**Positioning countries in Southeast Asia and the Pacific Islands for success in the transition towards a sustainable, equitable, net zero emissions world.**

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Developing countries have much to gain, and potentially much to lose, in the world's rapid transition towards net zero emissions.

The Paris Agreement commits the world to limiting global temperature rise to well below 2 degrees Celsius, aiming for 1.5 degrees. This means achieving global net zero emissions by the second half of this century, signalling a new era in which developing countries are looking to rapidly grow their economies, lift their populations out of poverty and minimise the environmental impacts that accompany rapid development.

As the developed world moves to replace emissions intensive infrastructure, technologies and practices with low or zero emissions alternatives, many developing countries have the opportunity to 'leapfrog' the fossil fuel technologies that are typically associated with economic development, yet now face redundancy in a decarbonising world. With costs for very low or zero emissions technologies such as renewables dropping rapidly, significant improvements in 'smart grid' technologies enabling electricity to be transported and used more efficiently, and potential for economic growth through protection and restoration of forests, countries who harness this opportunity can position themselves well in a world where carbon emissions will increasingly face a real or implied carbon price. Substantial climate finance is now available from multilateral donors and the private sector to support these investments that, when deployed in a manner consistent with long-term low emissions sustainable development planning, enables developing countries in southeast Asia and the Pacific Islands to position themselves for successful and inclusive green growth.

**The developing world has a key role to play in solving climate change**

Although historically developing countries have contributed least to global GHG emissions[1], they are often highly vulnerable to the impacts of climate change. Recent analysis by the Asian Development Bank (ADB) shows that Southeast Asia is likely to sustain larger economic losses from climate change impacts than the rest of the world - up to 11% of regional GDP by 2100 under a business-as-usual scenario where climate action is not prioritised by any government. Further, small island developing states including many Pacific

[1] Fankhauser, S. and Jotzo, F. (2017), Economic growth and development with low-carbon energy. CCEP Working Paper 1705, March 2017. Crawford School of Public Policy, The Australian National University.

Islands, are often most vulnerable to climate impacts, are heavily dependent on imported energy and food, and have limited opportunities for economic growth or building national resilience. To manage these risks, the ADB report urges Southeast Asian countries to take a leading role in global climate action, proactively shifting to a low carbon economy[2]. And several Pacific Island nations are already leading global ambition in addressing climate change.[3]

Further, as Frankhauser and Jotzo find, "Meeting the Paris targets will not be possible without substantial contributions from developing countries… Six of the top 10 emitters are now developing countries, and developing countries as a block account for around 60 per cent of total annual emissions. They will be responsible for practically all emissions growth from now on." [4]

Rapid growth in emissions in Southeast Asia is being driven primarily through deforestation and growing energy demand, with five countries - Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam - making up more than 90% of the region's emissions[5].

If the Paris Agreement targets are to be achieved, developing countries - in particular those in Southeast Asia - must create alternative pathways to prosperity. The potential exists for countries to decouple their economic growth from carbon emissions, and in doing so, avoid many of the environmental, social and economic costs that are the hallmark of fossil fuel dependency.

**Strong economic growth can be achieved without a corresponding growth in GHG emissions.**

The Deep Decarbonization Pathways Project (DDPP)[6] was convened in 2013 with an aim to address a gap in the climate policy dialogue by providing clear and tangible country-specific pathways to reduce emissions, consistent with limiting global warming to 2°C or less[7].

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[2] Raitzer, D.A., Bosello, F., Tavoni, M., Orecchia, C., Marangoni, G., and Samson, J.N.G. (2015),Southeast Asia and the Economics of Global Climate Stabilization. © Asian Development Bank. https://openaccess.adb.org.

[3] Marshall Islands heads up the High Ambition Coalition, which negotiated the inclusion of the 1.5 degrees goal in the Paris Agreement. Fiji will host COP23 in Bonn, November 2017.

[4] Fankhauser, S. and Jotzo, F. (2017), Economic growth and development with low-carbon energy. CCEP Working Paper 1705, March 2017. Crawford School of Public Policy, The Australian National University.

[5] Raitzer, D.A., Bosello, F., Tavoni, M., Orecchia, C., Marangoni, G., and Samson, J.N.G. (2015),Southeast Asia and the Economics of Global Climate Stabilization. © Asian Development Bank. https://openaccess.adb.org.

[6] A global collaboration of research teams from 16 countries, representing 74% of current global GHG emissions: Australia, Brazil, Canada, China, France, Germany India, Indonesia, Italy, Japan, Mexico, Russia, South Africa, South Korea, the United Kingdom and the United States. ClimateWorks Australia co-led the Australian analysis with the Australian National University. The DDPP was convened by The Institute for Sustainable Development and International Relations (IDDRI) and the Sustainable Development Solutions Network (SDSN).

[7] Deep Decarbonization Pathways Project (2015). Pathways to deep decarbonization 2015 report, SDSN - IDDRI, p.3

Both developed and developing economies were included in the DDPP, and in each country the potential to decouple GHG emissions from economic growth (GDP) was demonstrated to be feasible, with average per capita emissions in 2050 reduced to 2.1 tCO2 across the 16 countries, and average emissions per unit of GDP reduced by 87%, relative to 2010. The DDPP synthesis report showed that these emissions reductions were achievable alongside a global average GDP rate of 3.1% per year to 2050[8].

In the developed world, there is already substantial evidence that economic growth can be decoupled from emissions. New data compiled by the World Resources Institute[9] shows that 21 countries have reduced annual greenhouse gas emissions while simultaneously growing their economies since 2000. This includes a number of Eastern European countries who have experienced rapid economic growth over the period 2000-2014 - Bulgaria (62% increase in GDP, 5% reduction in GHG emissions), Czech Republic (40% growth in GDP, 14% reduction in GHG emissions), Romania (65% growth in GDP, 22% reduction in GHG emissions), Slovakia (75% growth in GDP, 22% reduction in GHG emissions), and Ukraine (49% growth in GDP, 29% reduction in GHG emissions). Importantly, in Bulgaria and the Czech Republic, these emissions reductions were achieved without shrinking their industrial sectors.

These findings are also supported by the findings of PWC's Low Carbon Index[10] which shows a number of G20 countries reducing the carbon intensity of their economies in 2014-15 while maintaining real GDP growth, including countries classified as 'developing' such as China, India, South Africa and Mexico.

In China, Teng et al found that while both GDP per capita and absolute GDP are expected to increase more than sixfold between 2010 and 2050, primary energy consumption is expected to grow to just 1.76 times the 2010 level in 2050. China expects to achieve a 47% reduction in energy intensity per unit of GDP by 2030 and 73% by 2050. This demonstrates a significant decoupling of energy consumption from economic growth, driven by China's focused efforts at improving energy efficiency. [11]

China is now the world's largest economy, and the world's largest GHG emitter. Yet, by many indicators it is still a developing country[12]. Despite these challenges, "Promotion of a low-carbon transition is no longer regarded as a costly effort, driven mainly by international pressure. Instead, it is considered as an opportunity, a means for propelling China's growth and for avoiding the middle-income trap".[13]

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[8] Deep Decarbonization Pathways Project (2015). Pathways to deep decarbonization 2015 report, SDSN - IDDRI, p.6

[9] Aden, N. "The Roads to Decoupling: 21 Countries Are Reducing Carbon Emissions While Growing GDP", World Resources Institute, April 5, 2016. Accessed August 1, 2017.

[10] PWC. http://www.pwc.com/gx/en/psrc/publications/assets/the-paris-agreement.pdf

[11] Teng, F et al. (2015). Pathways to deep decarbonization in China, SDSN - IDDRI. P.11. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_CHN.pdf

[12] Teng, F et al. (2015). Pathways to deep decarbonization in China, SDSN - IDDRI. P.5. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_CHN.pdf

[13] Teng, F et al. (2015). Pathways to deep decarbonization in China, SDSN - IDDRI. p.26. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_CHN.pdf

**Decoupling economic growth from emissions is necessary for the achievement of other SDGs**

2015 was a watershed year for multilateral agreement, with both the Paris Agreement and the 2030 Agenda for Sustainable Development[14] forged in that year. As CARE International and WWF found[15], "The adoption of these two major international policy frameworks in 2015 provided a key opportunity for tackling the interlinked twin challenges of sustainable development and poverty eradication, and climate change." Both of these agreements clearly acknowledge the interlinkage between climate change and sustainable development, through the inclusion of a climate goal (SDG 13) in the 2030 Agenda for Sustainable Development, and explicit language in the Paris Agreement that recognises the sustainable development needs and contributions of climate action, as well as the greater challenges developing countries face in achieving sustainable development and addressing climate change.

Further, the SDGs include many actions that directly affect efforts to address climate change. There are SDGs focused specifically on changing patterns of consumption and production, on energy generation and use, and on economic growth, with each of these challenges also acknowledged in the Paris Agreement. Both Agreements also signpost the need to adapt and build resilience to climate change impacts, and include social development goals such as gender equality and human rights.[16]

While the two Agreements are designed to be complementary, further work is needed to fully map the interactions (both synergies and tradeoffs) of strong climate action consistent with the Paris Agreement (SDG 13: Climate Action) with the other 16 SDGs. However, there are several obvious interactions: in particular SDG 3: Good Health and Wellbeing (reducing fossil fuel use has direct benefits to air quality and respiratory health), SDG 7: Affordable and Clean Energy (a shift to clean energy provides a key means for tackling climate change), SDG 11: Sustainable Cities and Communities (improves climate resilience and reduces energy demand), SDG 12: Responsible Consumption and Production (reduces organic waste, and associated GHG emissions), SDG 14: Life Below Water (reducing GHG emissions plays an important role in addressing ocean acidification), SDG 15: Life On Land (protecting and restoring biodiverse landscapes helps sequester carbon dioxide from the atmosphere, while also boosting the resilience of natural landscapes to extreme weather events), and SDG 17: Partnerships for the Goals (the Paris Agreement and Green Climate Fund provide a key mechanism for clean technology development and transfer and capacity building in developing countries, addressing climate change is critical to enhancing global macroeconomic stability, etc).

[14] The Sustainable Development Goals, or SDGs

[15] Harmeling, S. & Fuller, R. (eds.). *Twin Tracks: Developing sustainably and equitably in a carbon-constrained world*. Care International and World Wide Fund for Nature. 2016 http://careclimatechange.org/wp-content/uploads/2016/04/CARE-WWF_Twin-Tracks-3rdEdition.pdf

[16] Harmeling, S. & Fuller, R. (eds.). *Twin Tracks: Developing sustainably and equitably in a carbon-constrained world*. Care International and World Wide Fund for Nature. 2016 http://careclimatechange.org/wp-content/uploads/2016/04/CARE-WWF_Twin-Tracks-3rdEdition.pdf

Efforts to limit global temperature rise to well below 2 degrees and aiming for 1.5 degrees must be considered within the context of the achievement of the Sustainable Development Goals, if both the Paris Agreement and the Global Goals are to be achieved.

**Rapid decarbonisation can be achieved in a way that enables the other SDGs**

Analysis suggests that emissions reductions consistent with keeping global temperature rise well below 2 degrees can be achieved in a way that also enables other sustainable development outcomes. The South African DDPP team explored deep decarbonisation pathways that focused on the achievement of development and climate goals, with equal emphasis. South Africa has extreme and persistent poverty and high unemployment rates, and reducing carbon emissions is but one of many national goals, and not necessarily the highest priority. Demonstrating the positive correlation between decarbonisation and other objectives (such as employment and income growth) was therefore a key focus of the research.[17]

The South African DDPP team compared two different decarbonisation scenarios. The first scenario, the Economic Structure Scenario considered ways to decrease unemployment by growing sectors with low-carbon emissions and high potential for unskilled labour absorption. The second, the High Skills Scenario, assumes significant improvements in education and training in order to fundamentally change the labour force through the injection of high skilled labour into the economy. In both scenarios, per capita GDP increases by 170% between 2010 and 2050. The proportion of the population living below-poverty-line decreases from 50% to ~18% in both scenarios by 2050. And the Economic Structure Scenario shows potential to halve the official unemployment rate of 25% to 12% by 2050. The High Skills Scenario suggests that while improving the education system is key to South Africa's future, it delivers a slower rate of improvement to unemployment, reducing it to 18% by mid-century.[18]

The work of the South African DDPP team suggests that decarbonisation can be achieved in a way that reduces poverty (SDG 1) and creates jobs and economic growth (SDG 8).

*China looked at impact of air pollution on health outcomes.*
China is the world's largest CO2 emitter, accounting for about 27% of world GHG emissions. However, according to most indicators, China remains a developing country, with per capita income well below that of developed countries.[19]

[17] Altieri, K. et al. (2015). Pathways to deep decarbonization in South Africa, SDSN - IDDRI. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_ZAF.pdf
[18] Altieri, K. et al. (2015). Pathways to deep decarbonization in South Africa, SDSN - IDDRI. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_ZAF.pdf
[19] Teng, F et al. (2015). Pathways to deep decarbonization in China, SDSN - IDDRI. P.5. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_CHN.pdf

With almost 13% of China's population - approximately 170 million people - still living below the poverty line, economic growth remains a key priority to address this disadvantage.[20]

Decision makers in China are facing multiple challenges including growing the economy to high income stage, securing energy systems to enabling increasing urbanisation and industrialisation, improving air quality to enhance public health and local environmental outcomes and curbing carbon emissions to reduce its contribution to climate change.[21]

The work of the Chinese DDPP team reflects this complexity, considering the interaction of decarbonisation pathways with priority development goals - namely economic growth, air quality and public health outcomes.

Pathways to Deep Decarbonization in China reports that "China's poor air quality has become the number one cause of social unrest and a threat to political stability. It is also causing millions of premature deaths every year and costing billions dollars in environmental damage "[22]

Of the 74 cities subject to China's air quality standards (introduced in 2012), only 4 cities met the national standard for 'good' air quality. A number of measures to reduce CO2 emissions included in China's decarbonisation pathway lead to significant improvements in air quality sufficient to enable all 74 cities to achieve the 'good' air quality standard,[23] a key driver of improving health outcomes, reducing premature deaths and reducing other environmental impacts.

*India found that decarbonisation could be achieved in a way that was compatible with sustainable development*

The Indian DDPP team also found that considering sustainable development in the design of a decarbonisation pathway could deliver substantially better air quality improvements than a pathway that focused solely on climate mitigation outcomes. In the Indian 'Sustainable' decarbonisation scenario, end-use demand is reduced, with consumption shifted to cleaner modes and technologies and clean energy increased in the energy supply mix.[24]

The 'Sustainable' scenario takes an integral view of social, economic and environmental goals as per the World Bank's 'inclusive green growth' paradigm. It seeks to decouple India's economic growth from a highly resource intensive and environmentally inferior conventional path. Compared to the 'Conventional' scenario also modelled by the Indian DDPP team, the 'Sustainable' scenario assumes measures such as higher investments in education and

[20] Ibid, p.5
[21] Teng, F et al. (2015). Pathways to deep decarbonization in China, SDSN - IDDRI. P.3. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_CHN.pdf
[22] Teng, F et al. (2015). Pathways to deep decarbonization in China, SDSN - IDDRI. P.7. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_CHN.pdf
[23] Deep Decarbonization Pathways Project (2015). Supplementary Material to 2015 Synthesis Report, SDSN - IDDRI, p.36
[24] Deep Decarbonization Pathways Project (2015). Supplementary Material to 2015 Synthesis Report, SDSN - IDDRI, p.34

health[25], also therefore demonstrating compatibility of decarbonisation with the achievement of SDGs 3 (Good Health and Wellbeing) and 4 (Quality Education).

The 'Sustainable' scenario also assumes a number of measures are proactively introduced that align with several sustainable development goals; namely, enhancing technology innovation and deployment (SDG 9), improving governance (SDG 16) and promoting sustainable behavior (SDG 12). In the 'Sustainable' scenario, urbanisation continues at the same rate as in the 'Conventional' scenario, however, policies aimed at supporting small cities, towns and large rural centers enables more evenly distributed urban population in small and medium cities, which facilitates better implementation of low carbon mobility plans, providing infrastructure and improving green cover (SDG 11) which deliver improved quality of life.

**Countries who continue to increase emissions may face continued economic disadvantage**

Before the Paris Agreement, there was a common argument that countries who acted strongly to reduce their contribution to climate change risked competitive disadvantage, if other trade partners or competitors did not also act strongly. For developing countries, most of whom had contributed little to climate change, it was considered reasonable that they be able to substantially increase their emissions in order to grow their economies and lift large proportions of their populations out of poverty.

However, the Paris Agreement has changed the global context in which development is taking place. Development pathways are connected to domestic economic and social structures, as well as global trade, prices, financial flows and international agreements[26]. In a global context where all countries who have ratified the Paris Agreement have committed to rapid decarbonisation, countries who continue to increase emissions in order to achieve other development outcomes may inadvertently position themselves to experience continued economic disadvantage. This can happen in several ways.

As carbon pricing mechanisms are implemented and ratcheted up to support developed countries to achieve their Nationally Determined Contributions (NDCs) to the Paris Agreement, those industries that are emissions-intensive will feel the impact most acutely (e.g. steel, aluminium and cement manufacturing, and fossil fuel electricity generation). These industries become less competitive compared to imports from other countries without a carbon price. This can cause these industries to decline, require significant investment in emissions reductions to reduce the carbon price burden, or relocate to countries without similar carbon pricing policies.

In the short-term this can provide an opportunity for economic growth for developing countries, where production costs are typically much lower. However, there is a risk that countries who are rapidly decarbonising may impose tariffs on emissions-intensive goods

[25] Shukla, P.R. et al. (2015). Pathways to deep decarbonization in India, SDSN - IDDRI, p.14
[26] Altieri, K. et al. (2015). Pathways to deep decarbonization in South Africa, SDSN - IDDRI. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_ZAF.pdf

and services, to either subsidise domestic emissions intensive industries to enable them to transition more smoothly, or to put pressure on countries who continue to grow their emissions to do more.

Chen and Guo[27] found that in China, where export goods have a relatively high emissions footprint, a carbon tariff introduced by its major export markets Japan, US and the EU would put China's foreign trade at a disadvantage. The World Bank also found that a carbon tariff could cause China's exports to decrease by 21%, causing 20 million jobs to be lost[28]. The EU, US and Japan have all discussed possible future carbon tariffs and imposing fiscal pressure on developing countries to discourage emissions. [29]

Further, countries who fail to position themselves on a pathway towards decarbonisation today, risk making substantial investments in long-lived fossil fuel assets that may not be able to operate for their full technical lifespan, if the country is to honour its commitment to the Paris Agreement.

To avoid stranding these assets, countries need to take account of future carbon constraints in their decision-making. Yet, the rate at which emissions intensive assets are being added to the energy system is inconsistent with goal of limiting global temperature rise to well below 2 degrees.[30]

Nowhere is this more apparent than in Southeast Asia, where the rate of new coal-fired power generation is growing faster than any other region in the world.[31]

Finally, developing countries whose economic growth is currently being driven by the extraction and export of fossil fuel reserves are particularly heavily exposed to the risk of stranded assets. As global demand for fossil fuels declines, fossil fuel rich countries stand to lose the economic value of their resource base. This is particularly relevant for a number of Southeast Asian countries such as Indonesia, Viet Nam, Thailand and Malaysia. With fossil fuels expected to lose their economic value in a decarbonizing world economy, countries currently dependent on these exports for economic growth should employ strategies to guard against this risk by diversifying their economy, through efforts to strengthen non-fossil fuel sectors - either other resources sectors, or manufacturing and services.“ [32]

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[27] Chen, W. and Guo, Q. 'Assessing the Effect of Carbon Tariffs on International Trade and Emission Reduction of China's Industrial Products under the Background of Global Climate Governance', Sustainability, Published 15 June 2017

[28] World Bank. The World Bank Annual Report 2014 Year in Review; World Bank: Washington, DC, USA, 2014

[29] Chen, W. and Guo, Q. 'Assessing the Effect of Carbon Tariffs on International Trade and Emission Reduction of China's Industrial Products under the Background of Global Climate Governance', Sustainability, Published 15 June 2017

[30] (Kriegler et al 2014; Pfeiffer et al. 2016).

[31] CoalSwarm, Greenpeace USA, and Sierra Club. *Boom or Bust. 2017*

[32] Fankhauser, S. and Jotzo, F. (2017), Economic growth and development with low-carbon energy. CCEP Working Paper 1705, March 2017. Crawford School of Public Policy, The Australian National University. p.14

**Even in highly diverse scenarios, a focus on decarbonisation can deliver superior sustainable development outcomes**

To further demonstrate the utility of our approach, this section demonstrates how a zero emissions pathway contributes to economic growth and improved development outcomes in two challenging scenarios. The first is an energy and infrastructure poor country, such as we may see in a small island developing state, with high development (employment, education and health) priorities. In the second, we will look at the benefits and tradeoffs of zero emissions planning in emerging 'power-house' cities such as those springing up across rapidly developing Southeast Asian countries, with a strong energy demand and potential for economic growth juxaposed with competing development priorities related to energy provision and jobs.

**Scenario One: How does electricity provision benefit the poor?**

The IEA's current outlook reveals that progress towards global electrification is slow. In 2014, the world's access to clean electricity climbed to 85.3%, up only slightly from 85% in 2012, representing a slowdown from previous years. Approximately 1.06 billion people still lived without access to electricity; despite the fact that 86 million people are getting electricity every year.The IEA Global Tracking Framework 2017 shows that, at the current rate of progress, only 91% of the world will have electricity access in 2030, while only 72% will have access to clean cooking.

Why is this important? Quite simply, electricity is the vehicle for economic activity and the provider of a range of basic services. With access to modern, reliable and affordable energy, children can study in the evening, small business can thrive, women can walk safely under street lights and hospitals can function. Food and vaccines can be kept refrigerated and internet becomes a reality, bringing with it enhanced communication and information flows. Coupled with televisions, radios and mobile phone networks, people are able to make better, more informed choices rather than relying purely on word of mouth. In areas that are newly electrified, electricity provision is enabling households to access formal financial services and build their economies, and the provision of electricity is helping attract better teachers and healthcare workers to rural areas.

In terms of financial advantages and better environmental outcomes, electricity replaces expensive traditional fuels such as kerosene for lighting and the use of batteries to power radios and other small appliances. Households with access to electricity will therefore spend less time and money on energy than comparable households without access to power, although upfront costs associated with electricity connections are often unaffordable for rural households. In Fiji for instance, research demonstrates that un-electrified households spend more on energy for lighting than electrified households and are more vulnerable to increases in the price of fuel[33].

[33] Dornan, M., 2014, Access to Electricity in Small Island Developing States of the Pacific: Issues and Challenges, Renewable and Sustainable Energy Reviews, 31, 726-735.

In this scenario, the most cost and time efficient way to deliver electricity access is through renewables. Technologies such as solar PV, are quick and reasonably simple to install, have no ongoing operating costs, require very little maintenance and can deliver substantial benefits without any additional infrastructure. Delivering the same level of welfare improvement through traditional electricity sources is significantly more complex and expensive.

**Scenario two: Can zero emissions planning support development priorities in emerging and rapidly urbanising cities, without impeding economic growth?**

Lowering the social and environmental impact of the supply of food, power and water have become the defining issues of sustainable cities and, increasingly, efforts to meet the Sustainable Development Goals. Many cities are now embracing a net zero emissions development pathway and are actively investing in achieving a 100% renewable energy supply over the next two decades. These cities will be more likely to attract investment in infrastructure that supports the integration and expansion of renewable energy.

Countries with cities experiencing phenomenal economic growth driven by a comparative advantage in labour or natural resources may find it optimal to 'leap frog' coal dependency. Such circumstances may be able to attract internal or external finance to construct 'super grids', a separate network of high-capacity cables designed to direct current at very high voltages and minimise transmission losses.[34] Super grids provide our first glimpse into a zero-carbon global electrical system. China is now building a "regional" supergrid, which will incentivise cities to use renewable energy[35]. It may also allow nuclear plants to be built far from human populations, that are capable of providing baseload to compensate for fluctuations in renewable energy supply. It will also make access to the densest pools of wind and solar energy feasible, incentivising investment capital by reducing risk and bringing down the cost of electricity for everyone.

Currently, there are 37 megacities[36] in the world, which will likely house more than 66% of the world's population by 2050. The smart city phenomenon, defined by the increasing sophistication and declining cost of digital technologies provides an integral part of sustainable planning at scale, as a platform to economise resources and share physical space. Cities investing in telemetry systems to monitor and manage resource distribution are increasingly able to recover costs and resource losses, and re-route resources to meet peak demand. The City of Maynilad, for instance, holds accountability for water distribution in the west zone of Manila (Philippines). Its investment in an end-to-end water monitoring system enabled the recovery of 640 million litres of water (annually) and grew its service delivery to cover 95% of the population with a 24 hour service. Similar scaled investments in the energy sector in India, South Africa and Brazil can remotely detect unusual usage patterns and thwart energy thieves. In the built environment, smart technologies are improving energy efficiency in condominium and high density living, achieving higher rental rates and a better ROI for owners.

[34] These lines operate independently to AC carrying lines and are capable of moving large amounts of electricity over greater distances, between cities and countries without the risk of blackouts.
[35] Economist (2017), What is a super grid?, January 17th accessed from URL: https://www.economist.com/blogs/economist-explains/2017/01/economist-explains-10
[36] Megacities are defined as urban areas with more than 10 million residents.

Two ‘megacities’ are currently being purpose built to achieve zero emissions in the next two decades, including Xiongan in China, and Munich in Germany. Xiongan is a newly constructed city expected to cover 2,000 sq kms close to Beijing, and operate as special economic zone, smart city and tech hub, attracting 2.5 million people and easing congestion in Beijing. The plan aims to attract 2.4 trillion yuan ($348 billion) of investment over the next decade, adding 0.4% to China’s economic growth. Munich, has made a similar pledge, along with 30 US cities[37], demonstrating that leadership at sub-national levels is able to attract investment independent of national policy.

For Southeast Asian countries, adopting lessons from their own experiences of rapid urbanisation and that of other countries can position them well to facilitate the rapid growth of new cities in a way that maximises the achievement of many SDGs, while minimising emissions growth. Cities are where the vast majority of emissions growth will occur, and a failure to proactively manage how these cities evolve will lock in higher emissions, air quality issues, social and environmental impacts than necessary.

**Decarbonising offers new employment opportunities**

*Employment of Indigenous land stewards: an Australian example*
Modest carbon prices also impact indigenous communities in remote landscapes where economic viability is sometimes challenged. In Australia’s northern savannas for instance, Indigenous traditional knowledge is contributing to landscape fire management, reducing emissions and providing ecosystem services. The West Arnhem Land Fire Abatement (WALFA) project is a prime example of scientists, governments, Indigenous land managers, and carbon markets connecting to provide innovative solutions to resource management and economic development. The WALFA project reduces greenhouse gas emissions through prescribed burning of savannas, generating revenues by providing offsets to the regional energy industry. Under modest carbon prices, this type of fire management could be economically viable across tens of millions of hectares and could provide desirable employment and economic development in remote regions in Australia and fire-prone savanna ecosystems elsewhere[38].

*Employment of rural communities through valuing indigenous forest in East Africa*
For rural communities that are often resource poor and risk-adverse, sustainable agricultural and forestry practices can play an important role in climate mitigation and carbon sequestration when done at scale. World Vision’s ‘Farmer Manager Natural Resources’ program for instance, has reforested hundreds of thousands of hectares of degraded land in Africa and Asia via community groups whom are incentivised by the socio- economic benefits associated with indigenous forest products and market chains. In East Africa, for instance, reforestation activities benefit women through time savings (from searching for scarce fuel wood), allowing girls to attend school more often. Indigenous trees, when

[37] World Economic Forum (2017), Chinas mega-city will run entirely on renewable energy, July 7 2017, Accessed from URL: https://www.weforum.org/agenda/2017/07/china-megacity-xiongan-renewable-energy/
[38] Heckbert, S. et al (2011), Indigenous Australians fight climate change with fire, Solutions Journal, Vol 2, 6 (50-56).

restored at scale, create a range of employment through the production and processing of forest based market chains as well as bringing soil, water and livestock fodder quality improvement and climate resilience outcomes[39].

*Employment in the renewable energy sector*
According to the IEA[40], renewables are already a significant source of new employment, accounting for an estimated 9.4 million jobs in 2015 (including large hydropower). Most of these jobs are located in Asia in solar PV and bioenergy technologies. If the share of renewables reached 36% by 2030, employment in the sector could reach 24.4 million.

*Energy efficiency creates local jobs*
Energy efficiency goes hand in hand with a shift to renewable or zero emissions electricity[41]. By reducing energy demand, it helps to reduce the overall cost of the transition. Policies to stimulate significant improvements in energy efficiency can also generate jobs[42]. As Cambridge Econometrics found, "(b)ecause of their relatively high levels of labour intensity, energy efficiency measures are widely seen in the literature as creating more jobs than new energy generation, which tends to be much more capital intensive. Per million euros of spend, investment in energy efficiency could create up to twice as many jobs as investment in new energy generation."[43]

**The process must be country driven (but many challenges exist that inhibit this)**

A country-driven planning process is critical to ensure the national appropriateness and ownership of mitigation actions and related plans. National stakeholders need to have technical expertise in the sectors targeted by intervention and develop an enabling environment that encourages private sector participation to achieve scale and innovation.

Evidence suggests that in many countries there are significant gaps in the abilities of national stakeholders to understand and implement mitigation actions, requiring technical expertise to strengthen capacity and understanding. Specific gaps identified include: the concept of change and transformation processes; experience in workable business models; knowledge of international financing and its requirements; technical and financial knowledge of best available technological solutions; knowledge on integrating private sector participation; a holistic understanding of the enabling mechanisms which will support the implementation and operation of mitigation actions; and, experience in integrating monitoring

[39] See http://fmnrhub.com.au/, a online program platform featuring reports and evaluations.
[40] IEA REthinking Energy 2017: Accelerating the global energy transformation, Accessed from URL: http://www.irena.org/DocumentDownloads/Publications/IRENA_REthinking_Energy_2017.pdf
[41] The work of the DDPP outlined four 'pillars' of activities that are required to achieve net zero emissions - ambitious energy efficiency; clean power generation; electrification and fuel switching; and non-energy emissions.
[42] Copenhagen Centre on Energy Efficiency (2015). Accelerating Energy Efficiency: Initiatives and Opportunities - Southeast Asia. Copenhagen Denmark
[43] Cambridge Econometrics. *Assessing the Employment and Social Impact of Energy Efficiency: Final Report. 2015*. Cambridge, UK.
http://ec.europa.eu/energy/sites/ener/files/documents/CE_EE_Jobs_main%2018Nov2015.pdf

& evaluation and/or international standards for measurement, reporting, and verification into mitigation actions.[44]

Inconsistent energy statistical data at all levels is also a major barrier in setting reasonable but ambitious emissions control targets.[45] Data challenges are particularly associated with financial costing, cost-benefit analysis, project monitoring and the ability to demonstrate project bankability. Impacting all stages of the project management cycle, poor data impedes the ability to attract investment, carry out feasibility studies to calculate the returns on investment or monitor project performance of proposed interventions. As a result, only 12% of climate finance from multilateral agencies has been accessed to date. It is hoped that the GCF's Readiness funding may increase access, by supporting capacity-building, awareness-creation and public-good investments.

A further challenge many countries face is the need for strong cross-ministerial collaboration to avoid "Siloed implementation [which] would … have detrimental effects and risk cancelling out successes on both sides"[46]

In all countries where incumbent fossil fuel electricity remains the dominant form of supply, relevant decision-making is highly politicised. Baker et al find that in South Africa a lack of transparency, and power struggles in the policy sphere are key challenges to decarbonisation in South Africa,[47] and in China coal remains the cheapest form of energy, making it difficult to diversify its energy supply. [48] These challenges hold true in Southeast Asian countries where existing policies and financial incentives often favour incumbents.

**Conclusion**

The evidence gathered in this paper demonstrates that not only is rapid decarbonisation possible in developing economies, it is in fact essential. However decarbonisation must be considered hand in hand with the achievement of other SDGs for true prosperity. While development and implementation of decarbonisation pathways must be country-led, a range of capacity constraints are currently preventing this. Addressing these barriers is key to unlocking the financial flows that are critical for the transition to a just, equitable, and environmentally-responsible net zero emissions future.

[44] Basu, A., et al GHDK (2017) Operationalizing NDCs, Rethinking the approach to Mitigation Actions to ensure Nationally Appropriateness, Vol 1. (Accessed 21/7/2017 URL: http://www.g-h.dk/CustomerData/Files/Folders/8-pdf-s/167_vol1-2017-operationalizing-ndcs.pdf)
[45] Teng, F et al. (2015). Pathways to deep decarbonization in China, SDSN - IDDRI. p.28. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_CHN.pdf
[46] Ibid 4
[47] Baker, L., Burton, J., Godinho, C & Trollip, H. 2015. The political economy of decarbonisation: Exploring the dynamics of South Africa's electricity sector. Energy Research Centre, University of Cape Town, Cape Town http://deepdecarbonization.org/wp-content/uploads/2015/11/DDPP-Political-Economy-261115-FINAL-for-printing.pdf
[48] Teng, F et al. (2015). Pathways to deep decarbonization in China, SDSN - IDDRI. p.6. http://deepdecarbonization.org/wp-content/uploads/2015/09/DDPP_CHN.pdf