technologies and related infrastructure. Subject to caveats, all SDG 7 dimensions (renewable energy, energy efficiency and energy access) score higher fiscal job creation multipliers relative to fossil fuel investments. Where job creation is a priority, solar PV, building energy efficiency and grids are the most prospective sectors. Overall, sustainable energy projects are more likely to be implemented rapidly relative to fossil fuel-based investments. While each country needs to determine its priorities across SDG 7 targets, clean cooking and rural electrification need more

support given the limited investment to date and risk on these targets being missed. The decision-making framework presented in Chapter 6 can support this prioritization process.

b) **Stimulus for carbon intensive sectors should be avoided** wherever possible, given their lower job creation and fiscal multipliers. These investments will slow down the transition to sustainable energy and put the SDG 7 targets further out of reach.

c) Transfers to households to support energy bills should be reframed where possible as **energy efficiency support**, to offer more durable solutions to reduce energy costs and reduce emissions. These policies need to take account of the barriers presented by the share of rented properties in the market and develop solutions to engage property owners.

d) Given the limited funds available, efforts should be made to **leverage private funds in sustainable energy stimulus**. Private sector funds, technologies and implementation expertise are needed to maximize the impact of funds invested in recovery.

e) **Grid investments** can help create long term infrastructure that support renewable energy and energy efficiency while delivering on economic stimulus and job creation. Grid investments that link renewable energy projects to markets, including cross-border grid connections or that increase grid efficiency should be allocated priority.

f) Investing in **hydrogen technologies and infrastructure** can support the long term decarbonization efforts and bring forward renewable energy projects that provide the energy source for green hydrogen.

g) Bailouts to carbon intensive companies can be used to **leverage adoption of low carbon technologies and business models**. For example, airline bailouts should be linked to increased sustainability performance. In the Asia-Pacific region, funds provided to car companies should be linked to commitments to increase environmental performance of vehicles, including commitments to manufacture electric vehicles.

Annex 1 – Literature Review

As a background to preparing the report, the following literature sources were reviewed in detail to develop a picture of the analytical work undertaken on the green recovery from COVID-19

1. **UNDESA and UNFCCC**. *Consultations on Climate and SDG Synergies for a Better and Stronger Recovery from the Covid-19 Pandemic (2020)*. The study is a summary of a series on consultations undertaken in 2020 on the need for coordinated plans and economic stimulus investments designed to meet multiple goals. This yielded the following key messages:

    a. Climate and SDG synergies are key to a better and stronger recovery.
    b. With innovative, integrated and far-sighted approaches countries can maximize climate and SDG co-benefits in their recovery strategies.
    c. The pandemic brings new demand and opportunities for, financing, partnerships and technology to drive synergies.
    d. Countries should take advantage of potential synergies to intensify their sustainable development and climate action efforts.
    e. Upcoming UN and other intergovernmental forums should be leveraged to advance climate and SDG synergies.

    (UNDESA, UNFCCC, 2021)

    https://sdgs.un.org/sites/default/files/2021-07/Consultations%20on%20Climate%20and%20SDG%20Synergies%20for%20a%20Better%20and%20Stronger%20Recovery%20from%20the%20Covid-19%20Pandemic.pdf

2. **Quitzow, R. et al**, *The COVID-19 crisis deepens the gulf between leaders and laggards in the global energy transition, Energy Research & Social Science* (2021). This review of the global energy sector reveals that "the COVID-19 crisis is deepening the gulf between the leaders and laggards of a global energy transition". It notes how the crisis, and its policy responses reinforce the pre-pandemic trends of deployment of renewables, and that divestment in the coal sector are accelerating with most strongly observed effects in the EU. However, in the developing countries, COVID-19 is exacerbating the financing challenges and that countries with strong lock-ins to fossil fuel industries are seeing stimulus directed towards propping up those sectors, which is further slowing down the transition to clean energy citing Indonesia as a case in point. (Quitzow, et al., 2021)

   https://www.sciencedirect.com/science/article/pii/S2214629621000748

3. **The World Economic Forum**. *How renewable energy can drive a post-COVID recovery* (2020) (blog by Sumant Sinha, Chairman and Managing Director, ReNew Power)
   This blog post outlines the opportunities for a renewable energy led recovery from the pandemic, noting that "each million dollars invested in renewables or energy flexibility could create at least 25 jobs, while each million invested in efficiency would create about 10 jobs".
   https://www.weforum.org/agenda/2020/09/renewable-energy-drive-post-covid-recovery/

4. **IRENA**. *Post-COVID recovery: An agenda for resilience, development and equality* (2020). This analysis highlights the link between post-COVID-19 recovery and the energy transition, noting the need to invest in renewable energy and energy efficiency in the recovery process citing the higher job creation multipliers. It positions a renewables-led recovery from COVID-19 as an opportunity to create a decisive shift in the global energy mix. (IRENA, 2020)

   https://www.irena.org/publications/2020/Jun/Post-COVID-Recovery

5. **International Institute for Sustainable Development**. *Achieving a Fossil-Free Recovery* (2021). This report notes the role of energy stimulus in the recovery process and the over-representation of fossil fuel-intensive sectors over clean energy sectors. It acknowledges the overarching priority for health and social protection, followed by getting economies back on track in a manner consistent with the SDGs and net-zero commitments. (International Institute for Sustainable Development , 2021)

   https://www.iisd.org/system/files/2021-05/achieving-fossil-free-recovery.pdf

6. **Alam et al.** *Covid-19 recovery: How the G20 can accelerate sustainable energy transitions in the power sector by supporting the private sector* (2020). This policy brief was prepared for the 2020 G20 Presidency and outlined the following 4 key recommendations for achieving sustainable energy transitions in the power sector across G20 economies (1) coordinating on sustainable recovery measures in the G20, (2) expanding renewable energy generation, (3) accurately reflecting environmental externalities and ensuring just transitions in the fossil-fuel sector, and (4) promoting efficient electricity consumption and faster electrification. It proposes a framework for recovery along the following 4 axes - 1) Coordinate the response; 2) Grow the Green; 3) Transition the brown; and 4) Transform the rest. (Alam, et al., 2020)
https://www.g20-insights.org/policy_briefs/covid-19-recovery-how-the-g20-can-accelerate-sustainable-energy-transitions-in-the-power-sector-by-supporting-the-private-sector/

7. **OECD**. *Focus on Green Recovery* (2022). The OECD has a dedicated web page on the green recovery and tracks spending by category focusing on OECD countries. It maintains the OECD Green Recovery Database. This "focuses on measures related to COVID-19 economic recovery efforts with clear positive, negative or "mixed" environmental impacts across one or several environmental dimensions." It covers 44 countries and the European Union. It highlights three key messages:

    a. "**For one thing, we need to walk the talk.** Green recovery measures are still a small component of total COVID-19 spending (only 21% of recovery spending, or only around 4% of the USD 17 trillion rescue and recovery spending combined). Significant funds are still allocated to measures with likely environmentally negative and mixed impacts.

    b. **For another, we need to align across policies and sectors, and over time.** The uneven spread of measures across sectors points to missed opportunities in this respect, which could help drive sustainability and transformation in key sectors, such as agriculture, waste management and forestry.

    c. **Finally, we need to invest more in skills and innovation**. Relatively few recovery measures focus on skills training and on innovation in green technologies. This also represents a missed opportunity, as more attention to measures that can drive green job creation, notably to compensate for job losses in other industries, can help to ensure a "just transition"." (OECD, 2022)

https://www.oecd.org/coronavirus/en/themes/green-recovery

8. **IEA**. *Sustainable Recovery – World Energy Outlook Special Report* (2020). The IEA devoted considerable analysis to sustainable recovery and canvasses promising energy related investment for countries to consider as part of the recovery. These have been quantified in terms of their impact on greenhouse gas emissions and job creation as well as resilience and energy security. A summary of these is provided below. The fallout from the COVID-19 pandemic means that there is an urgent need for significant levels of investment in the energy sector to sustain and boost employment, boost economic growth, and improve future sustainability and resilience. Investment decisions made now will impact the ways in which energy is produced and consumed for decades, and they therefore need to be aligned with long-term national and global objectives. (IEA, 2020)

Electricity	Expand and modernize grids Accelerate the growth of wind and solar PV Maintain the role of hydro and nuclear power Manage gas- and coal-fired power generation
Transport	New vehicles Expand high-speed rail networks Improve urban infrastructure
Buildings	Retrofit existing buildings and more efficient new constructions More efficient and connected household appliances Improve access to clean cooking
Industry	Improve energy efficiency and increase electrification Expand waste and material recycling
Fuels	Reduce methane emissions from oil and gas operations Reform fossil fuel subsidies Support and expand the use of biofuels
Strategic opportunities in technology innovation	Hydrogen technologies Batteries Small modular nuclear reactors Carbon capture, utilization and storage

https://www.iea.org/reports/sustainable-recovery/evaluation-of-possible-recovery-measures

9. **IEA**. *A Sustainable Recovery Plan for the Energy Sector* (2021). The IEA followed up its 2020 special edition on economic recovery with a detailed energy plan that is designed to support the pandemic

recovery in with the following three goals: “to maintain and create jobs, boost economic growth, and improve energy sustainability and resilience”. The plan would cost $1 trillion per year over the next 3 years, equivalent to about 0.7 per cent of global GDP. It would create 9 million new jobs in the energy sector and uplift global GDP by 3.5% after 3 years compared to the business-as-usual case. (IEA, 2021)

https://www.iea.org/reports/sustainable-recovery/a-sustainable-recovery-plan-for-the-energy-sector

10. **IEA.** *Energy efficiency and economic stimulus: IEA strategic considerations for policymakers* (2020). This study examines the role of energy efficiency programs in creating employment as part of stimulus programs. It makes the following key points:

    - **“Energy efficiency actions can support the goals of economic stimulus programmes** by supporting existing workforces and creating new jobs, boosting economic activity in key labour-intensive sectors, and delivering longer-term benefits such as increased competitiveness, reduced greenhouse gas emissions, improved energy affordability and lower bills.
    - **Governments can deliver stimulus at scale and speed** by leveraging existing programmes and standardizing designs, eligibility criteria and contracts; choosing shovel-ready options for retrofits and technology upgrades; and considering how energy efficiency can be built into all government stimulus programmes.
    - **Important market considerations** include aiming for high energy efficiency without constraining programme delivery; setting sufficiently attractive incentives to deliver high uptake without significantly increasing program costs and risks; considering the capacity of suppliers to scale up rapidly while maintaining quality and safety of products and services; and considering the consumer motivations and demand for products and services.
    - **Government can facilitate better outcomes from large-scale investment programmes** by addressing unnecessary regulatory barriers; turning short-term impacts into long-term transformations by raising energy efficiency standards; and considering the resource efficiency impacts and recycling sector opportunities as part of programme design.” (IEA, 2020) https://www.iea.org/articles/energy-efficiency-and-economic-stimulus

11. **UN Energy**. *Accelerating SDG7 in the Time of COVID-19* (2021). In preparation for the High Level Dialogue on Energy in 2021, the multi-stakeholder group UN Energy prepared a policy brief on how

to accelerate SDG 7 in the context of COVID-19. The key messages of the report highlighted the global lack of progress on SDG 7 and the need to align the investments being made in the wake of the pandemic to align with these needs. The role of sustainable energy in protecting the gain made across other SDGs following the pandemic was also stressed along with the need to increase international cooperation in response to these challenges. (United Nations, 2021) https://sustainabledevelopment.un.org/content/documents/26235UNFINALFINAL.pdf

12. **United Nations Conference on Trade and Development (UNCTAD).** *A Comparison of 2008 and 2020: Sustainable Selected investing in Agriculture and Gender Equality Stimulus Packages in Renewable Energy, Food Security and the Empowerment of Women for Structural Economic transformation (2020)*. This study explained responses to the 2008/09 financial crisis and the coronavirus pandemic, using a sample of 20 countries and the European Union to assess support for structural economic reform to achieve SDG 7, SDG 2 and SDG 5. The results of the study indicate stimulus packages in 2020 while larger are less channeled towards these key SDGs. This represents a "missed opportunity to retire an economic model that marginalizes billions of people and advances the well-being of some at the expense of the rest and the planet". (UNCTAD, 2020)
    https://unctad.org/news/unprecedented-covid-19-stimulus-packages-are-not-being-leveraged-accelerate-sdg-investment

13. **Energy Policy Tracker.org (IISD, IGES, OCI, ODI, SEI and Columbia University.)** *Track public money for energy in recovery packages* (2022). This web-based resource provides a rich database of energy related recovery measures with detailed categorizations of the policies. (Energy Policy Tracker, 2022) https://www.energypolicytracker.org/region/select-countries-in-asia-pacific/

14. **WRI, IGES**. *From COVID-19 Response to Sustainable Redesign* (2021) This working paper identifies three transition that governments must undertake in the recovery from COVID-19 – circular economy, decarbonization and decentralization. It advocates investments in all three areas in order to achieve systematic change. (WRI, IGES, 2021)

    https://platform2020redesign.org/platform_cms/wp-content/themes/platform2020redesign/assets/pdf/relateddocuments/wri-iges_working_paper_1210.pdf

15. **ESCAP**. *Beyond the Pandemic: Building Back Better from Crises in the Asia-Pacific* (2021). This report sets out analysis and recommendation for countries in the Asia-Pacific region to recover better from COVID-19 by aligning recovery plans with the SDGs and the Paris Agreement, with a view to increase the resilience of the region and its vulnerability to future pandemics. I emphasized 4 interlined areas for action - broadening social protection, investing in a sustained recovery, strengthening connectivity and supply chains; and mending a broken relationship with nature. (ESCAP, 2021).

    https://www.unescap.org/kp/2021/beyond-pandemic-building-back-better-crises-asia-and-pacific

16. **ESCAP.** *Economic and Social Survey of Asia and the Pacific 2022*: *Economic Policies for an Inclusive Recovery and Development* (2022). This report takes stock of the region as it recovers from COVID-19 and sets out a policy agenda for an inclusive recovery. Recognizing the severe fiscal crunch that many developing countries are facing, it advocates addressing this by spending smart and taxing fairly to allow "citizens of all socio-economic groups are able to improve their livelihoods, incomes, health, and education levels". (ESCAP, 2022).

    https://www.unescap.org/kp/2022/economic-and-social-survey-asia-and-pacific-2022

17. **World Resources Institute**. *Lessons learned on Green Stimulus: Case Studies from the Global Financial Crisis* (2020). This report develops analysis and recommendations on how the experiences of the GFC in 2008 can be transferred to the present COVID-19 crisis. It recommends *inter alia,* that "Governments should prioritize green investments that have strong economic and social benefits and have the potential to reduce emissions, rather than prioritize fossil fuel investments". It also notes that stimulus on its own is insufficient and that these investments need to be accompanied by "other policies and fiscal and regulatory reforms, such as phasing out fossil fuel subsidies and use, introducing carbon pricing, and setting emissions targets and standards". (WRI, 2020)

    https://files.wri.org/d8/s3fs-public/lessons-learned-on-green-stimulus-case-studies-from-the-global-financial-crisis.pdf

18. **World Bank.** *What Have We Learned about the Effectiveness of Infrastructure Investment as a Fiscal Stimulus? A Literature Review* (2021). This working paper examines a range of issues on economic

recovery but focuses on fiscal multipliers as the key determinant in the success of fiscal policies. It notes that fiscal multipliers can increase over 1 if a multi-year time horizon is used and that the prevailing economic conditions can affect the value of multipliers… "in particular the country's absorptive capacity, and the selection of high-quality shovel ready projects". It points to one important gap - the limited empirical evidence available on the magnitude of fiscal multipliers in developing countries, or for infrastructure sectors or subsectors. (World Bank, 2021)

https://openknowledge.worldbank.org/handle/10986/36347

19. **IGES.** Impacts and implications of the COVID-19 crisis and its recovery for achieving Sustainable Development Goals in Asia: A review from an SDG interlinkage perspective (2021). This analysis provides a methodology to understand how the COVID-19 crisis will affect progress of the SDGs across the Asian region. Using an SDG interlinkage analysis it examines two candidate countries as examples - Bangladesh and the Republic of Korea - to develop an integrated planning framework for managing both SDG achievement and COVID-19 recovery. (Zhou & Moinuddin, 2021)

https://www.iges.or.jp/en/pub/impact-implications-covid19-sdgs/en

Annex 2 – Calculation of SDG 7 Composite Scores

The calculation methodology presented in the report to determine the SDG 7 composite score is as follows.

Each country in the Asia-Pacific region for which full data was available (n=48) was assessed against its progress on the following SDG 7 targets:

- Renewable energy (percentage of consumed energy)
- Energy efficiency (annual percentage improvement 2010-2018)
- Access to electricity (% of population) and access to clean cooking (% of population).

These scores were then fitted to a normal distribution and the percentile value obtained for each of these scores. The SDG 7 progress score was derived from the arithmetic average of the percentiles for renewable energy, energy efficiency and energy access (average value of clean cooking and electricity access was used). The results of this analysis are provided overleaf

SDG 7 rank	Composite SDG7 Score	Country	Renewable energy (%)	Annual energy intensity improvement (2010 - 2018)	Electricity access (%)	Clean cooking access (%)	Average access	Percentile Values				
								Renewable energy	Energy Efficiency	Electricity access	Clean cooking access	Average access
1	77%	Bhutan	81	2.2%	100	79	90%	100%	91%	89%	69%	41%
2	65%	Kiribati	41	1.3%	100	10	55%	80%	73%	76%	45%	41%
3	60%	Nepal	75	0.5%	90	31	61%	97%	71%	80%	34%	13%
4	59%	Cambodia	62	1.3%	93	31	62%	95%	65%	63%	47%	17%
6	58%	Tajikistan	40	0.8%	100	82	91%	78%	56%	60%	39%	41%
5	58%	China	13	3.8%	100	64	82%	45%	89%	78%	89%	41%
7	56%	Solomon Islands	49	4.4%	70	9	40%	86%	76%	58%	91%	6%
8	53%	India	32	2.7%	98	64	81%	73%	60%	43%	84%	26%
9	52%	Marshall Islands	12	0.3%	97	65	81%	41%	93%	97%	30%	23%
11	51%	Papua New Guinea	50	2.2%	63	9	36%	89%	63%	50%	71%	0%
14	50%	Uzbekistan	2	6.1%	100	85	93%	13%	97%	91%	100%	41%
10	50%	New Zealand	31	1.5%	100	100	100%	67%	43%	34%	54%	41%
13	49%	Viet Nam	24	1.5%	99	65	82%	58%	58%	54%	58%	32%
17	48%	Kyrgyzstan	23	-1.6%	100	77	89%	54%	50%	73%	10%	41%
18	48%	Lao PDR	42	-6.4%	100	8	54%	82%	21%	71%	0%	41%
15	48%	Russian Federation	3	0.4%	100	90	95%	23%	80%	86%	32%	41%
16	48%	Thailand	24	1.4%	100	80	90%	58%	45%	45%	52%	41%
19	47%	Turkmenistan	0	5.3%	100	100	100%	0%	100%	100%	93%	41%
20	47%	Japan	7	6.1%	100	100	100%	32%	67%	23%	97%	41%
21	46%	Samoa	37	-1.3%	99	36	68%	76%	30%	34%	19%	32%
23	46%	Kazakhstan	2	2.6%	100	98	99%	13%	84%	84%	80%	41%
25	45%	Palau	0	1.6%	100	100	100%	0%	95%	95%	63%	41%

SDG 7 rank	Composite SDG7 Score	Country	Renewable energy (%)	Annual energy intensity improvement (2010 - 2018)	Electricity access (%)	Clean cooking access (%)	Average access	Percentile Values				
								Renewable energy	Energy Efficiency	Electricity access	Clean cooking access	Average access
22	45%	Pakistan	42	1.1%	74	49	62%	82%	45%	50%	41%	8%
26	45%	Sri Lanka	51	2.3%	100	31	66%	91%	2%	0%	73%	41%
27	44%	Mongolia	3	2.6%	99	52	76%	23%	78%	80%	82%	32%
24	44%	Rep. of Korea	3	1.1%	100	100	100%	23%	69%	67%	43%	41%
29	44%	Nauru	1	5.8%	100	100	100%	4%	86%	63%	95%	41%
28	43%	Australia	10	2.3%	100	100	100%	34%	54%	39%	76%	41%
30	42%	Georgia	28	-0.9%	100	88	94%	63%	23%	30%	21%	41%
32	42%	Iran	1	-0.9%	100	96	98%	4%	80%	93%	23%	41%
31	42%	Myanmar	60	0.0%	68	30	49%	93%	28%	28%	28%	4%
34	41%	Indonesia	21	-1.5%	99	82	91%	50%	41%	54%	17%	32%
33	41%	Malaysia	5	1.7%	100	92	96%	30%	52%	45%	65%	41%
35	38%	Armenia	11	1.5%	100	98	99%	39%	34%	23%	56%	41%
37	37%	Fiji	28	1.3%	100	50	75%	63%	8%	6%	50%	41%
36	37%	Tuvalu	10	2.9%	100	69	85%	34%	36%	19%	86%	41%
38	32%	Bangladesh	31	2.0%	92	23	58%	67%	15%	8%	67%	15%
39	32%	Turkey	12	1.6%	100	95	98%	41%	15%	10%	60%	41%
40	32%	Vanuatu	31	-0.9%	65	8	37%	67%	26%	30%	26%	2%
41	30%	Philippines	23	0.8%	96	47	72%	54%	15%	15%	36%	21%
42	28%	Azerbaijan	2	-1.6%	100	97	99%	13%	30%	39%	13%	41%
43	27%	Afghanistan	21	2.4%	98	36	67%	50%	4%	0%	78%	26%
44	22%	Timor-Leste	18	-4.6%	95	13	54%	47%	0%	4%	2%	19%
45	21%	Federated States of Micronesia	2	-3.6%	82	12	47%	13%	39%	69%	4%	10%
46	18%	Singapore	1	-1.7%	100	100	100%	4%	10%	17%	6%	41%

SDG 7 rank	Composite SDG7 Score	Country	Renewable energy (%)	Annual energy intensity improvement (2010 - 2018)	Electricity access (%)	Clean cooking access (%)	Average access	Percentile Values				
								Renewable energy	Energy Efficiency	Electricity access	Clean cooking access	Average access
48	17%	Tonga	2	-1.5%	98	36	67%	13%	13%	19%	15%	26%
47	17%	Maldives	1	-1.6%	100	99	100%	4%	6%	10%	8%	41%

Annex 3 – Semi-structured Interview Questions

The following questions were posed for both the semi-structured interviews and the email questionnaires.

1. To what extent has your country furthered either carbon intensive industries or clean energy though COVID-19 stimulus packages? Can you identify any energy related stimulus that is supportive of SDG7? Do you see any major missed opportunities that serve as lessons for a future crisis?
2. What are some international best practice examples of utilizing stimulus to develop clean energy? Which energy investment categories in your view are more effective in economic recovery and job creation (for example renewables, building energy efficiency retrofits, energy access, heat pumps, high speed rail, grids, electric vehicles)?
3. Designing stimulus packages is a complex task for policymakers. It must take account of existing industrial structures, balance short-term and long-term considerations and aim to deliver maximum economic and job multiplier effects. To what extent do policymakers have access to analysis and tools to assist them make these decisions?
4. Developing countries face a fiscal squeeze in the wake of COVID-19 with increasing expenditure and declining revenues. How can they create the fiscal space to stimulate their economies using clean energy? Are their industrial structures ready for clean energy investment, or is there further progress needed in regulatory frameworks, supportive policy or industry development? Can South-South cooperation or international organizations play a role to support this process?
5. What are some of the positive changes COVID-19 has introduced which support the more sustainable use of energy, that should be retained? What policy shifts are needed to embed these changes?

Experts consulted through semi-structured interviews:

Dr Vaqar Ahmed of the Sustainable Development Policy Institute, Pakistan;

Dr Blandine Barreau of the International Energy Agency, Paris, France;

Dr Bill Hare of Climate Analytics, Australia;

Ms. Sichao Kan of the Institute of Energy Economics Japan;

Dr Adrian Panow of the Melbourne Energy Institute, Australia;

Dr Xunpeng Shi, of the Australia-China Institute, University of Technology Sydney, Australia; and

Professor Nobu Tanaka of the University of Tokyo, Japan and former Director of the International Energy Agency.

Experts participating in seminar on 19 August 2022:

Mr. David Morgado, Senior Energy Specialist at Asian Development Bank;

Ms. Mika Ohbayashi, Director of the Renewable Energy Institute; and

Dr. Venkatachalam Anbumozhi, Director of Research Strategy and Innovation at Economic Research Institute for ASEAN and East Asia (ERIA).

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