NEW NATURE ECONOMY: ASIA'S NEXT WAVE

RISKS, OPPORTUNITIES, AND FINANCING FOR A NATURE-POSITIVE ECONOMY

Authored by Temasek in collaboration with the World Economic Forum and AlphaBeta

TEMASEK | ecosperity

About Temasek and Ecosperity

Temasek is a global investment company with a net portfolio value of S$381 billion (US$283 billion) as at 31 March 2021. We are guided by our roles defined in the Temasek Charter as an Investor, Institution and Steward, which shapes our ethos to do well, do right, and do good. As a provider of catalytic capital, we seek to enable solutions to key global challenges. We actively seek sustainable solutions to address present and future challenges, as we capture investible opportunities to bring about a sustainable future for all.

Sustainability is central to what we do at Temasek, and Ecosperity is one of our key platforms for engagement and advocacy. The word "Ecosperity" twins ecology with prosperity, reflecting our belief that doing good and doing well can – and must – go together. We work with global leaders from the private and public sectors, academia, and civil society to exchange views, share best practices and push the agenda on sustainable development. Ecosperity Week is Temasek's annual sustainability event.

About World Economic Forum and Nature Action Agenda

The World Economic Forum, committed to improving the state of the world, is the international organisation for public-private cooperation. The Forum engages the foremost business, political, and other leaders of society to shape global, regional, and industry agendas.

The series of New Nature Economy Reports (NNER) is being developed under the umbrella of the World Economic Forum's Nature Action Agenda work, a platform for committed actors to join up ideas and efforts on the issue of biodiversity and nature. The NNER series aims to make the business and economic case for action. This report provides the Asia Pacific deep-dive from The Future of Nature and Business, the second of three reports in the NNER series. The Future of Nature and Business identifies the transitions needed to move towards a nature-positive economy and how businesses can be part of the solution, paving the way for new opportunities. It finds that by doing so, we could unlock up to US$10.1 trillion in annual business value and create 395 million jobs by 2030.

Important notice on contents

All information in this report is derived or estimated by AlphaBeta analysis using both proprietary and publicly available information. Temasek or the World Economic Forum have not supplied any additional data, nor does it endorse any estimates made in the report. Information obtained from third- party and proprietary sources is referenced in footnotes and endnotes.

The financial figures in this report are estimated in US dollars. Conversions, where applicable, are based on average exchange rates in the respective years of analysis, sourced from the International Monetary Fund (IMF).

About AlphaBeta

AlphaBeta is a strategy and economic advisory business serving clients across the world from its headquarters in Singapore.

This report is published by Temasek in collaboration with the World Economic Forum and AlphaBeta, and launched at Ecosperity Week in September 2021. It is available online at:
https://www.ecosperity.sg/en/ideas/new-nature-economy-asias-next-wave.html

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FOREWORD

Sustainability is central to what we do at Temasek. Some years ago, we coined the term "Ecosperity" as the name for our annual sustainability event. The word twins "ecology" with "prosperity", reflecting our belief that our success is closely linked to the well-being of our ecology, and that they must go hand-in-hand for sustainable growth.

We depend heavily on nature; from the food we eat to the air we breathe; from the energy that powers our lives to the joy of experiencing our forests and oceans. Threats to Asia Pacific's rich biodiversity are therefore existential threats to our society's continued growth. This report estimates that the region stands to lose over 60 percent of its gross domestic product (GDP), US$19.5 trillion, from biodiversity and nature loss.

Nature is declining at an unprecedented and accelerating rate, with the Asia Pacific region at the heart of the biodiversity and nature loss crisis. We know we need urgent action to limit the worse impacts of climate change, but we need to do even more to address the biodiversity crisis. Other drivers of biodiversity and nature loss include changes in land and sea use, and overexploitation of natural resources, pollution, and the invasive species we introduce into our ecosystems. However, we can stop the decline in nature with new business models that are economically self-sustaining and resilient – creating up to US$4.3 trillion in annual business value and 232 million jobs by 2030.

We need to halve carbon emissions and reverse nature loss by 2030 to avoid catastrophic consequences. It is critical for the business and investment community to work with governments and civil society stakeholders across the economy to support these new, nature-positive business models. This is on our watch.

We are delighted to partner with the World Economic Forum and AlphaBeta for this report, and hope that the innovative solutions outlined within can help unlock the financing we need to drive economic growth for success across the triple bottom line of people, planet, and profit.

STEVE HOWARD
Chief Sustainability Officer
Temasek International

The World Economic Forum's global report on the Future of Nature and Business outlined how nature degradation threatens our wellbeing, as well as our economic, political, and societal structures. Nowhere is this threat more prescient than in Asia Pacific, as highlighted in this report. Asia Pacific has taken significant strides in economic development in the past few decades, lifting over a billion people out of extreme poverty since 1990. However, this growth has significantly impacted the very ecosystems that have sustained this growth, with up to 42 percent of species in Southeast Asia's rich tropical landscapes now facing extinction by the end of this century. The disruption risk posed by biodiversity and nature loss is staggering, potentially impacting up to 63 percent of Asia Pacific's GDP due to the strong dependencies of the regional economy on natural capital.

AKANKSHA KHATRI
Head of Nature Action Agenda
World Economic Forum

Recognising and acting on the need for change is deeply ingrained in our societal makeup. Just over the past two years, the COVID-19 pandemic has spurred a global movement to rethink growth and development, with governments and institutions using the disruption to business-as-usual to challenge our current economic models and make them more sustainable and inclusive. However, we must also recognise that the scale of change required to address the biodiversity crisis far exceeds today's efforts. A new future for nature and business is needed, requiring governments, the private sector, investors, and civil society to create new pathways for nature-positive development together.

Transforming the three major socioeconomic systems that have precipitated the biodiversity and nature loss crisis in Asia Pacific brings with it a significant prize. Many of the opportunities in the nature-positive economy require immense capital and innovation – both financial and technological – to develop. The World Economic Forum, as the international organisation for public-private cooperation, stays committed to support stakeholders in Asia Pacific reset their relationship with the planet and create a nature-positive, carbon neutral and equitable world.

NEW NATURE ECONOMY IN ASIA PACIFIC:

RISKS, OPPORTUNITIES AND FINANCING FOR A NATURE-POSITIVE ECONOMY

ASIA PACIFIC (APAC) IS AT THE HEART OF THE BIODIVERSITY AND NATURE LOSS CRISIS

Under business-as-usual,
up to 42%
of all species in Southeast Asia could be lost, of which half would be global extinctions

63% of GDP
in APAC is at risk from nature loss due to business' dependency on nature

Climate change accounts for
11-16% of nature loss.
Imperative to tackle four other direct drivers like land and sea use change, overexploitation of resources, pollution, and invasive species

3 socioeconomic systems alone endanger
around 85%
of (near-) threatened species in APAC, with impact expected to grow as these systems are critical for regional growth

BUSINESS LEADERS HAVE HIGHLIGHTED A RANGE OF INNOVATIVE SOLUTIONS TO CATALYSE INVESTMENT IN NATURE-POSITIVE DEVELOPMENT[2]

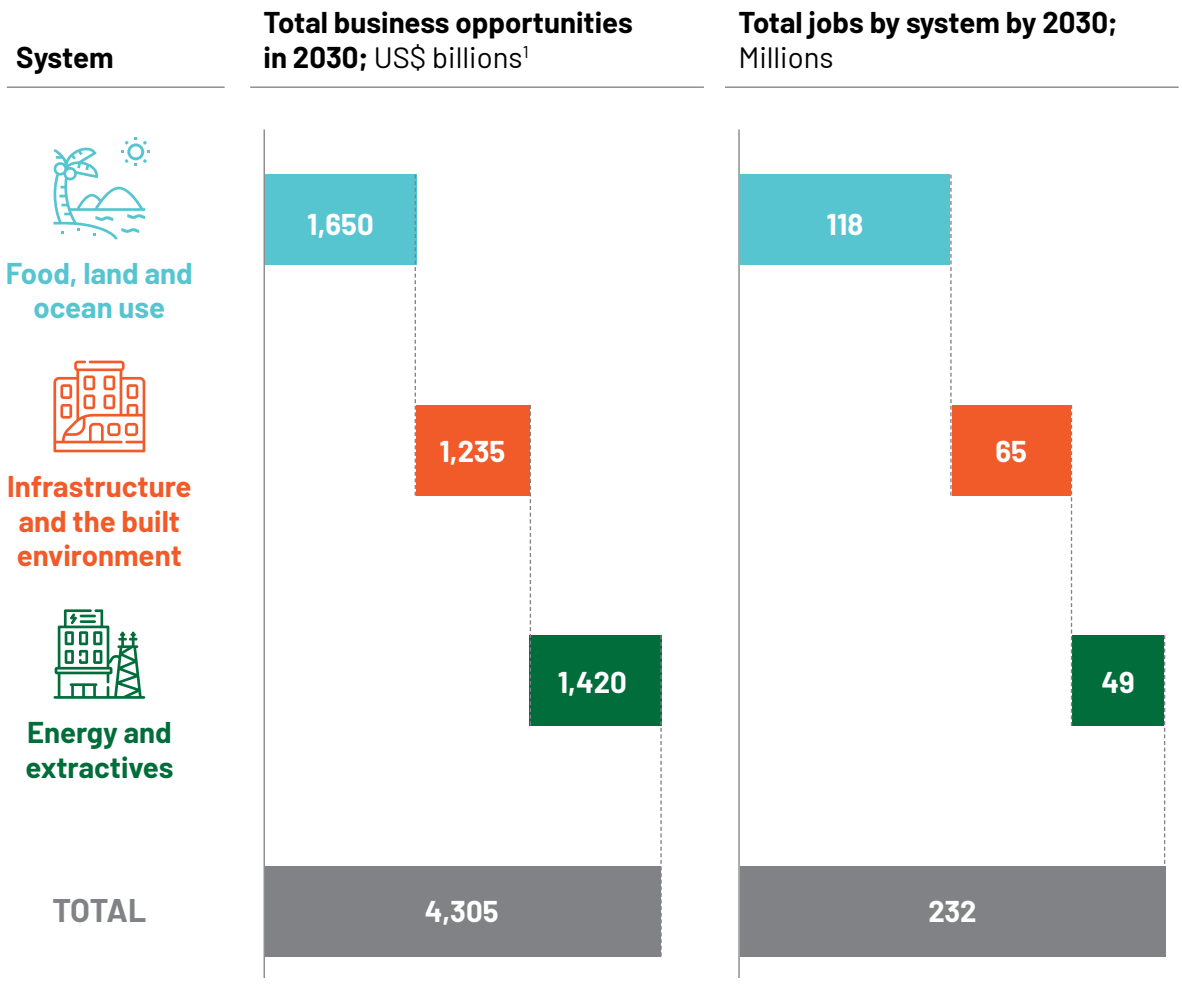
TOP BARRIERS TO INVESTMENT

60%
of respondents highlighted insufficient pricing of externalities as a key barrier to nature-positive models being profitable

47%
of respondents expressed concerns over entrenched behaviours in maintaining business-as-usual activities

2. Based on a survey of 65 business and community leaders in Asia Pacific.

NATURE-POSITIVE BUSINESS OPPORTUNITIES ACROSS THE 3 SYSTEMS COULD DELIVER US$4.3 TRILLION OF ANNUAL ECONOMIC VALUE AND GENERATE 232 MILLION JOBS BY 2030 IN APAC



1. Based on estimated savings or project market sizing in each area. These represent revenue opportunities that are incremental to business-as-usual scenarios. Rounded to nearest US$5 billion.

KEY SOLUTIONS TO ENCOURAGE INVESTMENT

54%

of respondents would like to see harmonised biodiversity reporting standards implemented across APAC

49%

of respondents support new financial products and mechanisms, including blended finance models

KEY FINDINGS AT A GLANCE

1. ASIA PACIFIC IS AT THE HEART OF THE GLOBAL BIODIVERSITY CRISIS

63 percent of gross domestic product (GDP) in Asia Pacific, **US$19.5 trillion**, is potentially at risk from biodiversity and nature loss – a higher share than the global average, due to the significant economic contributions of sectors that are highly dependent on nature, including food and agriculture.

2. FIGHTING CLIMATE CHANGE IS ESSENTIAL BUT NOT ENOUGH TO ADDRESS THE BIODIVERSITY CRISIS

Decarbonisation is critical, but climate change is **one of five** direct anthropogenic drivers of biodiversity and nature loss, responsible for 11-16 percent of the total loss. Changes in land and sea use, and overexploitation of natural resources have greater contributions to biodiversity and nature loss, while pollution and invasive alien species are also key issues to address.

3. SYSTEMIC TRANSITIONS IN THREE SOCIOECONOMIC SYSTEMS ARE KEY TO SOLVING THE BIODIVERSITY CRISIS

Three systems of critical socioeconomic importance to Asia Pacific are together responsible for the most significant business-related pressures to biodiversity; but these are also the systems with the largest opportunities in pursuing nature-positive economic growth. These are: **(1) Food, land and ocean use system; (2) Infrastructure and built environment system; and (3) Energy and extractives system**. Together, these systems endanger around 85 percent of all threatened and near-threatened species in Asia Pacific.

4. 59 NATURE-POSITIVE BUSINESS OPPORTUNITIES[I] HAVE BEEN IDENTIFIED THAT COULD BE WORTH US$4.3 TRILLION AND COULD CREATE 232 MILLION JOBS IN ASIA PACIFIC ANNUALLY IN 2030 IN THESE THREE SYSTEMS

This includes over US$1.6 trillion opportunities in the food, land and ocean use system and 118 million jobs, over US$1.2 trillion and 65 million jobs in the infrastructure and built environment system, and over US$1.4 trillion and 49 million jobs in the energy and extractives system. Together, the value of these opportunities is equivalent to 14 percent of Asia Pacific's GDP in 2019. It is also equal to around **43 percent of the global US$10.1 trillion opportunity** created by the same business opportunities.

5. US$1.1 TRILLION IN CAPITAL INVESTMENT WILL BE REQUIRED TO SUPPORT THE BUSINESS OPPORTUNITIES IDENTIFIED

While this is substantial, it is a **fraction of the US$31.1 trillion fiscal stimulus** measures that have been announced by the Asian Development Bank's (ADB) 45 member countries to combat COVID-19. It also represents around **41 of the global total capital investment required** to unlock nature-positive business opportunities annually through to 2030.

6. INNOVATIVE SOLUTIONS CAN UNLOCK THE INVESTMENT REQUIRED IN ASIA PACIFIC FOR A NATURE-POSITIVE ECONOMY

The top three barriers to investment highlighted by the business community in Asia Pacific today are: **(1) Insufficient pricing of externalities (indicated by 60 percent of respondents); (2) Returns on investment (56 percent); and (3) Entrenched behaviours (47 percent)**. The top three suggested solutions which require further development are: **(1) New externality pricing models (63 percent); (2) Harmonised biodiversity reporting standards (54 percent); and (3) New financial products and mechanisms and regulations enforcing compliance (both 49 percent)**.

7. GREATER RESEARCH AND DEVELOPMENT (R&D) AND BETTER PUBLIC-PRIVATE DIALOGUE ARE KEY ENABLERS

Greater R&D can unlock efficiency gains and new technologies for nature-positive business models, while meaningful public-private collaboration can mobilise policy, capital, and collective action.

I. Nature-positive business models seek to add natural capital back to nature relative to a business-as-usual (BAU) trajectory. These business models include both those that involve direct investment in natural capital (e.g., natural climate solutions, agro-forestry, natural systems for water supply, mine rehabilitation, etc.) and those that reduce our impact on nature relative to a BAU scenario (e.g., circular production models that reduce material demand, alternative proteins, energy efficiency in buildings, etc.). These are inherently different to "green economy" business models or those that generally seek to decarbonise business and economic activities, as these may or may not be pursued by depleting natural capital.

Chapter 1:

63 PERCENT OF GDP IS AT RISK FROM BIODIVERSITY AND NATURE LOSS IN THE ASIA PACIFIC REGION

The Asia Pacific region is at the heart of the biodiversity and nature loss crisis. This matters for businesses as key economic activities supported by nature could be disrupted – 63 percent of the region's GDP is assessed to be at risk. While tackling climate change is important to address this crisis, a range of other direct anthropogenic drivers of biodiversity and nature loss constitute a far larger share of the problem. Economic activities in three socioeconomic systems have been identified as key contributors to biodiversity and nature loss: food, land, and ocean use; infrastructure and the built environment; and energy and extractives.

1.1 THE ASIA PACIFIC REGION IS AT THE HEART OF THE BIODIVERSITY AND NATURE LOSS CRISIS, WITH 63 PERCENT OF GDP AT RISK FROM BIODIVERSITY AND NATURE LOSS

Nature is declining at an unprecedented and accelerating rate. Nearly one million species are at risk of extinction because of human activity. The 2019 Global Assessment Report of the Intergovernmental Panel of Biodiversity and Ecosystem Services (IPBES), the most comprehensive study done to date, has brought urgent attention to the critical state of our planet.[1] Asia Pacific is rich in endemic biodiversity found nowhere else on the planet, with diverse ecosystems ranging from the tropical forests of Southeast Asia to the coral reefs in the Pacific Ocean. However, the region is also at the epicentre of biodiversity and nature loss. Asia Pacific contains the world's largest concentration of hotspots with natural capital depletion[2], and has consistently recorded the highest number of threatened species of any region globally in past years.[3] In Southeast Asia alone, between **13 and 42 percent** of all species are projected to be lost by 2100, around **half of which would be global extinctions**.[4] Earth system scientists have warned the Pacific's coral reefs are fast approaching the cusp of irreversible tipping points that could trigger rapid biome shifts with far-reaching effects on ocean biodiversity and blue carbon sequestration.[5] The links between biodiversity and nature loss and the rise of infectious diseases has also raised alarm bells like never before. The COVID-19 pandemic has shone a light on the domino effect triggered when ecosystems are destabilised. Natural habitats are being diminished, causing wild animals to live in closer quarters to one another and to humans.[6] In turn, 70 percent of emerging infectious diseases originate from wildlife[7], with COVID-19 potentially having emerged through the same route.

Climate action failure, biodiversity and nature loss, and infectious diseases ranked as the top three risks humanity will face in the next 10 years, according to the World Economic Forum's 2020 *Global Risks Report*.[8] But how does it matter for the economy and for businesses? The IPBES *Global Assessment Report* outlines nature's 18 contributions to humanity, including supporting a range of key economic activities through

UP TO 42 PERCENT OF ALL SPECIES IN SOUTHEAST ASIA COULD BE LOST BY 2100, HALF OF WHICH WOULD BE GLOBAL EXTINCTIONS

regulation of the environmental process (e.g., regulation of air quality, pollination, and buffering against floods) and materials that sustain our lives (e.g., energy, food, and medicine).[9] Biodiversity and nature loss disrupts these key contributions of nature to people, in turn placing critical economic activities at risk of disruption. For instance, pollinator populations have declined globally, putting at risk the production of crops with an annual market value of between US$235 billion and US$577 billion – because these crops depend on animal pollination.[10] Pollinator loss could particularly affect countries in Asia Pacific – for instance, losses in China could represent up to 15 percent of its over US$1.8 trillion of agricultural output. Environmental disasters such as hurricanes and floods in Asia Pacific's coastal regions in 2018 impacted 50 million people and cost US$56.8 billion in economic losses.[11] These disasters were exacerbated by environmental damage as the coastal ecosystems such as mangroves and seagrasses that could have protected these areas from extreme weather events had previously been destroyed.

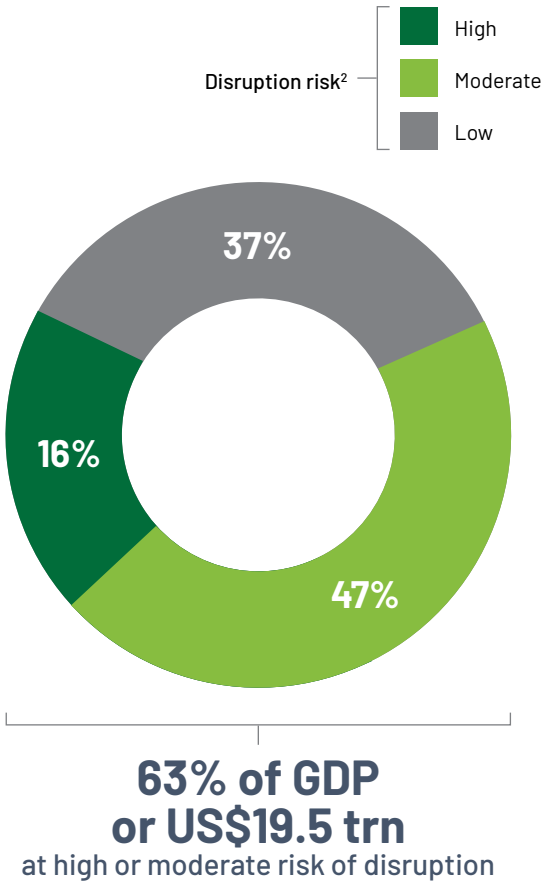
Accounting for all potential disruptions to economic activities, it has been assessed that **63 percent of GDP** in the Asia Pacific region is at risk from biodiversity and nature loss – or **US$19.5 trillion** of economic value generation in 2019 terms (Exhibit 1). This is higher than the risk assessed at the global level – just over half of GDP – as outlined by the first report of the World Economic Forum's New Nature Economy Report (NNER) series, *Nature Risk Rising*.[II] This highlights the Asia Pacific region's higher economic contribution of sectors that are at risk of disruption from biodiversity and nature loss, in particular sectors that are directly dependent on nature such as agriculture, and food, and beverages. However, other sectors with less direct

dependencies on nature still face significant disruption risks. For instance, depletion of natural resources not only impacts upstream sectors such as oil and gas extraction and mining and metals excavation, but also affects multiple downstream sectors which manufacture products such as the retail, consumer goods and lifestyle, electronics, and automotive sectors. Additionally, all 19 sectors analysed in Asia Pacific use water resources, which are under significant threat from overuse of groundwater and contamination of freshwater ecosystems, among other threats. All sectors also have some form of infrastructure holdings – such as buildings, telecommunications, and power lines – which are under threat from extreme weather events, particularly in coastal areas. A business-as-usual route that disregards our economy's impact on biodiversity and nature loss is therefore not a viable option.

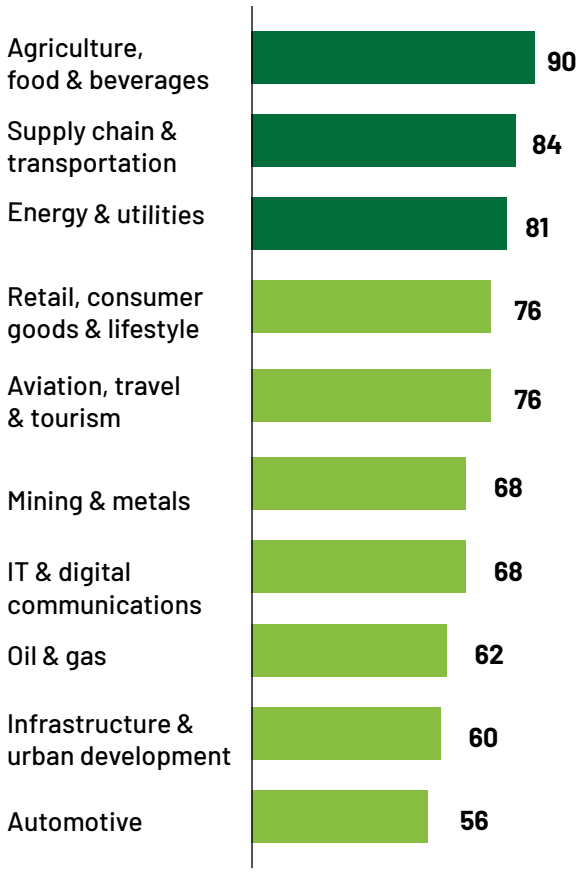
EXHIBIT 1:

63% OF GDP IN ASIA PACIFIC – US$19.5 TRILLION – IS AT RISK OF DISRUPTION FROM BIODIVERSITY AND NATURE LOSS

ECONOMIC VALUE AT RISK IN ASIA PACIFIC[1]
Percent of 2019 GDP disrupted by biodiversity and nature loss



Top 10 industry sectors at risk of disruption
Disruption risk (Max = 100)



1. GDP in Asia Pacific considered for 51 countries in 2019. Total GDP was estimated at US$31 trillion for 2019.

2. Disruption risk was calculated for 19 industry sectors as classified by the World Economic Forum and their estimated contributions to GDP in Asia Pacific. Sectors were assigned disruption risk scores out of 100 based on the average number of up to 85 percent of business operations disrupted by up to 27 drivers of environmental change through their impact on natural capital assets (through the form of up to 21 ecosystem services). A sector with over 80% of its production processes materially disrupted is considered "High" risk; a sector with over 55% of production processes disrupted is "Medium" risk; and a sector with less than 55% of production processes disrupted is "Low" risk.

SOURCE: World Bank; Natural Capital Finance Alliance; ENCORE database; WEF; AlphaBeta analysis

11. World Economic Forum and PwC, 2020, Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy, http://www3.weforum.org/docs/WEF_New_Nature_Economy_Report_2020.pdf

1.2 CLIMATE CHANGE AND BIODIVERSITY AND NATURE LOSS ARE INTERTWINED CRISES; DECARBONISATION ALONE WILL NOT SOLVE THEM

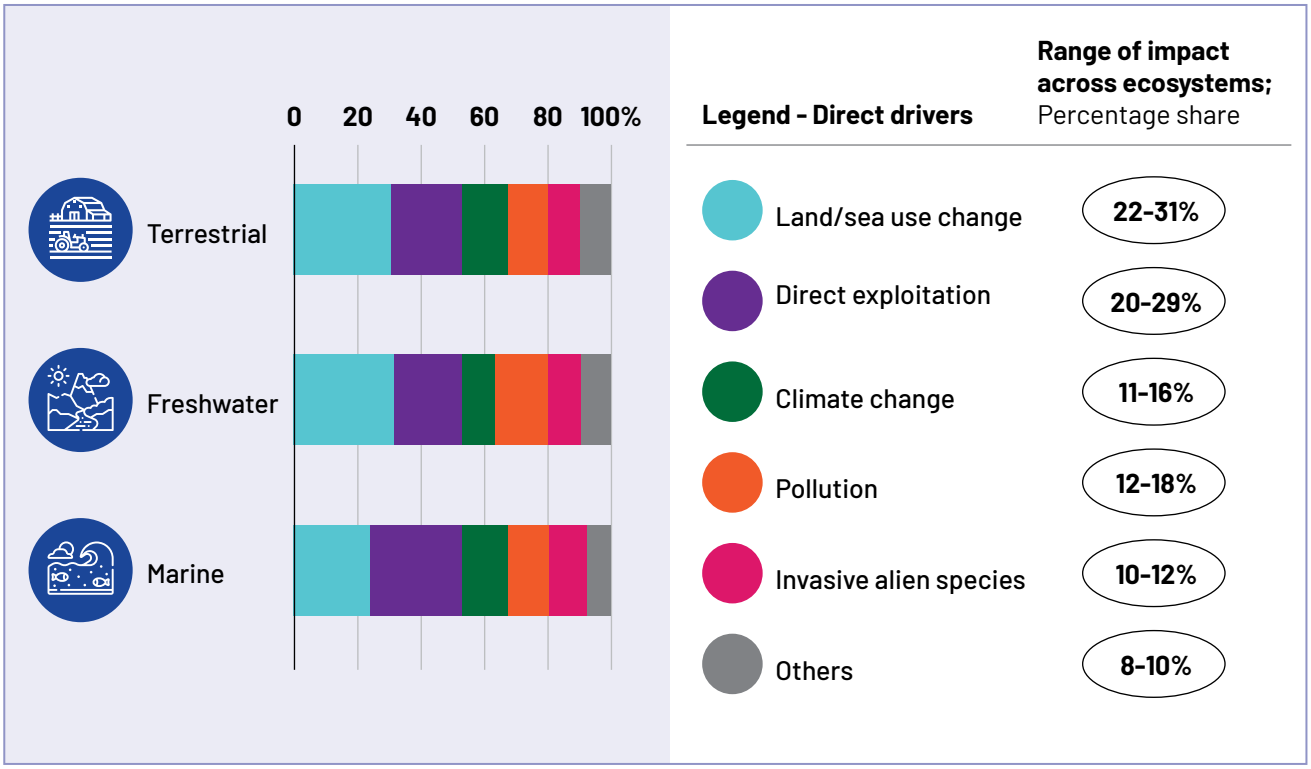
Climate change is one of the most important challenges facing humanity, driven primarily by anthropogenic (i.e., human) greenhouse gas (GHG) emissions. The latest report by the UN's Intergovernmental Panel on Climate Change (IPCC) alerted a "code red for humanity", underscoring the gulf between targets and actual progress in limiting climate change to 1.5^{0}C and outlining the devastating effects for climate change that are already "locked in".[12] Climate change and nature loss are deeply interlinked, as evidenced by the multiple natural calamities in recent years in the Asia Pacific region that reflect the urgencies of both crises. The 2019-20 Australian bushfire season, also known as "Black Summer", burnt over 18 million hectares of land[13] – an area larger than the size of Cambodia – killing or displacing nearly three billion terrestrial vertebrates with many endangered species being driven to extinction.[14] In August 2021, flooding caused by torrential rain in China's Hubei province, killed hundreds of people and affected nearly 300,000, exacerbated by the loss of natural green zones and buffers that could regulate excess rainwater.[15] However, climate change is one of five direct anthropogenic drivers of biodiversity and nature loss, accounting for between 11 and 16 percent of biodiversity and nature loss at the global level, with ranges based on impact across different types of ecosystems (Exhibit 2). Changes in land and sea use and direct exploitation of natural resources account for over half of the impact, pollution and invasive alien species account for a similar share as climate change. Therefore, as important as it is to decarbonise the economy is, it is not enough if the other direct drivers of biodiversity and nature loss are not tackled concurrently.

III. Invasive alien species (IAS) are species whose introduction and/or spread outside their natural past or present distribution threatens biological diversity. IAS occur in all taxonomic groups, including animals, plants, fungi, and microorganisms, and can affect all types of ecosystems. While a small percentage of organisms transported to new environments become invasive, the negative impacts can be extensive and over time, these additions become substantial. A species introduction is usually vectored by human transportation and trade. If a species' new habitat is similar enough to its native range, it may survive and reproduce.

EXHIBIT 2:

CLIMATE CHANGE DRIVES 11-16% OF BIODIVERSITY AND NATURE LOSS

GLOBAL BIODIVERSITY AND NATURE LOSS IMPACT BY DIRECT ANTHROPOGENIC DRIVERS[1]
Share of overall current impact on **total biodiversity and nature loss** across different ecosystems[2]



1. Overall impact is scored across six Essential Biodiversity Variables (EBVs); derived measurements used to study, report and manage biodiversity change): genetic composition, species populations, species traits, community composition, ecosystem function, and ecosystem service. The Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) has assigned a confidence rating of three on a scale of four for this score – implying that the conclusion is "established but incomplete".

2. IPBES assesses the impact of the direct anthropogenic drivers on biodiversity and nature loss leveraging an extensive range of global scientific research on biodiversity and nature loss over 1960-2015. In other words, this analysis should be interpreted as current impact, and does not include forward-looking scenario modeling (e.g., only the historical impact of climate change mediated through ocean acidification, sea-level rise, extreme weather events, etc. has been assessed, not potential impact under different pathways for temperature rise).

SOURCE: IPBES

1.3 BIODIVERSITY THREATS FROM THREE SOCIOECONOMIC SYSTEMS ARE MOST CRITICAL TO ADDRESS

Three socio-economic systems were prioritised in this research based on (a) their impact on biodiversity (as highlighted in Exhibit 3); (b) that they contain sectors which are highly dependent on biodiversity services (as shown in Exhibit 2); and (c) that they are crucial for economies across the Asia Pacific region.[IV] These are: (1) Food, land and ocean use system; (2) Infrastructure and built environment system; and (3) Energy and extractives system. Together, these systems endanger around 85 percent of all threatened and near-threatened species in Asia Pacific.[V]

The **food, land and ocean use system**, including its supply chains, is of vital importance to the Asia Pacific region.[VI] Its contributions to regional GDP and employment are significantly higher than the global average, rising to up to 40 percent of GDP and over 60 percent of employment in low-income countries in Asia.[16] The system provides the food and clothes that sustain humanity and is crucial for the livelihoods of billions of people, not only in Asia Pacific but around the world. Asia accounts for 19 percent of global food and agricultural exports[17] and just seven Asian countries account for over half of global textile and apparel exports.[18] Advances in production, supply chain, and new consumer models have created economies of scale that have helped lift over 160 million people out of undernourishment across Asia Pacific over 2001-18, including 100 million in China alone.[19]

However, the system's adverse impacts on nature have rendered business-as-usual practices in how we farm and fish and the quantity of food and clothes we consume as unsustainable. After several decades of consistent progress, growth in agricultural yields has slowed since the late 20th century due to land degradation and inertia caused by subsidies incentivising bad farming practices, and now lag population growth.[20] Southeast Asia's wild fisheries are at high risk of collapse – 64 percent of fisheries' resource base is at a medium to high risk of overfishing due to destructive practices such as blast fishing and bottom trawling.[21] The fibre sub-system, which produces the textiles we use, impacts biodiversity across the value chain of production. Raw materials such as cotton use land, water, fertilisers, and energy; material preparation including dyeing use significant amounts of water, chemicals, and energy; production generates waste from excess cloth; transport and retailing create further waste and energy use; while actual use by consumers utilises water, chemicals, and energy in washing and maintenance.[22] Textile waste is also most prevalent in Asia, exacerbating all of these impacts, with China alone producing 26 million tonnes of end-use textile waste annually.[23] Transitioning these nature-negative business models to nature-positive ones is imperative given the expected challenges in providing safe, nutritious, and affordable food and fibre for an ever-growing population.[VII] Asia Pacific will be home to nearly 5.5 billion people by 2050 – roughly a billion people more than today.[24] This population will also be significantly wealthier, demanding higher quantities per person and more diverse varieties of food. Over 880 million of the one billion new members of the global "consuming class" will emerge from Asia between 2019 and 2030.[VIII]

IV. The World Economic Forum's second report in the NNER series, The Future of Nature and Business prioritised the same socioeconomic systems at the global level based on an assessment of key biodiversity threats caused by economic activities. See World Economic Forum, 2020, The Future of Nature and Business, http://www3.weforum.org/docs/WEF_The_Future_Of_Nature_And_Business_2020.pdf

V. The Future of Nature and Business also analysed how key biodiversity threats emerging from the three socioeconomic systems impacted threatened and near-threatened species, using data from the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. These have similarly been analysed for Asia Pacific. For more information, please refer to the Methodological Note for the Future of Nature and Business for further details: https://www.alphabeta.com/our-research/methodology-note-NNER-II/

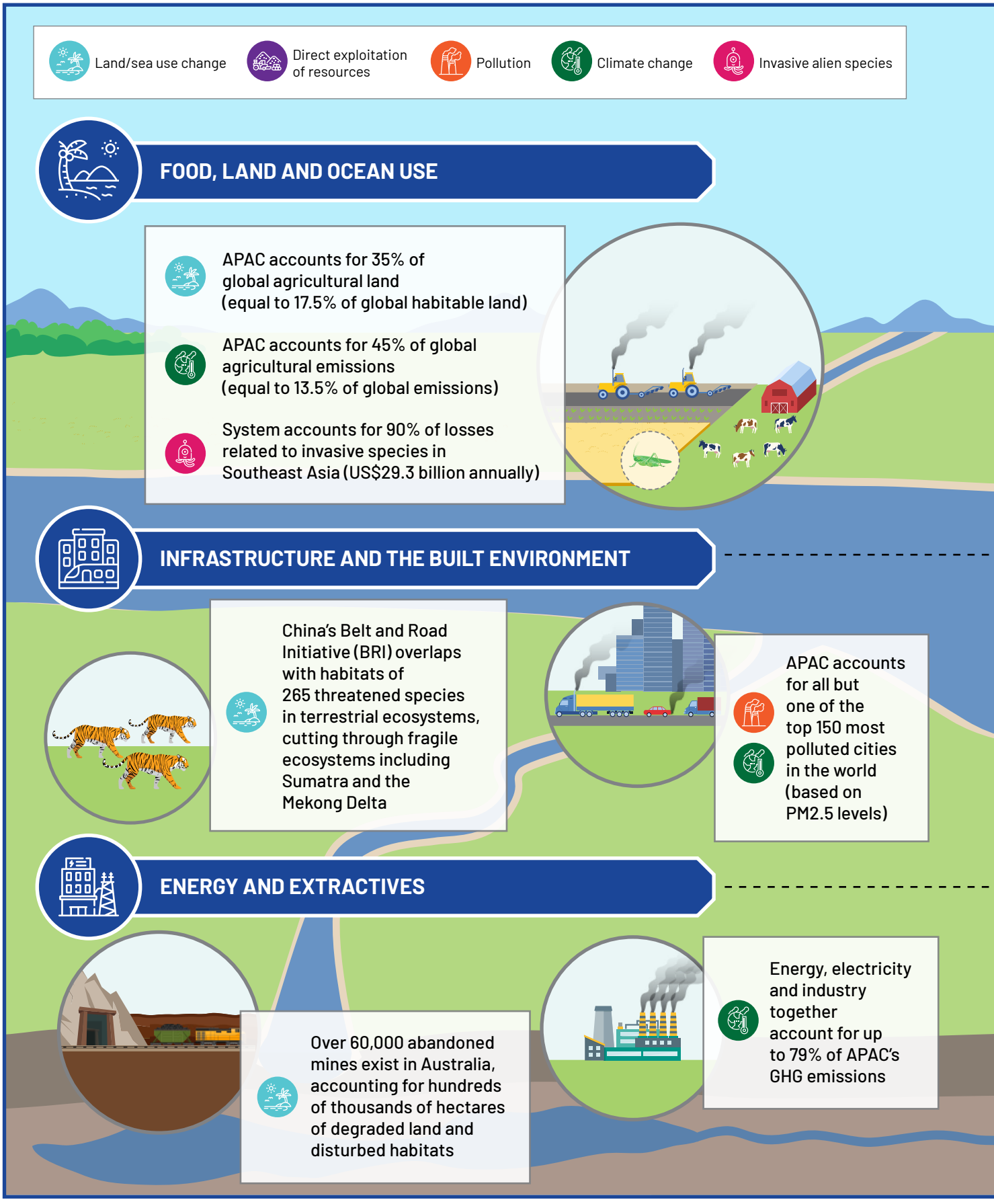
VI. This report builds on definitions developed by the Food and Land Use Coalition (FOLU) used to define the "food, ocean and land use system" – this includes the ways land and the ocean is used and food is produced, stored, packed, processed, traded, distributed, marketed, consumed, and disposed of. As such it includes food from aquatic ecosystems, both marine and freshwater, and both farmed and wild-caught, as well as agriculture for non-food purposes, such as fibre for textiles and crops for bioenergy, as these both compete with food for fertile land or are part of integrated agriculture systems. In this report we additionally include in the system all forests, while making explicit the role of the oceans, hence the term "food, land and ocean use system". For further details, see The Food and Land Use Coalition [FOLU], 2019, Growing Better: Ten Critical Transitions to Transform Food and Land Use, https://www.foodandlandusecoalition.org/wp-content/uploads/2019/09/FOLU-GrowingBetter-GlobalReport.pdf.

VII. A nature-positive economy decouples economic growth from resource extraction and aims for new economic growth to actively contribute to natural capital as opposed to drawing it down. This is in line with objectives to halt nature loss by 2030. This is different to "low impact" economic growth which still allows for some negative impact on natural capital.

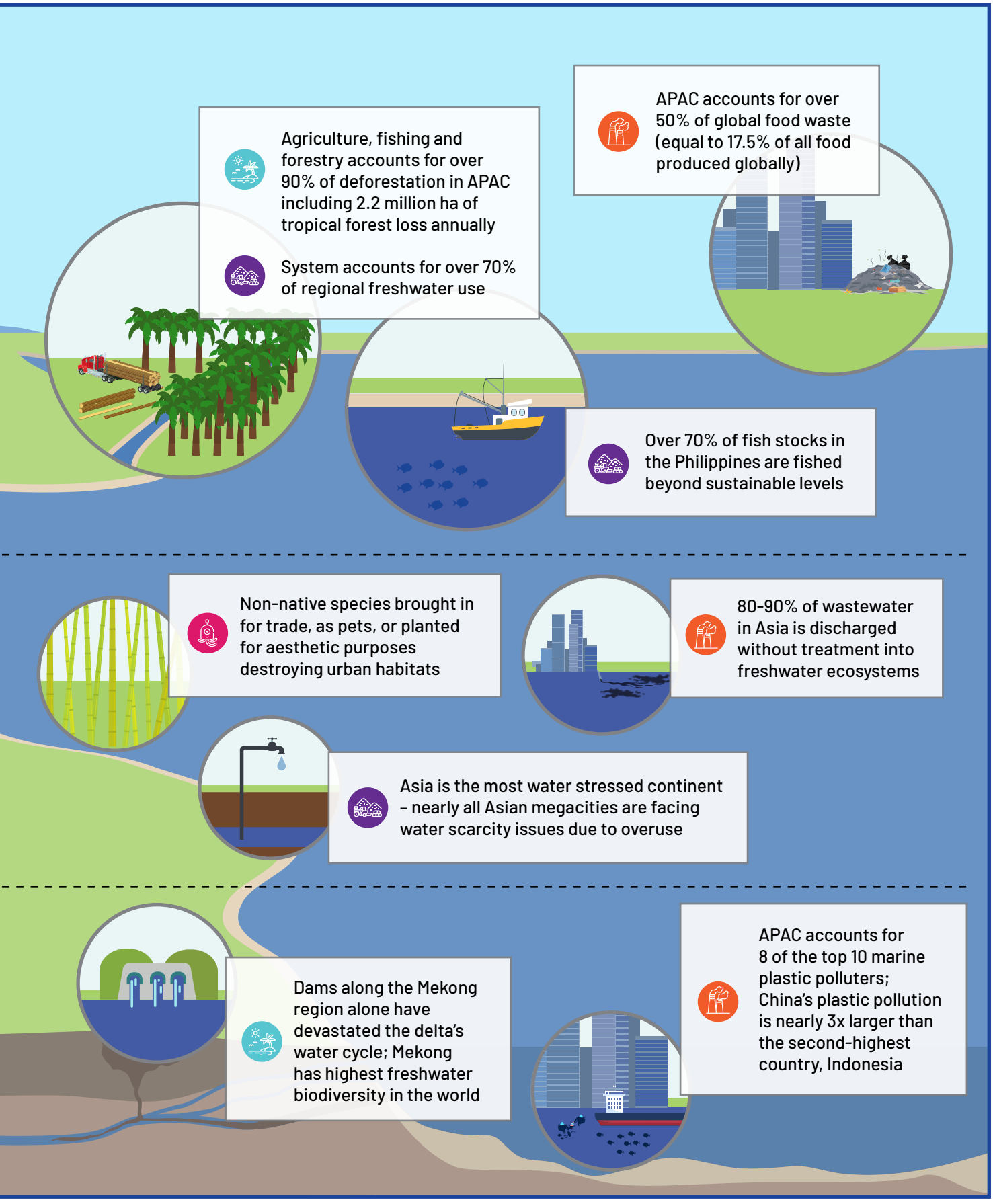
VIII. Consuming class or "middle class" refers to households with per capita incomes between $10 and $100 per person per day (pppd) in 2005 PPP terms. This implies an annual income for a four-person middle-class household of $14,600 to $146,000. See Homi Kharas, 2017, The unprecedented expansion of the global middle class: an update. Brookings Institute. https://www.brookings.edu/wp-content/uploads/2017/02/global_20170228_global-middle-class.pdf

EXHIBIT 3:

THREE SOCIOECONOMIC SYSTEMS PLACE SIGNIFICANT STRAIN ON BIODIVERSITY IN ASIA PACIFIC



SOURCE: Literature review; AlphaBeta analysis


Agriculture, fishing and forestry accounts for over 90% of deforestation in APAC including 2.2 million ha of tropical forest loss annually
System accounts for over 70% of regional freshwater use
APAC accounts for over 50% of global food waste (equal to 17.5% of all food produced globally)
Over 70% of fish stocks in the Philippines are fished beyond sustainable levels
Non-native species brought in for trade, as pets, or planted for aesthetic purposes destroying urban habitats
80-90% of wastewater in Asia is discharged without treatment into freshwater ecosystems
Asia is the most water stressed continent – nearly all Asian megacities are facing water scarcity issues due to overuse
Dams along the Mekong region alone have devastated the delta's water cycle; Mekong has highest freshwater biodiversity in the world
APAC accounts for 8 of the top 10 marine plastic polluters; China's plastic pollution is nearly 3x larger than the second-highest country, Indonesia

The **infrastructure and built environment system** is also critical to Asia Pacific's economy as urbanisation has largely driven the region's most recent wave of economic growth. Cities are the engines of the region's modern economy, providing the density, interaction, and networks that make its societies more creative, productive, prosperous, and healthy. The region houses over 2.3 billion people in urban areas, with urban population surpassing rural population for the first time in 2019.[25] The region also accounts for a majority of the global infrastructure market, projected to reach 60 percent of the world's total or US$5.36 trillion in spending by 2025, as well as the largest gap in infrastructure finance.[26] Basic infrastructure such as housing, commercial space, waste management, and transport networks account for the majority of new infrastructure spend, reflecting increased standards of urban living.

550 MILLION NEW PEOPLE WILL BE ADDED TO CITIES IN ASIA PACIFIC BETWEEN 2019-30 – NEARLY A MILLION PEOPLE EACH WEEK

However, the rapid and often unplanned expansion of the built environment has led to substantial negative impacts on nature and humanity. All of Asia Pacific's biodiversity hotspots identified now encompass large urban areas, including Ho Chi Minh City, Jakarta, Perth, and Singapore.[27] Nearly 4.7 million human deaths alone were attributable to air pollution in 2019[28], with studies suggesting far greater impact on urban flora and fauna, particularly as sulphur and nitrogen emissions affect water cycles and soils.[29] By some global estimates, roadkill has surpassed hunting as the leading cause of vertebrate mortality on land[30], with key concerns in emerging in Southeast Asia.[31] Asia is home to 99 of the top 100 cities facing the largest environmental risks, including pollution, extreme heat, climate change, and natural disasters.[32] As Asia's Pacific's population increasingly moves to urban areas and trade intensifies; if left unchecked, the built environment's contribution to biodiversity and nature loss will only grow. Over 550 million new people will be added to the region's cities between 2019-30.[33] Some 60 percent of the land projected to become urbanised between 2015 and 2030 was yet to be developed at the time of estimation.[34] The impact of long-range transport infrastructure in particular on

biodiversity is expected to increase in Asia Pacific with the development of large multi-country infrastructure projects, such as the Belt and Road Initiative (BRI), which could fundamentally shape biodiversity outcomes over the coming decades. Up to US$8 trillion has been committed to BRI projects through 2049, including roads, railroads, shipping lanes, airports, dams, and gas pipelines spanning Eastern China through to the United Kingdom. The infrastructure of many of these BRI projects will cut across critical or fragile locations, such as Sumatra and the Arctic.[35] Decisions made on infrastructure, including decisions that will be made as part of the stimulus packages for COVID-19 recovery, have long-lasting impacts and will have a crucial role to play in influencing the future of societies and their relationship with nature.

Finally, **the energy and extractives system** has also been a key driver of growth in Asia Pacific. Economic growth has been closely tied to equivalent increases in resource extraction, indicating the importance of energy and materials. Since 2010, the region has achieved near-universal electrification and accounted for majority of the increase in global access to clean cooking fuels and technologies.[36]

Providing reliable access to energy in Asia Pacific while achieving the necessary decarbonisation objectives will provide a significant challenge with a higher and more urbanised population. Under business-as-usual projections, global energy demand will rise by 40 percent through 2050[37], while energy efficiency has improved only modestly since 2010. Materials use will rise by 110 percent through 2060. Both projections are largely driven by increases in low- and middle-income Asia Pacific countries.[38] At the same time, identified oil, gas, metal, and mineral reserves have become increasingly difficult to extract, leading to ever-increasing impact of the energy and extractives system on biodiversity.[IX] Renewable energy projects also bring with them key challenges. For instance, renewable energy projects in India have shown to have three to 12 times larger land requirements than coal-powered plants – to achieve India's current renewable energy targets by 2030, more than six million hectares of forest and agricultural land could be disturbed.[39] Furthermore, commercial deep-sea mining is expected to become operational in the next decade to fulfil demand from renewable energy projects for key rare earth minerals such as cobalt and nickel, bringing new risks to the region's oceans.[40] These projections make the trade-off clear: to meet the needs of people in Asia Pacific within the means of our planet, the energy and extractives system needs to be radically revisited.

RENEWABLE ENERGY PROJECTS IN INDIA COULD HAVE THREE TO 12 TIMES LARGER LAND REQUIREMENTS THAN COAL- POWERED PLANTS

Today, these three socioeconomic systems both cause and face severe risks from biodiversity and nature loss in Asia Pacific. As the Asian economy rebuilds after COVID-19, we are presented with a unique opportunity to re-examine previous economic models and explore new thinking that would benefit people, planet, and profit.

Ample evidence indicates that adopting nature-positive business models can generate even more effective economic growth and build more resilient societies while reducing biodiversity and nature loss. The following chapter discusses what these opportunities could be in each of the three systems.

IX. "Reserves" are energy and materials identified in location and quantity, and they are therefore easy to factor into supply chains and rates of consumption, whereas "resources" cannot be quantified without long-term geological surveys.

Chapter 2:

THE US$4.3 TRILLION OPPORTUNITY IN 2030 FROM A NATURE-POSITIVE ECONOMY IN ASIA PACIFIC

59 nature-positive business opportunities have been identified which could transform the three major socioeconomic systems from a net-negative to net-positive impact on nature. These business models will change the way we farm and fish; how our infrastructure is designed, built, serviced, and connected; and how we extract and recycle natural resources, and power our economy. Together, they could unlock US$4.3 trillion of business opportunities in Asia Pacific and create over 230 million jobs.

2.1 NATURE-POSITIVE BUSINESS OPPORTUNITIES IN ASIA PACIFIC

The World Economic Forum's second report in the NNER series, *The Future of Nature and Business*, identifies 15 priority transitions across the three key socioeconomic systems that have formed the blueprint of a multistakeholder action agenda for a nature-positive economy.[41] These transitions were identified in direct response to the key emerging biodiversity threats for each of the three systems, and benefitted from the extensive work of multiple international initiatives, including the Food and Land Use Coalition (FOLU), the Business and Sustainable Development Commission (BSDC), the EAT-Lancet Commission, the International Resource Panel (IRP), and the long-standing efforts of international organisations, academic researchers, and think tanks. These transitions were also backed by a deep analysis by the Forum and AlphaBeta, as well as an extensive consultation process spanning academia, business, civil society, and governments.

Associated with these priority transitions, *The Future of Nature and Business* identified 59 emerging businesses opportunities to engage in nature-positive business models (see Box 1 for the definition and quantification of nature-positive business models). All of these opportunities are extremely relevant in tackling the biodiversity challenges faced by Asia Pacific. Some are innovative technology-driven business models already being pursued and attracting private capital – from alternative proteins to food waste-saving technologies. Others such as land restoration and sustainable fisheries are more nascent and are currently being pushed by impact-oriented investors, social enterprises, and blended capital. Still others, including many nature-based solutions, are attracting interest from large investors but might require regulatory and policy development to scale up. **The opportunities identified in this report for Asia Pacific add up to US$4.3 trillion in annual business value in 2030** (Exhibit 4), or around 43 percent of the US$10.1 trillion annual opportunity identified at the global level in 2030. This includes over US$1.6 trillion of opportunities in the food, land and ocean use system (38 percent of regional total), over US$1.2 trillion in the infrastructure and built environment system (29 percent), and over US$1.4 trillion in the energy and extractives system (33 percent). Together, this is equivalent to 14 percent of Asia Pacific's GDP in 2019. Asia Pacific captures a higher share of global opportunities in the food, land and ocean use system (46 percent of global opportunities in this system) relative to infrastructure and the built environment (41 percent) and energy and extractives (40 percent). This reflects the rapid growth in the Asia Pacific's middle class (discussed in Chapter 1) and the important role of agriculture across the region. The top 10 opportunities account for over 50 percent of the overall regional total (Exhibit 5).[X]

ASIA PACIFIC ACCOUNTS FOR 43 PERCENT OF THE GLOBAL NATURE-POSITIVE ECONOMIC OPPORTUNITY

The business opportunities identified could also create 232 million jobs by 2030 (Exhibit 4) – over 58 percent of the 395 million jobs that could potentially be created at the global level. These jobs are also more likely to be resilient (i.e., less likelihood of being lost to shifts in technology, global value chains or market demand trends) and offer the opportunity for better livelihoods than jobs in business-as-usual business models. The 118 million jobs potentially created by the food, land and ocean use system constitute 51 percent of the regional total, highlighting the system's relatively higher labour intensity versus energy and extractives, which comparatively could create 49 million jobs or 21 percent of the regional total.

This report analyses four regions within Asia Pacific.[XI] China accounts for the majority of the opportunity identified in Asia Pacific – US$1.9 trillion or 44 percent of the total (Exhibit 6). India and other low- and middle-income countries in Asia Pacific each account for US$850 billion (20 percent of the regional total), while high-income countries in APAC account for the remaining US$700 billion (16 percent).

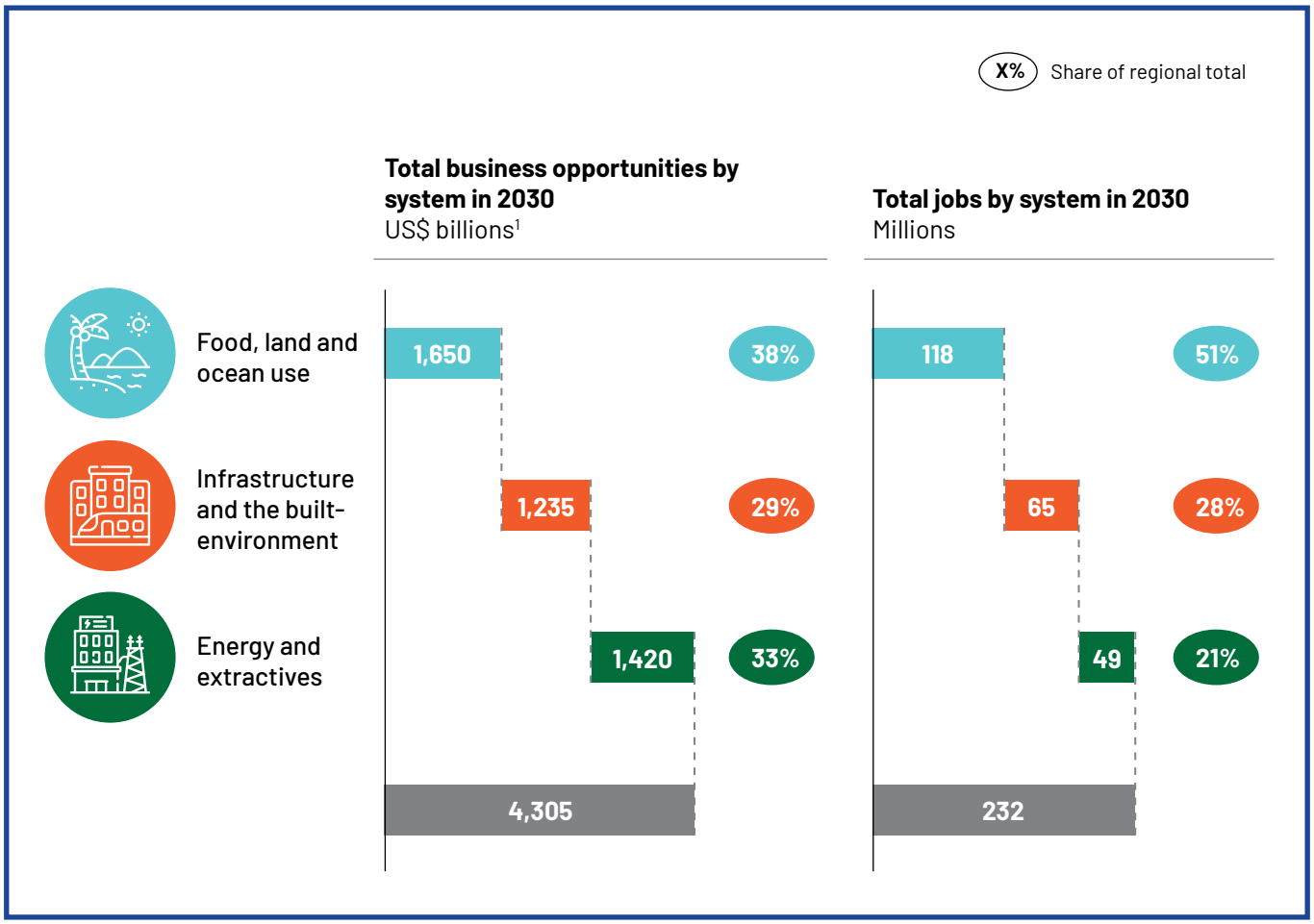
X. Opportunities will be discussed in further detail in subsequent sections of this Chapter.
XI. Four regions have been covered in this analysis: China, India, High-income countries in Asia Pacific, and low- and middle-income countries in Asia Pacific. References to the latter throughout this report exclude China (which is an upper-middle-income country) and India (a lower-middle-income country). Please refer to the Appendix for further details on regional classification, including constituent countries.

CHINA ALONE ACCOUNTS FOR US$1.9 TRILLION OR 44 PERCENT OF ASIA PACIFIC'S NATURE-POSITIVE ECONOMIC OPPORTUNITY

Key differences emerge when analysing the largest opportunities in each region. China and high-income countries in Asia Pacific (e.g., Australia) account for a much higher share of opportunities in the energy and extractives sector, related to materials-based opportunities such as circular models and renewable energy. They also account for a large share of downstream opportunities in other systems including reducing consumer food waste and improving energy efficiency. These are reflected in both region's top five business opportunities (Exhibit 7). However, India and the other low- and middle-income countries in Asia Pacific account for a higher share of opportunities related to primary production, particularly in food, land, and ocean use, related to productive and regenerative agricultural models, ecosystem protection and restoration, and sustainable fishing. Elements of basic infrastructure across systems, including waste management and better logistics to reduce food waste in the supply chain, are also important. The top five opportunities across both regions similarly reflect this (Exhibit 7). Expansion of nature-positive renewable energy is the only opportunity which features across the top five for every region in Asia Pacific.[XII]

EXHIBIT 4:

BUSINESS OPPORTUNITIES IN THE THREE SOCIO-ECONOMIC SYSTEMS COULD DELIVER US$4.3 TRILLION OF ECONOMIC VALUE AND 232 MILLION JOBS BY 2030



1. Based on estimated savings or project market sizing in each area. These represent revenue opportunities that are incremental to business-as-usual scenarios. Where available, the range is estimated based on analysis of multiple sources. Rounded to nearest US$5 billion.

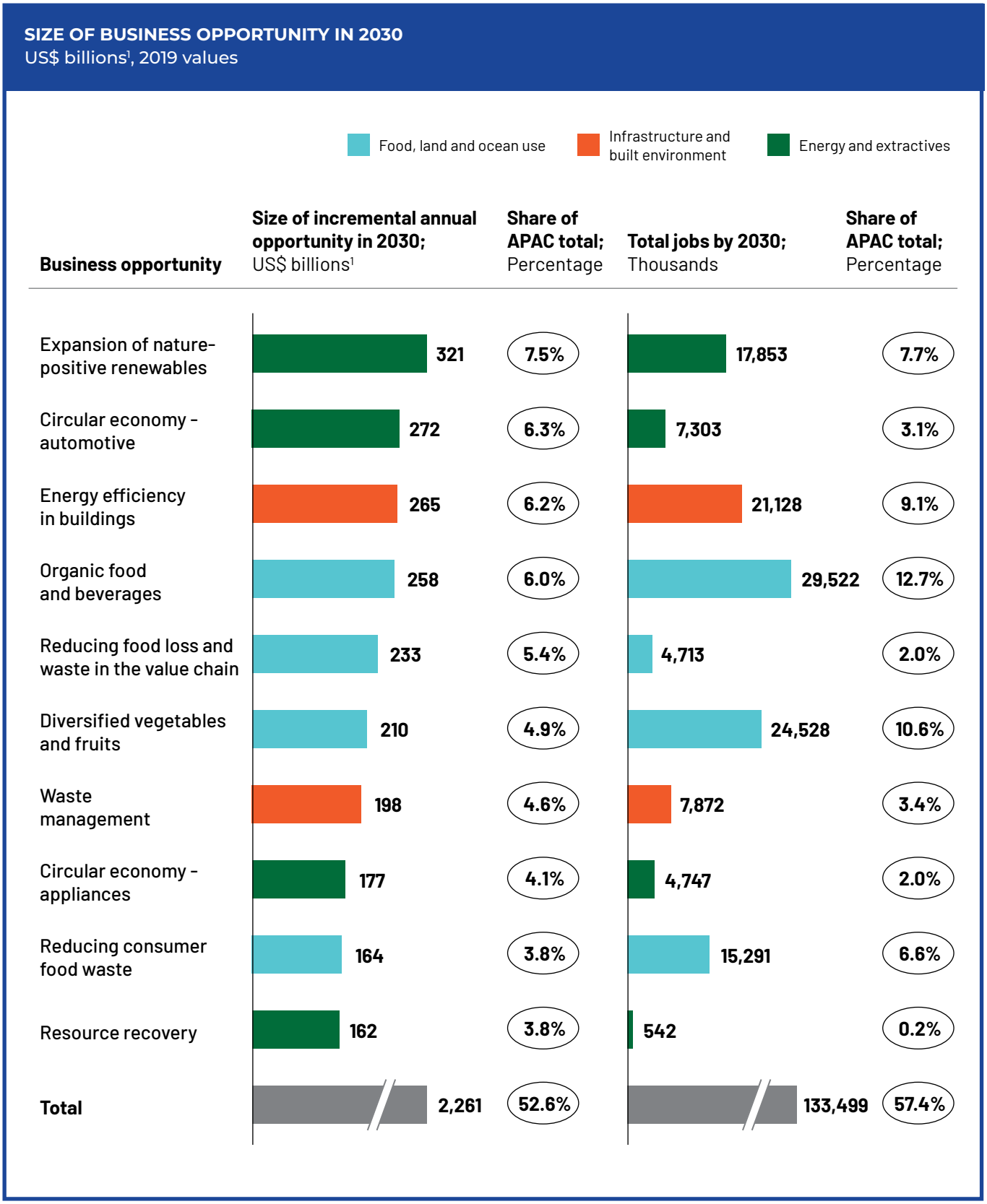
SOURCE: Literature review; Market research; Expert interviews; AlphaBeta analysis

XII. Business opportunities will be discussed in greater detail in relevant sections across this chapter.

EXHIBIT 5:

THE TOP 10 OPPORTUNITIES ACROSS THE THREE SYSTEMS ACCOUNT FOR US$2.2 TRILLION OR OVER 50% OF THE OVERALL OPPORTUNITY

SIZE OF BUSINESS OPPORTUNITY IN 2030
US$ billions[1], 2019 values



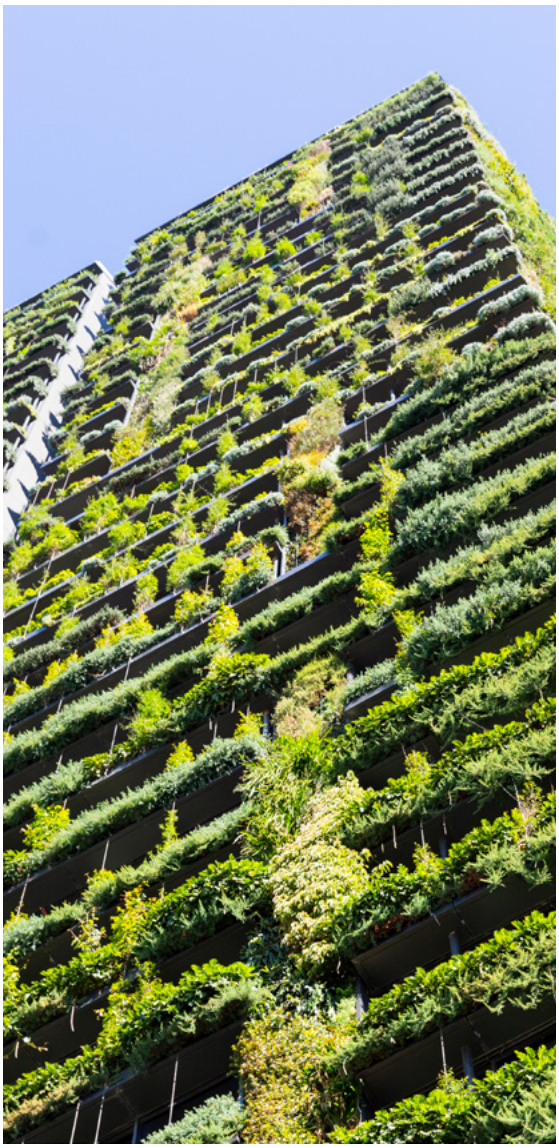
1. Based on estimated savings or project market sizing in each area. These represent revenue opportunities that are incremental to business-as-usual scenarios. Where available, the range is estimated based on analysis of multiple sources.

SOURCE: Literature review; Market research; Expert interviews; AlphaBeta analysis

BOX 1

QUANTIFYING NATURE-POSITIVE BUSINESS OPPORTUNITIES FOR ASIA PACIFIC[XIII]

Nature-positive business models seek to add natural capital back to nature relative to a business-as-usual (BAU) trajectory. These business models include both those that involve direct investment in natural capital (e.g., natural climate solutions, agro-forestry, natural systems for water supply, mine rehabilitation, etc.) and those that reduce our impact on nature relative to a BAU scenario (e.g., circular production models that reduce material demand, alternative proteins, energy efficiency in buildings, etc.). These are inherently different to "green economy" business models or those that generally seek to decarbonise business and economic activities, as these may or may not be pursued by depleting natural capital. However, nature-positive business models by definition do not deplete natural capital while they may or may not contribute to decarbonisation. As a result, some "green economy" business models were excluded from this analysis, including bioenergy with carbon capture and storage (BECCS) and first-generation biofuels, due to their adverse impacts on nature (both involve growing additional crops which require land, water, fertilisers, etc.).



The nature-positive business opportunity values presented in this report are estimates of the annual cost savings or the revenue upside generated by major opportunities (those worth at least US$15 billion in 2030) in 2030, expressed in 2019 US dollars. From the

XIII. For more information on the methodology for sizing business opportunities, please refer to the Methodological Note for the Future of Nature and Business for further details: https://www.alphabeta.com/our-research/methodology-note-NNER-II/
XIV. This adjustment is made to the growth rates of consumer demand-related opportunities (e.g., organic food demand, eco-tourism) for the next two years, and then it is assumed the pre-COVID estimates of growth return. Fourteen of the opportunities sized, largely in the food, land and ocean use system, are impacted by these adjustments. For further details, see IMF, April 2020, World Economic Outlook, April 2020: The Great Lockdown, https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020

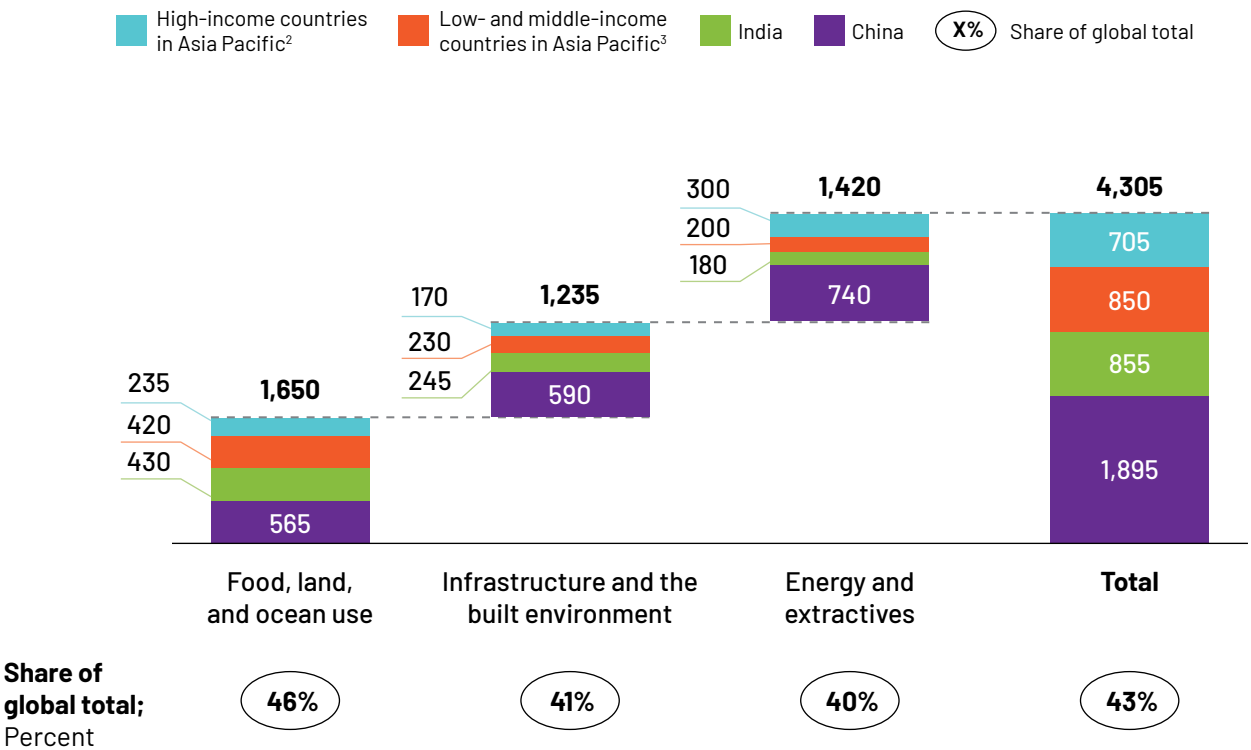
size of the global opportunity, regional "scaling factors" were used to determine the share that each region can capture. Scaling factors are essentially the best available metrics related to each opportunity that indicate the potential share of the opportunity available to each region based on its comparative advantages in production and/or exports in the case of production-related opportunities, and potential market size in relation to demand-related opportunities. For instance, the opportunity for natural climate solutions was allocated to various regions based on their share of potential carbon mitigation potential across forest, peatland, and grassland ecosystems, accounting for differences between regional ecosystems such as tropical and boreal forests as well as estimations of cost efficiency of relevant mitigation activities in each region. Employment figures are based on regional labour productivity rates, while investment estimates are based on opportunity-specific case studies. China, India, and other low- and middle-income countries in Asia Pacific generally have a greater share of the nature-positive economic opportunity because of their higher concentration of natural capital and related primary production activities (e.g., agriculture, extraction), high infrastructure needs in the coming decade, and large populations with growing middle-class consumers.

These estimates depict the incremental size of the business opportunities in a nature-positive scenario compared to what could be achieved in a BAU scenario. This is not intended to be an exhaustive assessment of business opportunities related to biodiversity, but rather to highlight some of the most important opportunities. As such, they are a subset of the total biodiversity business opportunities available. These figures are also not an attempt to estimate the full value of the benefits provided by nature but instead focus on financial shifts in revenue or profit pools. It is important to note that while all of the estimated value of the opportunity can be achieved in a nature-positive manner, it is theoretically possible that some of these opportunities can be pursued in a nature-negative manner (e.g., renewable energy; these tradeoffs have been discussed in greater detail where relevant). It should also be noted that these estimates are based on existing business models and commercialised technologies. Additional opportunities are expected to arise as nascent technologies and new players emerge and markets develop (e.g., hydrogen fuel, which have not been included in this analysis). To reflect the impact of the COVID-19 pandemic, consumer demand forecasts were revised to incorporate the impact of the crisis on GDP growth in 2020 and 2021 as forecasted by the International Monetary Fund.[XIV]

EXHIBIT 6:

BUSINESS OPPORTUNITIES IDENTIFIED IN THE THREE SOCIO-ECONOMIC SYSTEMS ALONE WILL BE WORTH OVER US$4.3 TRILLION BY 2030 IN ASIA PACIFIC

SIZE OF BUSINESS OPPORTUNITY IN 2030
US$ billions[1], 2019 values



1. Based on estimated savings or project market sizing in each area. These represent revenue opportunities that are incremental to business-as-usual scenarios. Where available, the range is estimated based on analysis of multiple sources. Rounded to nearest US$5 billion.

2. Based on World Bank's classifications for countries by income group – high income countries have an annual GNI per capita of US$12,696 or above.

3. Low-income countries have an annual GNI per capita of US$1,045 or lower; lower-middle-income countries range between US$1,046-US$4,095, and upper-middle-income countries range between US$4,095-US$12,696.

SOURCE: Literature review; Market research; Expert interviews; AlphaBeta analysis

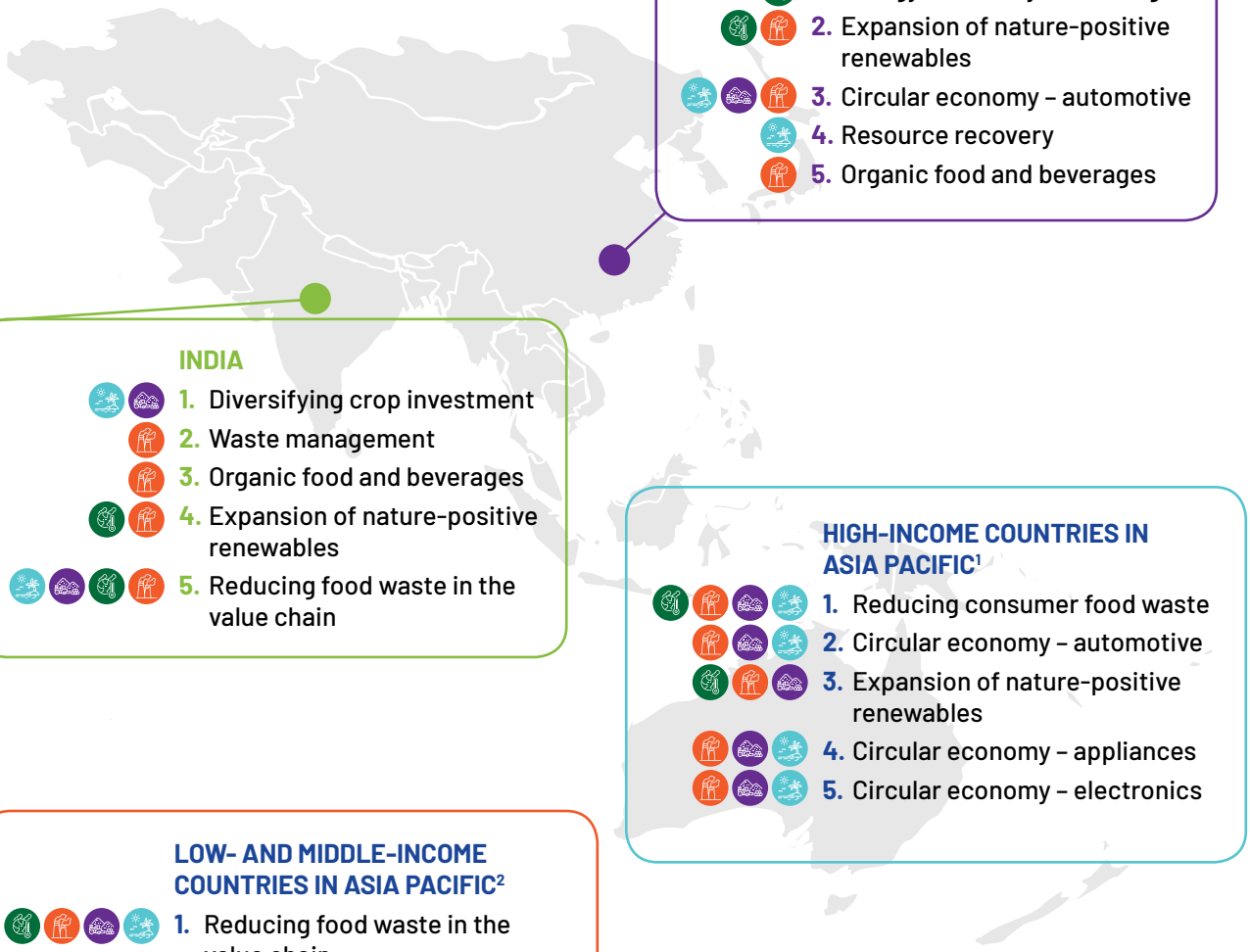
EXHIBIT 7:

THE MAIN BUSINESS OPPORTUNITIES VARY SOMEWHAT ACROSS ASIA PACIFIC

TOP BUSINESS OPPORTUNITIES BY REGION

Drivers of biodiversity loss positively impacted:

- Land/sea use change
- Direct exploitation of resources
- Pollution
- Climate change
- Invasive alien species



CHINA

1. Energy efficiency in buildings
2. Expansion of nature-positive renewables
3. Circular economy – automotive
4. Resource recovery
5. Organic food and beverages

INDIA

1. Diversifying crop investment
2. Waste management
3. Organic food and beverages
4. Expansion of nature-positive renewables
5. Reducing food waste in the value chain

HIGH-INCOME COUNTRIES IN ASIA PACIFIC[1]

1. Reducing consumer food waste
2. Circular economy – automotive
3. Expansion of nature-positive renewables
4. Circular economy – appliances
5. Circular economy – electronics

LOW- AND MIDDLE-INCOME COUNTRIES IN ASIA PACIFIC[2]

1. Reducing food waste in the value chain
2. Organic food and beverages
3. Waste management
4. Expansion of nature-positive renewables
5. Circular economy – automotive

1. Based on World Bank's classifications for countries by income group – high income countries have an annual GNI per capita of US$12,696 or above.

2. Low-income countries have an annual GNI per capita of US$1,045 or lower; lower-middle-income countries range between US$1,046-US$4,095, and upper-middle-income countries range between US$4,095-US$12,696.

SOURCE: Literature review; Market research; Expert interviews; AlphaBeta analysis

2.2 OPPORTUNITIES IN A NATURE-POSITIVE FOOD, LAND AND OCEAN USE SYSTEM

Systemic transitions in the food, land, and ocean use system involve two major actions. The first is to "spare" nature by increasing the amount of land and water that is left undisturbed to allow natural ecosystems to thrive. At the same time, we must ensure that working land and water is much more hospitable to biodiversity – that is, we must greatly improve the way we "share" space with nature. Achieving this two-fold objective requires implementing and scaling 28 business opportunities, which can together put the food, land and ocean use system on a path consistent with planetary boundaries. In Asia Pacific, these opportunities could create over US$1.6 trillion in incremental annual business value in 2030 (together with over 118 million new jobs), while bringing with them a range of biodiversity benefits in the key impact areas discussed in Chapter 1 (Exhibit 8). This section details some of the largest business opportunities related to this system.[42]

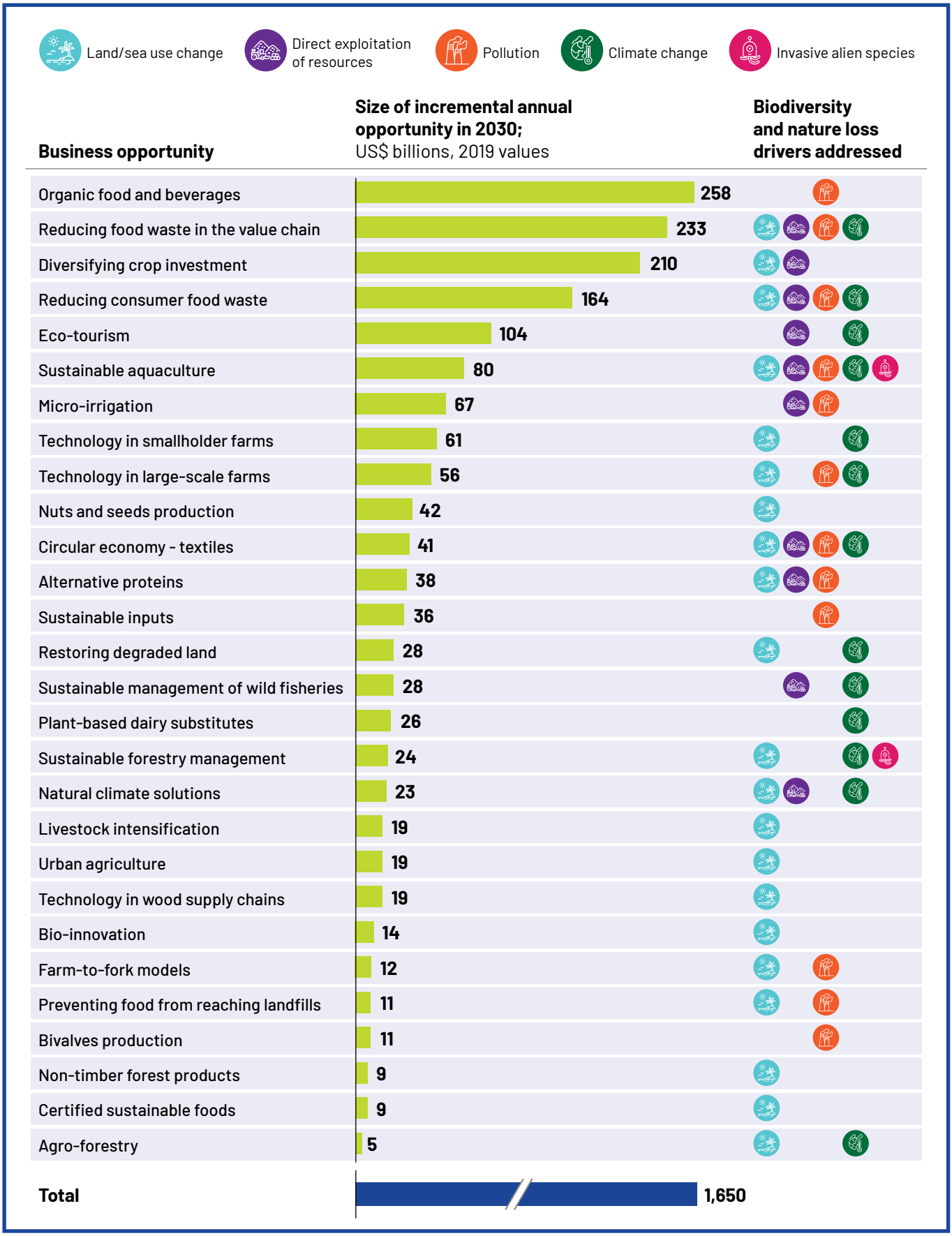
Organic food and beverages is the largest opportunity in the food, land and ocean use system in Asia Pacific, generating new annual incremental market revenues of US$258 billion in 2030. This opportunity is particularly large in Asia Pacific given the region's growing population that is able to afford greater quantities of nutritious, safe, and affordable food. Across Asia Pacific, the opportunity is largest in China (US$99 billion) and India (US$75 billion) – both countries are also coincidentally home to the largest organic cultivation area in the region.[43] The opportunity could also support nearly 30 million new jobs. Organic foods bring significant biodiversity benefits as they are produced without the use of any chemical fertilisers, antibiotics in livestock, and genetic engineering, thereby improving the health of soils, water systems, animals, and humans consuming their end products. Organic produce in particular reduces the impact of agricultural effluents, such as nitrogen and phosphorous that are commonly found in chemical fertilisers, which are released into soils and freshwater ecosystems, causing land degradation and eutrophication which have knock-on impacts on climate change. However, despite these clear environmental benefits and increasing demand, organic farming methods currently come at a tradeoff – requiring more land to produce the same amount of food as conventional farming due to lower yields.[44] Therefore, reducing the gap between organic and non-organic yields is critical to unlocking the biodiversity benefits from this opportunity.

The Sustainable Development Goals (SDG) objective of halving food waste presents a significant opportunity to **reduce food loss and waste in the food supply chain** (i.e., from farm to retail) – potentially generating cost savings of US$233 billion in 2030 in Asia Pacific.[45] This opportunity particularly large in China (US$87 billion) and low- and middle-income countries in Asia Pacific (US$84 billion). Estimates suggest that up to 70 percent of all food waste occurs in the value chain before reaching consumers, typically due to mishandling of produce, poor tracking and tracing, and insufficient cold storage[46], while up to a third of all food produced is wasted.[47] 50 percent of global food waste by volume occurs in Asia Pacific.[48] Eliminating this food waste brings critical biodiversity benefits as it proportionately reduce the impact of the agriculture, fishing, and livestock rearing necessary to produce this food has across all biodiversity and nature loss impact areas. Basic technologies such as small metal silos and plastic crates, which are scarce in many developing countries in Asia Pacific, can have a major impact on the efficacy of storage and transportation. Pilots in India suggest that relatively low-cost storage techniques and handling practices can reduce post-harvest food loss by more than 60 percent and raise smallholders' incomes by more than 30 percent (Box 2).[49] More advanced technologies enabled by the Fourth Industrial Revolution (4IR) similarly hold immense potential to reduce food loss – for instance, Walmart's blockchain traceability platform in China improves supply chain monitoring and builds consumer trust and confidence in food safety, quality, and authenticity.[50]

Diversifying crop investment to include a greater focus on fruit and vegetables is another key business opportunity that could create significant upside opportunities – estimated to be worth US$210 billion in 2030. It could also support nearly 25 million new jobs – including 16 million in India alone. Agricultural diversification is key to reducing the environmental

EXHIBIT 8:

BUSINESS OPPORTUNITIES IN THE FOOD, LAND & OCEAN USE SYSTEM COULD CREATE OVER US$1.6 TRILLION OF ANNUAL VALUE IN 2030 AND LARGE BIODIVERSITY BENEFITS



SOURCE: Food and Land Use Coalition (FOLU); Business and Sustainable Development Commission (BSDC); The Nature Conservancy (TNC); World Resources Institute (WRI); McKinsey Global Institute (MGI); Market research; Literature review; AlphaBeta ; Expert interviews

BOX 2

OFF-GRID COLD STORAGE SOLUTIONS IN INDIA[51]

Cold storage solutions are in short supply for smallholder farmers in India. There is currently a capacity gap of around 10 million tonnes of cold storage, resulting in over 30 percent of perishable produce doing to waste annually. Existing cold storage facilities are largely accessible only to large-scale farmers and their intermediaries. There is also a tendency of these facilities to be full capacity in periods of peak production and harvest, which in turn leads to large price fluctuations. Smallholder farmers are particularly impacted by this as they are often forced to sell their produce at very low prices immediately post-harvest.

To remedy this situation, Ecozen Solutions, an agri-tech company in India, developed micro-cold storage solutions for local farmers. One such solution includes a solar-powered cold storage system called Ecofrost.[52] The system is capable of charging itself completely within six hours with over 30 hours of backup battery reserves, providing round-the-clock cold storage. Ecozen also provides different ownership models – including upfront purchase, lease and rental, and community ownership models to increase affordability. After just two years of usage, small-scale farmers have reported an increase in profits of more than 40 percent.

impact of the food system, given that industrial agriculture that favours monocrop production systems has overexploited key crops and greatly reduced broader biodiversity in working agricultural lands. Asia has the lowest crop species and varietal diversity of all regions in the world for cereal crops with key concerns for pulse, and root and tuber crops.[53] Rice, in particular, is the key staple crop and dominates the Asian agricultural landscape, with the region producing over 90 percent of global production (80 percent in just China, India, Indonesia, Bangladesh, and Thailand), also producing large quantities of wheat (40 percent of global) and maize (30 percent).[54] At the same time, there is significant underconsumption of vegetables in South Asia relative to recommended dietary intakes, fruits and whole grains in both South Asia and East Asia and the Pacific, and legumes in East Asia and the Pacific.[55] This opportunity is thus a "win-win" from both a sustainability and nutritional perspective.

Reducing consumer food waste presents a significant opportunity, potentially creating an annual cost savings of US$164 billion in 2030 in Asia Pacific. In contrast with the opportunity to reduce value chain waste, the consumer food waste opportunity is significantly larger in high-income countries in Asia Pacific – US$88 billion in 2030 – in part owing to the higher per capita food waste that occurs in these countries as well as their higher consumer prices for food. Consumer food waste typically occurs due to factors enabling overconsumption, such as cheap food prices, ease of availability, and high disposable incomes. Reducing this food waste can similarly help proportionately reduce the biodiversity impact of the remaining 30 percent of food waste beyond supply chain waste. There are already several campaigns and products to minimise food waste and to educate the public across this region. For instance, a local supermarket chain in Singapore, NTUC Fairprice, has started the "Great Taste, Less Waste Selection" at some

outlets to sell blemished food items and implemented a Food Waste Index across stores to measure the total food waste.[56] Technologies and business models that could reduce consumer food waste include packaging solutions such as BluWrap and ethylene-removal technology; food-sensing technologies to verify food safety and reduce avoidable waste; retrofitting dining facilities to nudge customers towards smaller portions and less waste; better tracking of waste within restaurants and food service; and promoting "secondary retailers" who can make edible products from still-usable produce.[57] Although annual returns on investment vary by technology application and geography, research has shown that returns of up to 14 times the initial investment can be achieved.[58] Achieving consistency in food labelling standards will be a critical enabler in communicating product shelf life to consumers and restaurants and reducing premature wastage.

Another large, significant opportunity is **sustainable aquaculture**, which could create an incremental opportunity worth US$80 billion in 2030 – nearly three-quarters of the global opportunity. The aquaculture industry is projected to almost double between 2015 and 2030, with majority of the growth being driven by China, Indonesia, and Vietnam, but in many ways it is relatively immature and has significant potential to reduce the environmental footprint of production.[59] Expanding aquaculture across Southeast Asia, particularly for shrimp, over the past two decades was the main driver of global mangrove losses.[60] For example, in Indonesia, the world's second-largest aquaculture producer after China, poorly planned development of seaweed farming has increasingly damaged critical coral reefs and sea grasses that house a wealth of endemic biodiversity and sequester large amounts of carbon.[61] Aquaculture also suffers from significant problems related to chemical pollution and organic waste released into freshwater and marine ecosystems causing eutrophication, while also suffering from high levels of animal disease. Implementing sustainable aquaculture could thus provide significant biodiversity benefits in each of the five impact areas (i.e., changes in land and sea use, direct exploitation, pollution, climate change, and invasive species). Technological improvements to address these problems – such as in inland aquaculture, automated feed dispensing, water quality monitoring, improved waste management systems, harvesting and packaging — alone constitute nearly a fifth of the opportunity. In Singapore, the Apollo Aquaculture Group has created a local "high-rise" seafood farming project that produces six times more than a traditional aquaculture project over equivalent land areas, where all processes are remotely controlled and carefully managed, including the amount of fish feed dispensed.[62] New techniques in mariculture could also reduce conversion pressure on coastal ecosystems, while regenerating ocean ecosystems.[63]

Micro-irrigation could create cost savings of over US$67 billion in 2030 in Asia Pacific. This opportunity is particularly prescient for India (US$33 billion) and low- and middle-income countries in Asia Pacific (US$13 billion). Micro-irrigation methods such as sprinkler and drip irrigation systems deliver a lower amount of water more efficiently and could be transformative in reducing freshwater usage for agriculture in Asia Pacific. Freshwater over-usage in agriculture, which constitutes 70 percent of all freshwater use in Asia Pacific, remains a key biodiversity challenge.[64] Many farms, particularly in rural areas, continue to rely on the outdated technique of flood irrigation to water their crops, whereby water is delivered to the surface of the cropland and allowed to be absorbed by the plants. This sees a large amount of water loss due to evaporation and runoff, which further carry agricultural effluents including nitrogen and heavy metals that are discharged as pollution into freshwater ecosystems. The use of sprinklers not only reduce the water required in fields by up to 15 percent, but also can improve yields by five to 20 percent. Drip irrigation is even more effective,

MICRO-IRRIGATION TECHNIQUES CAN REDUCE WATER REQUIRED TO IRRIGATE FIELDS BY UP TO 60 PERCENT

reducing the water required by 20 to 60 percent while improving yields by 15 to 30 percent.

Technology in large-scale farms represents a large business opportunity that could yield up to US$56 billion in Asia Pacific in 2030 when valuing land spared by increased productivity. Technology solutions to improve yields are critical to reducing land conversion pressures for agriculture and associated release of sequestered carbon in converted lands in Asia Pacific – currently, the region accounts for 35 percent of global agricultural lands[65] and agriculture accounts for 90 percent of regional tropical deforestation.[66] New precision-agriculture technologies could improve large-scale farm yields by up to 40 percent over the next 20 years (see Box 3).[67] Yield improvement is critical given the dual need to maximise land efficiency and feed a growing middle class in the region. Such innovations include farm-management software that leverage satellite imagery and big data analytics to improve planting and harvest cycles; and machinery that applies farming inputs more precisely, such as tractors fitted with Global Positioning Systems (GPS) and multispectral sensors (for accurate application of nitrogen and other fertilisers), drone technology to sow seeds and apply pesticides, and advanced robotics.[68, 69] This opportunity is particularly relevant for India (US$24 billion) and low- and middle-income countries in Asia Pacific (US$21 billion).

Alternative proteins (i.e., alternative meats, poultry, seafood, and other hybrid products) could capture a significant share of the global proteins market in high-income countries in Asia Pacific by 2030 up from a near-negligible base today, potentially creating a market value of US$38 billion across the region.[70] Alternative protein products were created with the intent of curbing the environmental impact of GHG emissions and of water and land use, among other environmental concerns, of resource intensive red meat.[71] Alternative meats can use up to 99 percent less water and 97 percent less land than beef, and generate 96 percent less GHG emissions.[72] Experts expect the recent surge in demand for alternative proteins, including in plant-based, cultured, microbial, and insect-based proteins, to continue as consumer awareness grows, technologies mature, and prices fall. Investment in non-traditional proteins has exploded in recent years, with a record US$3.1 billion invested in 2020 across plant-based meat, eggs, and dairy; cultivated meats; and fermentation alternatives.[73] Investor confidence is driven by a mix of increased consumer acceptance, significant increase in product launches and variety, and economies of scale. China, and in particular Hong Kong, is emerging as a hub for alternative proteins companies, including Avant Meats and Omnipork.[74] Singapore is similarly a vibrant hub for alternative proteins, with significant support from the government, finance from venture capital funds, and a network of cutting-edge startups such as Shiok Meats producing novel products like alternative seafood.

ALTERNATIVE MEATS CAN USE UP TO 99 PERCENT LESS WATER, 97 PERCENT LESS LAND, AND GENERATE 96 PERCENT LESS GHG EMISSIONS VERSUS ANIMAL-BASED PROTEINS

Sustainable management of wild fisheries could lead to around US$28 billion in savings by 2030 by reducing losses caused by overexploitation of wild fisheries in Asia Pacific. The regional opportunity constitutes 70 percent of the global opportunity. Losses from overfishing are estimated to be around US$60 billion in Asia Pacific today[75] – including through reduced catch volume and value, and the need for vessels to travel further to find fish (it takes five times the effort to catch the same amount of fish now as it did in 1950).[76] Improved area targeting and harvest management can help fish stocks replenish over the long term and help reduce losses from overfishing. Studies of coral trout in marine protected areas (MPAs)[XV] around the Great Barrier Reef in Australia have shown yield enhancements of up to 12 percent despite lower access to fish populations through a five-fold increase in the production of offspring by healthier fish.[77] MPAs also bring additional benefits in reducing conversion pressures in the ocean for other activities,

XV. Marine protected areas (MPAs) are areas designated and effectively managed to protect marine ecosystems, processes, habitats and species, which can contribute to the restoration and replenishment of resources for social, economic and cultural enrichment. MPAs include marine reserves, fully protected marine areas, no-take zones, marine sanctuaries, ocean sanctuaries, marine parks, locally managed marine areas and so on. See Friends of Ocean Action, 2019, The Business Case for Marine Protection and Conservation, http://www3.weforum.org/docs/WEF_Business_case_for_marine_protection.pdf

BOX 3

PRECISION AGRICULTURE IMPROVES CROP YIELDS IN INDONESIA[78]

HARA, a smart-farming solution, helps Indonesian farmers to improve yields by providing data-driven insights into farm and field potential, input and supply management, and proactive mitigation of pests and disease. Developed by local data analytics firm Dattabot in partnership with cloud provider Predix and General Electric, HARA analyses a combination of historical data, manual feedback, input from sensors and satellite imagery. It has resulted in an average 60 percent improvement in crop yields, 50 percent reduction in farming inputs, and 25 percent reduction in crop failure rates.

including oil rigs and deepsea mining. A key solution to support this opportunity is to use tradeable fishing permits supported by new technologies in areas such as sensing, tracking, mapping, and simulation. Meanwhile, precision fishing technologies – for example, those that allow fishers to optimise navigation routes and manage catch quality – could save large-scale fishing companies about US$11 billion a year while substantially reducing bycatch and damage to coral reefs, seagrasses, and the seabed.[79] Demand is growing for sustainable fish production: in one global survey, 72 percent of consumers agreed that shoppers should consume only food from sustainable sources.[80]

Based on available carbon market valuation methods, **natural climate solutions** could create an opportunity worth US$23 billion by 2030 in Asia Pacific.[XVI] Natural climate solutions include cost-effective reforestation and the avoidance of further conversion of terrestrial ecosystems for agriculture.[81] Three-quarters of this regional opportunity is concentrated in lower income areas of the Asia Pacific, particularly South and Southeast Asia's biodiverse tropical forests, peatlands, and grasslands. Besides restoring millions of hectares of deforested and degraded lands, natural climate solutions could also help abate up to 20 percent of

75 PERCENT OF ASIA PACIFIC'S OPPORTUNITY FOR NATURAL CLIMATE SOLUTIONS IS CONCENTRATED IN SOUTH AND SOUTHEAST ASIA

total global anthropogenic GHG emissions by 2030, and could provide up to a third of climate mitigation needs in Southeast Asia.[82] The potential benefits of such investment are significant. For instance, achieving the Bonn Challenge of restoring 46 percent of the world's degraded forests, including many tropical forest regions in Southeast Asia degraded from decades of palm oil cultivation, could provide between US$7 and US$30 in economic benefits for each dollar spent in implementation costs.[83] Further developing payment for ecosystem services – including climate change mitigation, watershed services and biodiversity conservation – will be essential for enabling the private sector to participate in a meaningful way. Although this opportunity relates to natural climate solution pathways outside of working landscapes, there is strong potential to deploy opportunities to sequester carbon through regenerative agriculture in working lands in tandem with such solutions.[84]

XVI. Methodologically, it is difficult to project effective carbon prices that emission reductions from natural climate solutions (NCS) may command in 2030, given the uncertainty on future policy regulation. Therefore, rather than estimating the opportunity at revenue, a cost-based approach has been used to size this opportunity. The size of the opportunity is therefore estimated as the integral of the supply curve, i.e., assuming the entire volume is sold at cost. As the exact shape of the supply curves is unknown, it has been assumed that these are linear between US$0-US$10 for low-cost volumes, and from US$10-US$100 for cost-effective volumes. Moreover, only the portion of the supply curve below US$50 per tonne has been included. This estimate is based only on carbon payments and does not include additional revenues from agroforestry and reduced impact logging. Please see the Methodology Note for more details on sizing at https://www.alphabeta.com/our-research/methodology-note-NNER-II/. See also Griscom, B. W. et al., 2017, "Natural Climate Solutions", PNAS 114 (44) 11645-50, https://doi.org/10.1073/pnas.1710465114 for more on mitigation potential of different NCS pathways considered.

2.3 OPPORTUNITIES IN A NATURE-POSITIVE INFRASTRUCTURE AND THE BUILT ENVIRONMENT SYSTEM

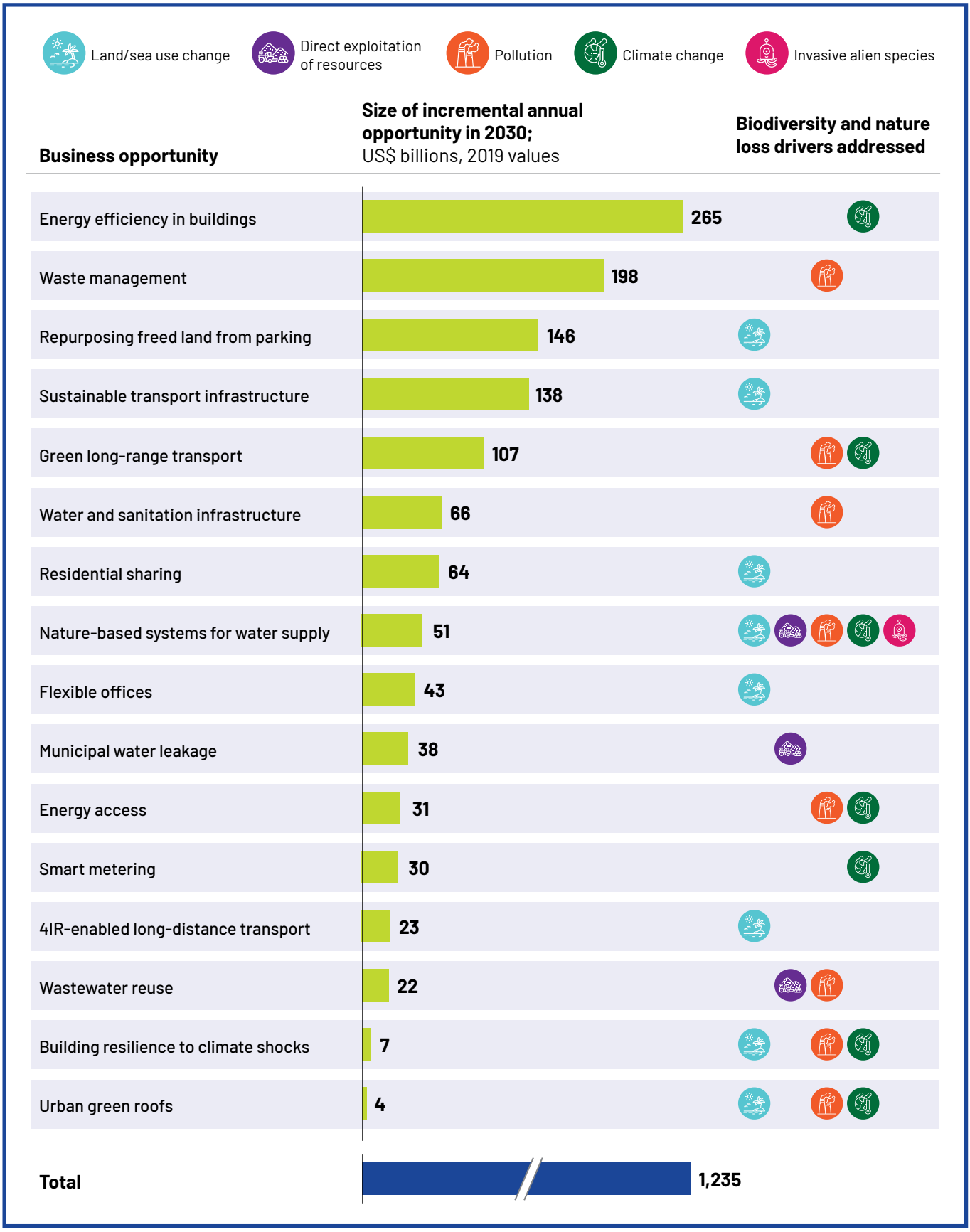
Systemic transitions in the infrastructure and built environment system require built-up areas to avoid encroaching into remaining fragments of primary ecosystems that are the habitats of endangered species. It also means that the built environment itself should be more hospitable to nature and wildlife while reversing its negative impact on the surrounding natural environment, be it through the reduction of pollution or the improvement of the infrastructure that connects it to other areas.[85] Achieving these objectives requires implementing and scaling 16 business opportunities, which can together place the infrastructure and built environment system on a pathway to nature-positive economic growth. In Asia Pacific, these opportunities could create over US$1.2 trillion in incremental annual business value in 2030 (together with over 65 million new jobs), while bringing with them a range of biodiversity benefits in the key impact areas discussed in Chapter 1 (Exhibit 9). This section details some the largest business opportunities identified in this system.

Improving energy efficiency in buildings is the largest opportunity in the infrastructure and built environment system. It could help create annual cost savings of US$265 billion in 2030 and generate 21 million new jobs. Unsurprisingly, Asia Pacific's higher income regions with larger electricity consumption per capita account for the bulk of this opportunity, with China accounting for US$161 billion of the regional total, and high-income countries in Asia Pacific US$38 billion. The 40 low- and middle-income countries in Asia Pacific combined account for a similar US$37 billion opportunity value, while India accounts for the remaining US$28 billion. Buildings contribute to biodiversity and nature loss both in the construction phase (by utilising land and resources) but also account for significant use of water and energy throughout their lifecycle, creating pollution and GHG emissions in the process. The climate impact in particular is significant. Globally, buildings account for 30 percent of energy consumption and 28 percent of energy-related carbon emissions,[86] with Asia Pacific registering similar proportions in terms of carbon emissions.[87] Improving energy efficiency is thus critical to improving buildings' impact on nature by reducing the need for electricity, in turn reducing GHG emissions and associated air pollution. There are two main components to this opportunity.[88] First, heating and cooling performance can be improved by retrofitting systems in existing buildings and installing more efficient technology in new buildings.[89] Simple building refurbishment can reduce energy consumption by up to 30 percent; more major overhauls can reduce it by up to 80 percent.[90] As an alternative to building-specific systems, district heating and cooling can improve efficiency up to 90 percent by linking electricity generation and heating.[XVII] Second, more efficient lighting, appliances and electronics can reduce electricity demand. We estimate that more efficient lighting – including switching to light-emitting diodes (LEDs) and substituting natural light – could alone provide over 78 percent of energy cost savings by 2030. Components of improving energy efficiency also have knock-on positive effects on land use. For instance, the use of urban green spaces is a common complement to improving energy efficiency, as the temperature cooling effect provided by urban greenery (e.g., up to 2°C in Singapore) reduces the energy demand from cooling systems.[91] Such components are critical to ensuring that improving building efficiency is nature-positive in its outcomes; tools such as mandatory building standards combined with environmental impact assessments (EIAs) are key enablers.

XVII. District energy enables the use of low-grade waste heat from electricity generation or free cooling sources such as seawater. Investments in district energy may be more economical than further retrofits where buildings are already relatively efficient. District energy has not been separately sized as it is difficult to accurately estimate how it would substitute for building-level investments in energy efficiency. However, its potential contribution is significant.

EXHIBIT 9:

BUSINESS OPPORTUNITIES IN INFRASTRUCTURE AND THE BUILT ENVIRONMENT COULD CREATE OVER US$1.2 TRILLION OF ANNUAL VALUE IN 2030 AND LARGE BIODIVERSITY BENEFITS



SOURCE: Business and Sustainable Development Commission (BSDC); The Nature Conservancy (TNC); New Climate Economy (NCE); McKinsey Global Institute (MGI); International Finance Corporation; UN Environment Programme; Market research; Expert interviews; Literature review; AlphaBeta analysis

BOX 4

SUPPORTING ENERGY EFFICIENCY IN THE PHILIPPINES[92]

The Asian Development Bank (ABD) assists several member governments with national drives to replace incandescent light bulbs with more energy-efficient and longer-lasting compact fluorescent lamps (CFLs). The Philippine Energy Efficiency Project, co-financed with a US$1.5 million grant from the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility, supported by the Government of Japan, is one such project. The project seeks to reach 13 million households in the Philippines to accept free CFLs. CFLs use around 20 percent of the electricity to produce the same amount of light, help lower consumption and bring down electricity bills, which especially help the poor. It was estimated that replacing a million incandescent bulbs with CFLs for US$1.5 million could cut electricity demand by 50 megawatts, which is equivalent to the impact of building a "virtual power plant" that would cost US$50 million to build and US$2-3 million per year to operate. The government of the Philippines estimated that by investing US$46.5 million in such energy efficiency projects, it could defer US$450 million in new power plants, save US$100 million annually in fuel costs, and reduce carbon emissions by around 700,000 tonnes.

Improving **solid waste management** could create an additional revenue opportunity of US$198 billion in 2030 with higher collection and recycling – around two-thirds of the global opportunity.[93] Asian cities with large urban populations, particularly in low- and middle-income countries can generate over a million tonnes of solid waste daily.[94] With solid waste management remaining a low priority, these waste streams can have significant impact on biodiversity and nature by utilising large areas of land, causing severe pollution, spreading diseases, generating GHG emissions, and exacerbating urban flooding. Addressing emerging Asia's urban waste generation is therefore critical to reducing its strain on biodiversity, as solid waste management facilities replace the open dumping and landfill practices that cause these biodiversity impacts.[95] Key components of waste management infrastructure include waste collection, sorting, and recycling facilities, often combined together in the form of integrated waste management facilities (IWMF) to further reduce land conversion pressures.[96] India accounts for US$82 billion of the opportunity, while low- and middle-income countries in Asia Pacific including Thailand, Indonesia, the Philippines, and Vietnam account for US$63 billion all together. However, high-income countries such as Singapore and Australia also have key areas for progress, including reducing dependency on open dumping, landfills, and incineration. This opportunity will be supported by developing policy and regulatory oversight for solid waste collection by local governments and by increasing the efficiency of collection through partnerships with private sector partners.[97] Waste collection must also be linked to a shift to more circular models of production that emphasise reduction, reuse, and recycling of waste.[XVIII]

Repurposing land freed from parking for new commercial purposes could generate an annual rental value of US$146 billion in Asia Pacific in 2030. Parking facilities impose significant impact on nature by utilising scarce and often valuable land area for vehicles. Parking is also an unproductive use of land – in many city centres, cars in parking lots remain unused for over 95 percent

XVIII. Circular models discussed in further detail in section 2.4.

of the day.[98] These parking requirements could be reduced by up to 95 percent through a combination of encouraging shared mobility (e.g., public transport, car sharing and ride sharing) and rethinking policies such as minimum parking requirements and price controls on parking.[99] Repurposing this land could create large commercial opportunities that could be devoted to sustainable infrastructure and more productive land uses, while reducing the overall land footprint of cities and reducing land conversion pressures. Across 33 cities in Indonesia, for example, over 6,000 hectares of retail, office and on-street parking could be repurposed; this newly available land would have an annual rental value of US$7.2 billion, while saving an equivalent amount of new land from conversion.[100]

The Asian Development Bank (ADB) estimates that over 2016-30, there will be a US$600 billion annual transport infrastructure finance gap in its 45 member countries.[101] Private institutional investors could potentially help address up to US$138 billion of the financing gap for **sustainable transport infrastructure**.[102] China accounts for two-thirds of the regional opportunity (US$91 billion), which is unsurprising given that US$8 trillion has been committed to BRI projects through to 2049, including roads, railroads, shipping lanes, airports, dams, and gas pipelines from Eastern China through to the United Kingdom. Transport infrastructure currently has significant impact on biodiversity, by using large amounts of land and altering ecosystems and habitats during construction, while also utilising large amounts of construction materials including steel and concrete that bring with them their own impact on biodiversity. Studies show that the population density of mammals and birds tends to be lower in the vicinity of such infrastructure – this effect is seen from a few hundred metres to 50 kilometres away.[103] For transport infrastructure to be built sustainably, it must minimise the disruption of habitats, reduce associated emissions, and maintain or enhance biodiversity outcomes. This involves shifting away from optimising only for time and distance considerations to integrating positive biodiversity and climate outcomes. It is critical that this shift originate at the planning stage, to avoid fragmentation of intact ecosystems; in design, for example, by including wildlife corridors in sensitive areas; and in construction (Box 5). A particularly useful framework is the "mitigation hierarchy", which sequentially recommends projects to avoid, minimise, rehabilitate, offset, and compensate for impacts on biodiversity in all infrastructure deployment activities to successfully balance conservation needs with development priorities.[104] A range of innovations in finance can be used to channel the necessary funding, including seed capital for more risky investments and sustainability-linked debt instruments such as green bonds and loans. We estimate that returns on investment in sustainable infrastructure for the private sector – even accounting for potential additional costs of compliance and procurement – could be between 2.5 and 3.5 times the initial investment.[105]

THE ADB ESTIMATES AN ANNUAL TRANSPORT INFRASTRUCTURE FINANCING GAP OF US$600 MILLION IN ASIA PACIFIC, AROUND A QUARTER OF WHICH CAN BE FINANCED BY PRIVATE INVESTORS SUSTAINABLY

Green long-range transport is a large market opportunity for using renewable electricity and second-generation liquid biofuels and biogas in the transport sector, which could create up to US$107 billion in additional revenues in Asia Pacific in 2030.[106] China accounts for US$52 billion of this opportunity, with the remainder of the opportunity evenly split between India, high income countries in Asia Pacific, and other low- and middle-income countries in Asia Pacific. Green long-range transport technologies can significantly help reduce the climate impact of infrastructure that connects built environments – the transport sector accounts for 13.5 percent of carbon emissions in Asia Pacific.[107] Second-generation biofuels are produced from non-food crops, including the waste from food crops, agricultural residue, wood chips, and waste cooking oil. These solve for the problems of first-generation biofuels including those made from sugar, starch and vegetable oils that were grown in competition to food crops using similar resources by using no additional agricultural inputs such as land, water, or fertilisers.[108] Examples of direct applications of renewables on long-range transportation include railway electrification and vehicles powered by renewables,

BOX 5

SINGAPORE'S ECO-BRIDGES

Eco-bridges are a type of wildlife corridor or crossing that reduce the ecosystem fragmentation caused by building roads through intact forests or grasslands. By providing the link, wildlife can continue to maintain their range across their native ecosystem without the dangers of human interaction (particularly with cars), reducing threats to their habitat and sources of food.

Singapore's Eco-Link@BKE is Southeast Asia's first such ecological bridge, opened in 2013 across the Bukit Timah Expressway (BKE). The bridge connects two nature reserves – the Bukit Timah and Central Catchment – in Singapore's last remaining primary forest area. Wildlife move freely across the link, with native plants continually being pollinated as a result by animals moving across the reserves.[109] Singapore also launched the Mandai Eco-Link bridge in 2019.[XIX] The bridge connects two the wooded areas on either side of the Mandai Lake Road for the first time in 60 years since the road was originally built, providing native pangolins, colugos, and lesser mousedeer safe passage and reducing roadkill incidents in the Mandai Precinct.

XIX. Straits Times, 2019, "New wildlife bridge now open in Mandai – but it's animals only, please", https://www.straitstimes.com/singapore/new-wildlife-bridge-now-open-in-mandai-but-its-animals-only-please

as well future fuels such as hydrogen fuel cells which although not included in the sizing of this opportunity could represent a significant market opportunity by 2040 (discussed further in the following section).

Nature-based solutions for water supply could save US$51 billion in providing clean and safe drinking water for Asia Pacific's burgeoning urban population in 2030.[XX] Asia's megacities face severe water scarcity – with the continent registering the lowest per capita water availability in the world.[110] Water depletion across urban watersheds is the highest in Asia of any region globally due to pressures from agriculture, mining, and urbanisation, and over 60 percent of the area encompassed by source watersheds in the region is at risk.[111] For instance, the Indian city of Chennai built its Information Technology (IT) corridor on a large area of marshland, severely reducing the capacity of its last remaining urban wetland to recharge groundwater, while also increasing the frequency of floods during periods of heavy rainfall.[112] 60 percent of the city's groundwater will be critically degraded by 2030. Reforestation and protection of urban and peri-urban watersheds remains a key solution in India and also across the Asia Pacific.[113] This would not only restore degraded landscapes and improve water security, but also reduce the risk of extinction for thousands of species. This is particularly applicable to cities in the Mekong Delta, which is home to 25 percent of the world's freshwater biodiversity. Additionally, there could

NATURAL SOLUTIONS FOR WATER SUPPLY COULD PROVIDE NEARLY 1,015 MTCO2e IN ADDITIONAL CARBON SEQUESTRATION BENEFITS IN ASIA'S URBAN WATERSHEDS

be significant carbon benefits, including avoiding up to 131 MTCO2e per year of emissions from tropical deforestation and sequestering up to 1,015 MTCO2e per year of carbon in soils and forests. Case studies from around the world suggest that Asian cities could significantly save on both upfront capital expenditure and annual operating costs by investing in natural water supply rather than in human-engineered solutions such as treatment and desalination, making a strong case for nature-based solutions. Cities could even see positive returns on their total project investment thanks to the savings they would generate in reduced annual treatment costs alone. Costs could be as low as US$2 or less per person annually. Innovative financing mechanisms such as water funds can enable water users – including consumers, businesses, utilities, and local governments – to invest collectively in these ecosystem services.

Reducing municipal water leakage could create cost savings opportunities worth up to US$38 billion in Asia Pacific in 2030.[114] The opportunity is particularly relevant in megacities and middleweight cities around the region – China accounts for US$15 billion of this opportunity value, low- and middle-income countries in Asia Pacific US$11 billion, and India US$8 billion. Overexploitation of freshwater resources in residential, commercial, and industrial applications have caused nearly all large Asian megacities to face water scarcity issues, further exacerbated by poorly constructed and maintained utilities supply lines. Adding smart sensors could save up to an estimated 40 billion cubic metres of water annually. Smart sensors are increasingly being deployed to reduce leakage by registering sudden drops in water pressure, which enables leaks to be located and engineers despatched quickly (Box 6). Returns on investments in water efficiency can be above 20 percent, but capital costs are high and some providers lack awareness about the benefits of reducing leaks.

XX. Based on estimates of cost savings in natural water supply projects.

BOX 6

REDUCING WATER LEAKAGE IN SINGAPORE USING SMART SENSORS

Singapore's water leakage rate of five percent is significantly lower than that of many other major cities thanks to the WaterWiSe monitoring system.[115] As of 2017, over 120 sensors were installed across 70 kilometres of Singapore's potable water supply lines, measuring flow rate and water pressure and detecting noise from leaks.[116] The system is a collaboration of Singapore's Public Utilities Board and Visenti, a spinoff of the Singapore-MIT Alliance for Research and Technology (SMART).[117]

2.4 OPPORTUNITIES IN A NATURE-POSITIVE ENERGY AND EXTRACTIVES SYSTEM

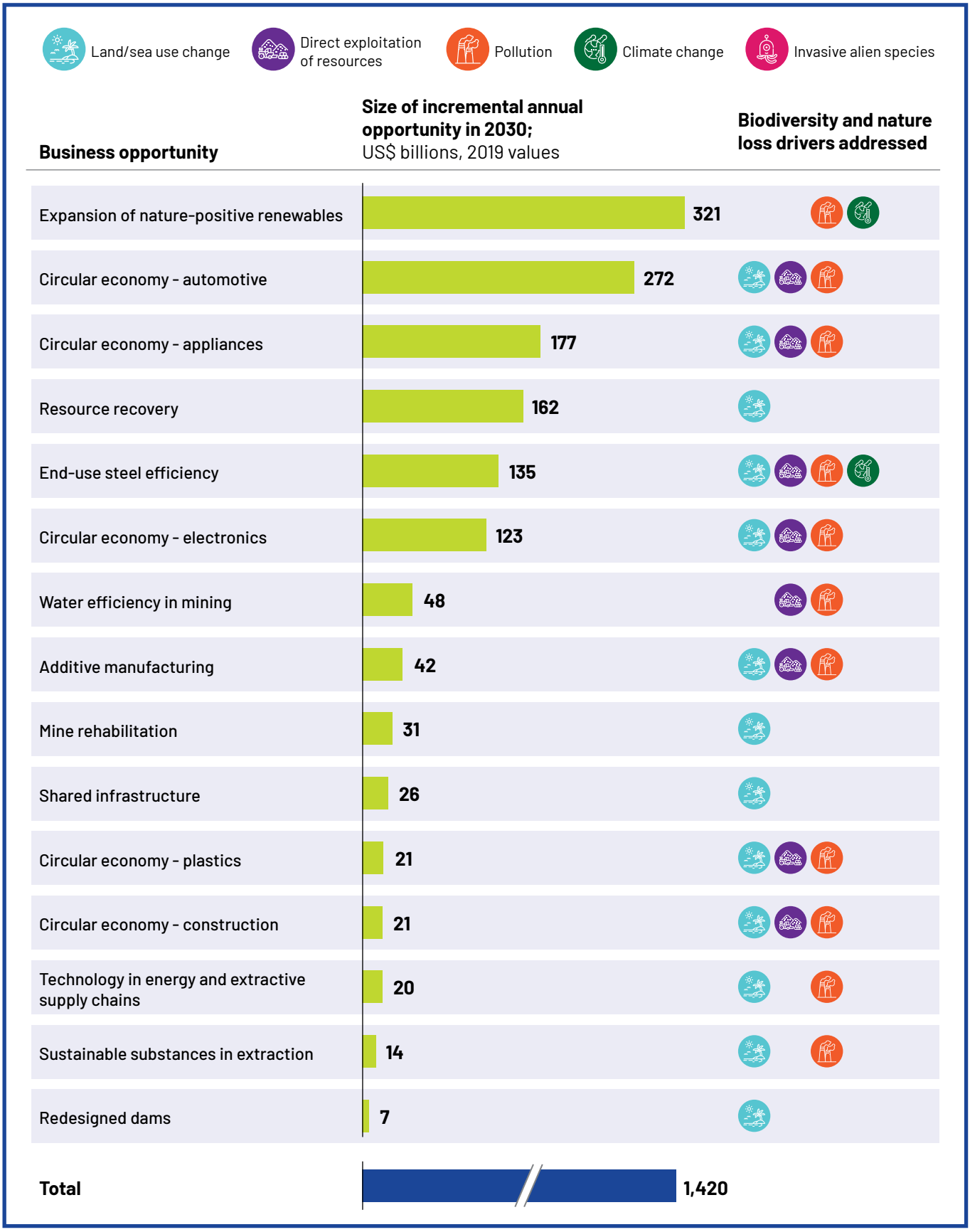
Systemic transitions in the energy and extractives system involves three main actions: improving our consumption efficiency to reduce the amount of resources we need to extract; improving how we extract those resources to minimise the impact on ecosystems; and shifting to more renewable energy in a manner that does not cause further harm to ecosystems. Achieving these objectives requires implementing and scaling 15 business opportunities. In Asia Pacific, these opportunities could create over US$1.4 trillion in incremental annual business value in 2030 (together with nearly 49 million new jobs), while bringing with them a range of biodiversity benefits in the key impact areas discussed in Chapter 1 (Exhibit 10). This section details some of the largest business opportunities identified in this system.

Nature-positive renewable energy is the largest opportunity for Asia Pacific in the energy and extractives system, creating a potential opportunity worth up to US$321 billion by 2030 and 17.8 million associated jobs. Asia Pacific is poised to become a key destination for renewable-energy development and investment in the coming decade, with capacity expected to increase by about two terawatts or 2,000 gigawatts (GW) by 2030.[118] Solar and wind are projected to be the main focus for governments and companies. Solar photovoltaic (PV) energy could more than triple to 1,500 GW by 2030, in comparison with 430 GW in 2020, with China remaining the largest regional and global market, adding 619 GW by 2030 and India the second largest, adding 138 GW.[119] APAC could become the world's second-largest offshore wind market, with capacity reaching 78 GW by 2030, building on strong returns in early phases of regional projects. Commercialised renewables had already become cost-competitive with traditional hydrocarbon sources before the COVID-19 price shock: solar energy without subsidies recently matched fossil fuel costs in over 30 countries and were projected to be cheaper than coal in China and India by 2021.[120] Although the pandemic is expected to reduce global solar and energy storage installations in 2020 by 20 percent compared to past projections,[121] a strong case is being made for stimulus packages to prioritise renewable energy investments because they provide returns of up to eight times the original investment, and renewable energy has the potential to generate millions of new jobs.

RENEWABLE ENERGY GENERATION CAPACITY COULD INCREASE BY 2 TERAWATTS BY 2030 FROM TODAY'S LEVELS

EXHIBIT 10:

BUSINESS OPPORTUNITIES IN THE ENERGY AND EXTRACTIVES SYSTEM COULD CREATE OVER US$1.4 TRILLION OF ANNUAL VALUE IN 2030 AND LARGE BIODIVERSITY BENEFITS



SOURCE: Business and Sustainable Development Commission (BSDC); International Renewable Energy Agency (IRENA); International Resources Panel (IRP); McKinsey Global Institute (MGI); Market research; Expert interviews; Literature review; AlphaBeta analysis

Decarbonisation of the economy is necessary and must accelerate, given that electricity generation and heat production account for over half of all carbon emissions in Asia Pacific,[122] but a nature-positive energy transition must further both global climate and nature goals.[XXI] While it is possible for all renewable energy deployments valued in this business opportunity to be designed in a nature-positive manner, it is also possible for them to be deployed in a nature-negative manner (despite being better for the climate than fossil fuels) if potential negative biodiversity tradeoffs are not addressed. There are two such tradeoffs to consider. The first is the potential for renewables deployments to increase land conversion pressures, which could be affected by siting and design decisions. For instance, if the singular aim is to maximise renewable energy production, more than six million hectares of forest and agricultural land could be disturbed to achieve India's targets. However, if projects are developed on degraded lands and combined with restoration and conservation, they could help meet decarbonisation targets while reversing land use conversion pressures. A study conducted by The Nature Conservancy (TNC) and the Center for Study of Science, Technology and Policy demonstrated that India has more than 10 times the low impact land needed to exceed its renewable energy goals.[123] An example of such a nature-positive renewable deployment is illustrated in Box 7. Offshore wind energy projects could also have synergies with the protection of high biodiversity marine areas. For example, China's Exclusive Economic Zone has areas of high potential for offshore wind that overlap with priority areas for biodiversity conservation:[124] combining the protection of this ocean area through MPAs and environmentally friendly offshore wind installations could bring significant biodiversity benefits.

The second tradeoff is to manage biodiversity risks from increasing demand for a new range of minerals and metals that are crucial inputs for renewable technologies, including nickel, cobalt, and lithium.[125] These inputs could become "green conflict materials" as identified metal and mineral reserves are proving increasingly difficult to extract,[XXII] while there is potential to fuel social conflict and inequalities where reserves are found.[126] Mineral development is encroaching into remote and often little disturbed locations, from mountain tops to beneath ice sheets. Decisions are about to be made on beginning commercial deep-sea mining for minerals used extensively in minerals; seabed mining techniques are new and the extent and severity of the potential impacts on deep ocean ecosystems not yet fully understood.[127] Scaling new business models to manage these risks as part of the nature-positive energy transition, including circular models in renewable projects supported by nature-positive extraction and sustainable supply chains, will thus be necessary. A large potential opportunity from the collection, repair, resale, and recycling of critical metals used in renewable energy could be available after 2030, once sufficient materials from the first wave of used materials recovered from older solar plants and wind farms built in the 2000s and early 2010s becomes available. For instance, materials used in Solar PV cells that could be profitably recovered include silicone, plastic, copper, cobalt, and lithium.[128] In the short term, substituting rare earth materials with alternatives that are more environmentally sustainable and available may have the most impact. For instance, following the 2010 price peak in neodymium (a critical material in wind turbines and electric vehicles), producers found ways to either need less neodymium or substitute it with other materials such as lanthanum and cerium, including by developing and deploying rare-earth-free turbines.[129, 130]

RESEARCH HAS SHOWN THAT INDIA HAS MORE THAN 10 TIMES THE STOCK OF DEGRADED LAND NEEDED TO EXCEED ITS RENEWABLE ENERGY GOALS, ENABLING CLEAN ENERGY DEVELOPMENT AND ECOSYSTEM RESTORATION

Circular models in the automotive sector could potentially creating cost savings of up to US$272 billion in Asia Pacific in 2030, while also creating over

XXI. Components of this transition have overlaps with forest ecosystem services/natural climate solutions that have been discussed under the food, land and ocean use system under business opportunities related to ecosystem restoration and avoided land and ocean use expansion. These components will not be discussed in detail in this section.
XXII. "Reserves" are energy and materials identified in location and quantity, and they are therefore easy to factor into supply chains and rates of consumption, whereas "resources" cannot be quantified without long-term geological surveys.

BOX 7

PAIRING SOLAR ENERGY DEPLOYMENTS WITH RESTORATION OF DEGRADED LANDS IN CHINA[131, 132]

Elion, the first Chinese company to commit to 100 percent renewables in its operations by 2030, started as a salt chemical engineering business in the Kubuqi Desert, of Inner Mongolia, China. Frequent sandstorms caused serious damage to its production activities and increased its costs in its early years of operation. To combat desertification and sandstorms, Elion developed a comprehensive ecological restoration-based economic system, enabled through an effective public-private partnership. Elion used its returns in the salt chemical industry to provide the initial capital for its ecosystem restoration activities, which eventually provided returns on the initial investment. The company took advantage of the abundant sunshine in the region to build one of China's largest PV power stations with high-rise solar panels, maintained by remote real-time monitoring. It then supplemented this eco-industrial system with animal husbandry, eco-tourism, and medicinal plants by planting medicinal sand plants that restore the soil, while providing Elion with an additional revenue stream. The technology package has successfully restored nearly 650,000 hectares of desert land, thanks to the construction of sand-protecting barriers, afforestation, and the closure of land for natural regeneration allowing the desert to form an ecological microclimate, while obtaining good economic and social value.

7.3 million jobs. The opportunity in China alone could reach US$122 billion by 2030, with high-income countries in Asia Pacific accounting for US$87 billion of the cost savings generated. Demand for a range of materials in the automotive sector have fuelled land conversion pressures from the mining sector and associated pollution of freshwater ecosystems near mining sites, while remaining mineral reserves are in more fragile ecosystems and are increasingly harder to extract. It is therefore critical to reduce these biodiversity risks by reducing the demand for new materials in the automotive sector entirely. Opportunities exist to recover manufacturing costs in materials including plastics, metals, and alloys. A small number of components, such as transmission systems, are responsible for how long most vehicles can last. Closed-loop recycling – in which manufacturers can refurbish and reuse some parts, such as transmissions – retains more value and uses less energy than recycling parts into base materials. This closed-loop approach requires vehicles to be designed with remanufacturing in mind; it also requires investment in centralised refurbishment plants, stronger car sharing models, and markets for refurbished vehicles. Some estimates suggest that vehicle models that include circular loops could be three times more profitable than traditional vehicles, providing the global automotive industry, which is undergoing severe disruptions, with a major profit pool and a new source of jobs.[133]

BOX 8

RECYCLING FOR THE MOBILITY REVOLUTION IN CHINA

By 2030, electric vehicles (EVs) are expected to take up 40 percent of the overall vehicle sales in China.[134] These ambitious shifts in urban mobility create urgency around the issue of EV batteries. Used batteries, if not properly managed, can have huge environmental costs as they can leach heavy metals and toxic residues. At the same time, every year, over six million tonnes of electronic products are discarded in China, representing a significant loss in economic value and a risk to the environment.[135]

China's GEM Co, the world's largest battery recycler, plans to collect and process 30 percent of China's discarded electric vehicle batteries in coming years. The company already has the highest electronic waste recycling capacity in China, recovering and recycling more than 10 percent of the China's total battery waste, 15 percent of used household appliances, and 20 percent of circuit boards. The company has committed to investing US$48 million in a project to produce 100,000 tonnes per year of battery-grade nickel and cobalt from their captured recycling process in China's Hubei province. Such approaches keep important minerals in constant use, avoiding the environmental externalities and economic losses associated with using virgin inputs in the production process. GEM Co. supplies these recycled materials to electronics manufacturers such as Samsung SDI and Ecopro Co. Ltd.

Improving resource recovery in extraction can save up to US$162 billion in Asia Pacific annually in 2030. China accounts for US$118 billion of this opportunity – over two-thirds of regional and half of global value of the opportunity. Mining and oil and gas operations often do not fully utilise all the resources in one site before moving on to new areas, increasing damage to biodiversity. New technologies and more mechanisation could enhance material recovery rates by up to 50 percent, reducing further land conversion pressures.[136] There are also opportunities to extract value from waste. For example, high-value metals can be recovered from waste streams generated by extracting and processing alumina, nickel, gold, copper, and zinc.[137] The internal rate of return from investing in such technologies could be greater than 10 percent.[138] Appropriate regulations will help unlock this opportunity, such as clear standards or targets on recovery rates.

Increasing **steel efficiency in end-use applications** could generate a cost savings of up to US$135 billion by 2030 in reduced material usage and energy demand. This opportunity is particularly relevant for China's world-leading steel sector – the country alone accounts for US$86 billion of this opportunity. Steel production has a range of impacts on the environment, including mining conversion pressures for iron, manganese, and phosphorous; significant use of energy in production; emissions of carbon, sulphur, nitrous oxides, and particulate matter; hazardous and solid wastes; and wastewater contaminants.[139] In fact, iron-steel production chains have the highest GHG emissions among metals, representing around a quarter of global industrial energy demand[140] – with China representing half of this consumption.[141] Reducing end-use of steel can proportionally reduce these biodiversity risks. Steel's per-unit energy consumption is around 40 percent lower than it was in 1980, but further gains will require a focus on reducing usage – through reuse, recycling and using high-strength steel to make more lightweight products.[142] Higher-strength steel can reduce the amount of steel needed in construction by up to 30 percent. By 2030, the cost savings opportunity also involves design optimisation in the construction, machinery, and automobile sectors, which together constitute 80 percent of global demand.[143]

Fully **rehabilitating mines** and oil and gas wells to remove contaminants, and developing post-mining local economies, could create a market opportunity for specialist companies worth up to US$31 billion by 2030. Mining sites have severe impacts on critical ecosystems. Not only are rich mineral deposits likelier to be in areas with rich biodiversity such as tropical forests requiring extraction sites to clear large swathes of land, but the extraction process itself uses a range of invasive extraction techniques and harmful chemicals that cause severe land degradation.[XXIII] Ancillary infrastructure that support mines, including roads and train lines to carry raw material to processing centres, further disturb habitats, fragment ecosystems, and utilise resources. Once extraction sites have exhausted available reserves, it is therefore critical that post-extractive sites and communities must be systematically rehabilitated to achieve a nature-positive extractives lifecycle. Abandoned mines and wells not only threaten ecosystem health, but also human health because of their safety and contamination issues while also curtailing alternative land uses.[145] Regulations can mandate rehabilitation in mine design and granting of concessions, demanding that companies develop closure and restoration plans and put adequate funds for restoration in escrow. For instance, Australia requires mines to be returned to "original" or similar conditions (Box 9).[146] Remediation activities are carried out by specialised businesses in partnership with mine operators. Rehabilitation processes vary by region and socioeconomic conditions, but they generally involve restoring topsoil, planting native species, and restoring natural drainage patterns.[147]

PLASTIC RECYCLING RATES VARY EVEN IN HIGH INCOME COUNTRIES – CHINA RECYCLES 25 PERCENT OF ITS PLASTIC WASTE, BUT SINGAPORE RECYCLES ONLY 4 PERCENT

Circular models for plastic packaging have the potential to create cost savings worth US$21 billion in Asia Pacific in 2030. Demand for plastics in packaging have fuelled land and sea conversion pressures from the oil and gas sector together with associated ecosystem pollution from waste leakage into oceans. It is therefore critical to capture the economic value of plastic packaging waste to reduce demand for virgin material as well as the damaging impact of waste on marine ecosystems. The vast majority of the economic value of plastic packaging is currently lost, with wide ranges of recycling rates across the region even at the more developed end of the spectrum – for instance, China recycles 25 percent of its plastic waste, whereas Singapore recycles only four percent.[148] The plastic packaging economy is expected to double in value globally by 2030, and this rate of increase could be far higher in Asia Pacific under the right conditions.[149] Levers such as improving packaging design and harmonising collection and sorting systems combined with high-quality recycling technology could potentially make plastic recycling cost-competitive compared to alternatives such as landfill, incineration, and energy recovery.[150] Recovering the amount currently lost to landfills and pollution will require a major change in consumer behaviour. Public policy and business initiatives will need to identify the most effective means to change recycling habits.

While a range of nature-positive business models are available, there remain key challenges for businesses and investors to overcome to pursue these models. The following chapter explores some of these barriers in greater detail and discusses potential solutions.

XXIII. For more information on nature-positive mining practices in the exploration, extractive, and maintenance phases of the value chain, please refer to the transition "nature-positive mining" in Chapter 4 of The Future of Nature and Business report: World Economic Forum, 2020, The Future of Nature and Business, http://www3.weforum.org/docs/WEF_The_Future_Of_Nature_And_Business_2020.pdf

BOX 9

MINE REHABILITATION IN AUSTRALIA[144]

Mining has long underpinned Australia's economic growth. The scale of its mining projects often requires similarly extensive rehabilitation schemes to restore the environment that has been damaged by extractive activities. To ensure systematic mine rehabilitation, Australia's regulations require mining companies to integrate rehabilitation plans into mine development in order to obtain mining permits.

Alcoa is one of Australia's leading mining companies; its mines supplied almost half of the bauxite produced in Australia in 2011. This scale of operation has led to considerable deforestation since their mines opened in 1963. To restore the degraded land at their extractive sites, Alcoa follows defined methods to reduce topsoil degradation during their operations (making subsequent restoration easier) and implements a comprehensive reforestation scheme once its mining operations are done. The company partners with local nurseries for tree plantings and works closely with scientists for species monitoring. Alcoa's reforestation programme has yielded positive results – for instance, it has successfully restored 100 percent of the plant species that were present in the Jarrah Forest before mining work in the ecosystem began.

Other mining companies in Australia are also working on similar restoration projects. Given how recent the practice of mine rehabilitation is, there is still a gap in the evidence for the most effective restoration techniques, requiring business to work closely with scientific, conservation and local communities to identify the most suitable solutions for each use case.

Photo source: https://www.ser-rrc.org/

Chapter 3:

INNOVATIVE SOLUTIONS FOR UNLOCKING THE US$1.1 TRILLION NEEDED TO POWER THE NATURE-POSITIVE ECONOMY

Business, government, and society have an opportunity to turn the vision of a nature-positive economy in the Asia Pacific region into reality, but this will be challenging. There remain a number of key barriers to unlocking these opportunities, chief among them mobilising the requisite capital to develop new business models. Encouragingly, business and community leaders in Asia Pacific have identified a range of solutions to address key barriers to investment today to unlock the financing required over the coming decade for a nature-positive economy.

3.1 US$1.1 TRILLION OF CAPITAL INVESTMENT WILL BE REQUIRED ANNUALLY THROUGH 2030 FOR A NATURE-POSITIVE ECONOMY IN ASIA PACIFIC

The business opportunity from reversing biodiversity and nature loss in Asia Pacific is significant: an annual opportunity of US$4.3 trillion in 2030, accompanied by 232 million jobs. Strong leadership is required by the region's business community to mobilise the momentum and resources required to unlock this opportunity, particularly given that government resources have been extremely strained by the fiscal response to the COVID-19 pandemic. Among the many resources required is substantial financial capital, as the opportunities can only partly be captured by reorienting existing processes. We estimate that the total annual investment required for all 59 opportunities across the three systems is around US$1.1 trillion through 2030 (Exhibit 11).[XXIV] This is equivalent to around 41 percent of the US$2.7 trillion required globally for the same purpose. While substantial, this is a fraction of the US$31.1 trillion announced by the ADB's 45 member countries to combat the COVID-19 pandemic.[151]

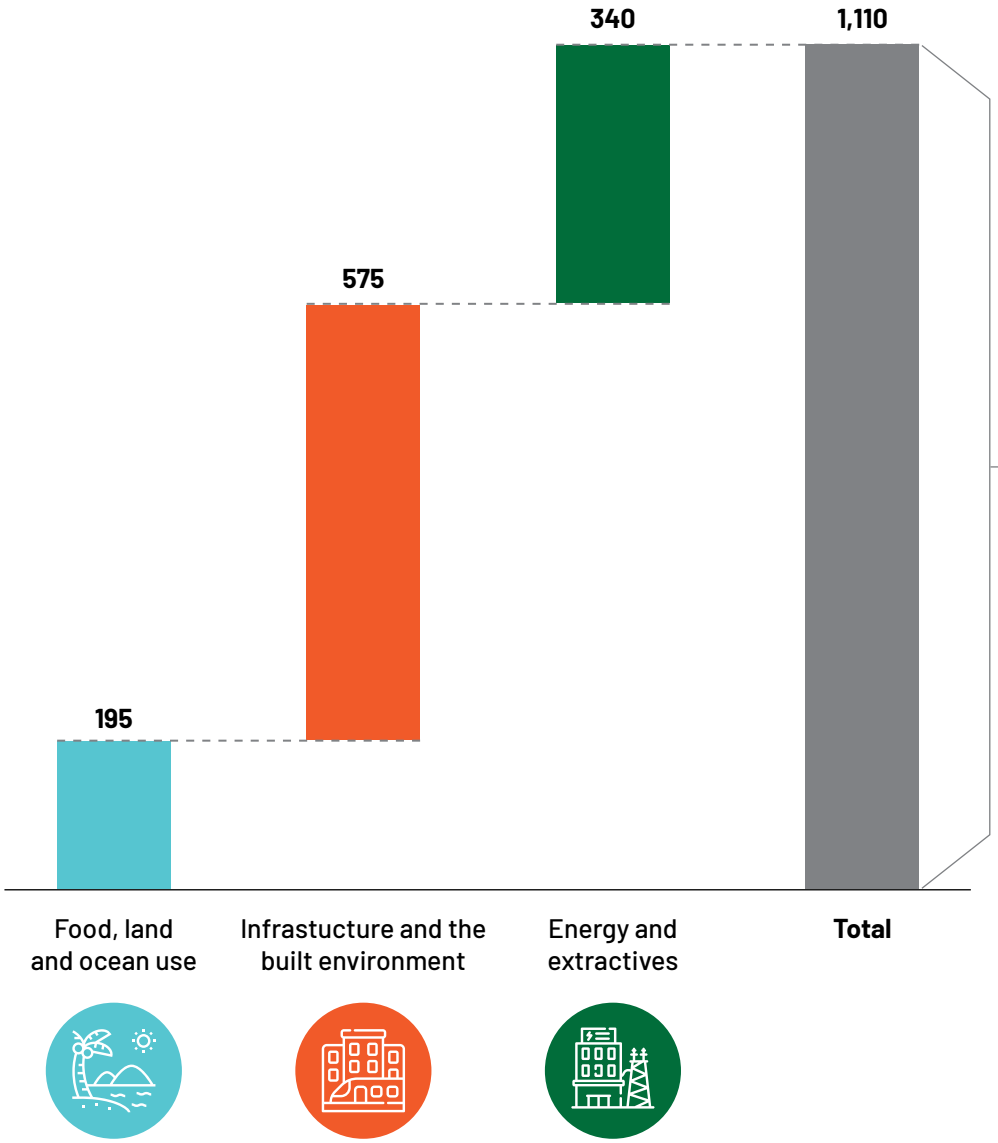
In general, opportunities related to decarbonisation in the infrastructure and built environment and energy and extractives systems are capital intensive and account for the bulk of overall annualised investment costs, such as improving building energy efficiency or expanding deployment of renewables. Large opportunities related to addressing other drivers of biodiversity loss such as changes in land and sea use, direct exploitation of resources, and pollution that require comparatively lower capital include reducing consumer food waste and natural systems for water supply. Opportunities in the food, land, and ocean use system also generally create more jobs due to more of the opportunities being labour-intensive (as opposed to capital intensive) in nature. Leveraging this report's findings, nature-positive business opportunities in this system could create 604 new jobs for every million dollars of capital investment by 2030, versus 113 in the infrastructure and build environment system and 144 in the energy and extractives systems.

XXIV. This estimate excludes supporting investments not directly related to the business opportunities. For example, investment in green corridors in urban spaces may be crucial to support the development of sustainable cities but is not linked to a business opportunity.

EXHIBIT 11:

CAPITAL INVESTMENT REQUIRED TO CAPTURE OPPORTUNITIES IN THE THREE SYSTEMS IN ASIA PACIFIC IS AROUND US$1.1 TRILLION ANNUALLY

Annualised investment costs (2020-30)
US$ billions; 2019 values[1]



While this is a substantial capital demand, it is less than 4% of the

US$31.1 trillion

amount announced by ADB's 45 member countries to combat the COVID-19 pandemic

1. Based on estimated investment requirements to capture the business opportunities linked to transitions in each system. Rounded to nearest $5 billion.
SOURCE: Literature review; Global Sustainable Investment Alliance; AlphaBeta analysis

3.2 BUSINESS LEADERS IN ASIA PACIFIC HAVE IDENTIFIED KEY BARRIERS TO INVESTMENT IN NATURE-BASED SOLUTIONS AND BIODIVERSITY BUSINESS OPPORTUNITIES ACROSS FOUR THEMES

Despite the large opportunities presented by nature-positive business models, many challenges remain in mobilising the requisite financial capital to develop these models and unlock their economic value. In an exclusive survey conducted for this research, business and community leaders in the Asia Pacific region have highlighted a range of key barriers to investment today (Exhibit 12).[XXV] The barriers identified, while interlinked, can be broadly categorised into four areas – regulatory challenges, market barriers, information gaps, and the lack of supportive enablers for investment. This section analyses each of these barriers in greater detail.

Principal among the key barriers to investment are **regulatory challenges. Insufficient pricing of externalities** in goods and services today is a top-of-mind challenge for the business community, with 60 percent of surveyed business leaders indicating this as an important barrier to investment. Insufficient pricing of externalities for products and services disguises their true cost and environmental impact, particularly in terms of GHG emissions. Many forms of natural capital are in fact available at no charge, which artificially lowers the cost of nature-negative business models.[152] The cost of such externalities can be extremely high – it is estimated that the global value of environmental externalities is US$4.7 trillion across water use, GHG emissions, waste, air pollution, land and water pollution, and land use.[153] Without the externalities being factored into the prices of products and services, nature-positive business models that reduce or eliminate environmental externalities at potentially higher initial costs of input materials, technology, production equipment, and/or labour may be less attractive investment opportunities in contrast with BAU, nature-negative production models. Implementation of externality pricing models, on the other hand, may bring about its own challenges. One risk is that increased costs may simply be passed on to consumers. Analysis by Trucost and McKinsey shows that if the environmental impact of production of food was included, the prices of soft commodities could increase by 50 to 450 percent.[154] This could bring about disproportionate impact on low-income consumers. For instance, carbon emissions tax leading to increased cost of utilities would impact poor households more, as they spend a greater proportion of their incomes on utilities compared to higher-income households.[155] Solutions are available for this challenge but require thoughtful policies. For instance, Singapore in the past has compensated low-income households for increases in water tariffs by providing rebates in the form of "quasi-cash" that households could draw on at any time to pay utility bills, including water.[156] The impact on competitive dynamics in the food and agriculture system of subsidy reform and/or carbon pricing in particular could also be dramatic.

Other regulatory challenges relate to key **government levers and policies that further incentivise BAU**, nature-negative business models. Many fiscal policies make destroying nature cheaper than protecting it, both globally and in Asia Pacific. For instance, more than US$300 billion is annually spent on fossil fuel subsidies globally,[157] including nearly US$100 billion in China, India and Indonesia combined.[158] Roughly US$20 billion of annual fishing subsidies contribute to the overcapacity of fishing fleets, a large proportion of which are in Southeast Asia.[159] Governments around the world provide around US$530 billion annually in public subsidies and market price support for farmers, particularly in countries such as India and China, but only 15 percent of these incentives support public goods and sustainable outcomes while the majority may spur the overuse of

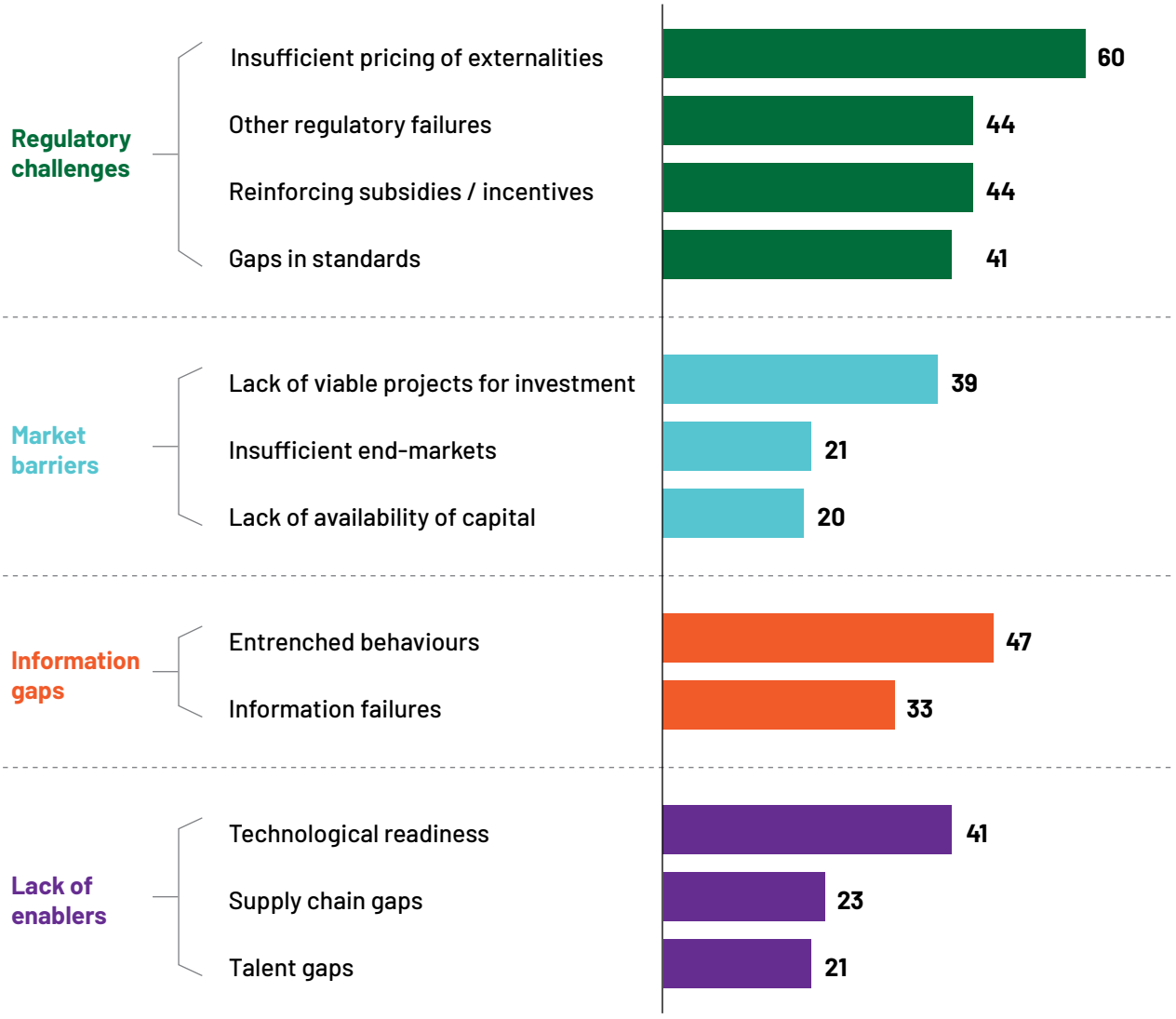
ANNOUNCED FISCAL STIMULUS PACKAGES IN RESPONSE TO THE COVID-19 PANDEMIC WILL CREATE A NET NEGATIVE ENVIRONMENTAL IMPACT IN ALL MAJOR ECONOMIES IN ASIA PACIFIC

XXV. Please refer to the Appendix for further details on survey methodology.

EXHIBIT 12:

BUSINESS AND COMMUNITY LEADERS HIGHLIGHTED A NUMBER OF KEY BARRIERS TO INVESTMENT IN NATURE-POSITIVE DEVELOPMENT

BARRIERS TO INVESTMENT IN NATURE-BASED SOLUTIONS AND BIODIVERSITY BUSINESS OPPORTUNITIES
Percent of survey respondents identifying barrier as relevant



SOURCE: AlphaBeta survey of 70 business and community leaders in Asia Pacific

fertilisers and natural resources.[160] The Greenness for Stimulus Index concluded that the announced stimulus measures in response to the COVID-19 will create a net negative environmental impact in all countries analysed in the Asia Pacific region, including China, India, Indonesia, the Philippines, Japan, The Republic of Korea and Australia.[161]

Studies have shown that nature-positive investments have comparable or even higher return on investment (ROI) than traditional investments. For instance, a global comparison between 10-year returns on renewable power and fossil fuel from 2011-20 showed that the former generated seven times more returns (422 percent) than the latter (59 percent).[162] Chapter 2 details a range of nature-positive business opportunities with internal rates of return (IRR) that significantly outweigh associated costs. However, **market barriers** may be more related to the type of investors rather than the actual returns. Investments are typically needed by small and medium-sized enterprises (SMEs), which often lack direct access to capital markets. Moreover, smaller average investment sizes and novel revenue models may make investment more difficult. For example, distributed electricity generation has higher capital costs per unit of electricity. Some opportunities require payments for "ecosystem services" (PES), where beneficiaries of ecosystem services make payments to ecosystem services stewards, such as landowners, in return for a guaranteed flow of services over-and-above what would be provided without payment.[163] For example, in India, there is a 20-year agreement where Palampur Municipal Council (PMC) will pay Rs 10,000 annually to the Village Forest Development Society (VFDS) as PES for the protection and management of Bheerni forest. In return, the VFDS has agreed to protect and conserve the catchment area of the Bohal spring to ensure the sustainable supply of water.[164] In many jurisdictions, these models are new, creating perceptions of higher risks and transaction costs.

The **lack of viable projects for investment** at scale also presents a key challenge as this means available capital is not fully deployed. In sustainable infrastructure, it is estimated that US$6.9 trillion is required a year annually till 2030 to meet climate objectives, much of which is concentrated in Asia Pacific due to regional challenges in climate resilience.[165] However, one of the major challenges impeding institutional investor flow to sustainable infrastructure is the lack of a sizeable project pipeline and "bankable" opportunities,[166] with institutional investors' share of total global private participation in infrastructure financing being extremely low at 0.67 percent.[167]

Lack of accurate information available to investors and businesses also poses a key barrier to investment. Stakeholders often lack key information on business opportunities, ROI and risk profiles, and appropriate projects and/or financing solutions. For instance, only 23 percent of the largest companies in APAC disclose biodiversity risks, due to a lack of understanding on the impact of such risks on their business.[168] Businesses today also need to contend with a complicated landscape for compliance which only increases costs – it is estimated that there are over 600 environmental, social and corporate governance (ESG) reporting provisions globally, of which over 150 are in Asia Pacific.[169] This is a result of the complexity of measuring biodiversity through a single methodology. The lack of harmonised standards (a regulatory barrier) creates gaps in measuring and comparing business performance for investors looking to invest in sustainable development.[170] Such gaps have proven prohibitive to sustainable investing in Asia Pacific, despite the presence of capital. According to the Global Sustainable Investment Alliance, the proportion of sustainable investing relative to total managed assets was less than one percent in Asia in 2016, compared with just over 26 percent globally, with some increases observed in recent years but the region still lags the global average.[171] Gaps have also resulted in Asia lagging other regions in terms of sustainability reporting. There are large variations in the region in terms of company disclosure rates across environmental and social practices, ranging from 31 percent disclosure in Japan to just three percent in Indonesia.[172]

THERE ARE OVER 600 ESG REPORTING PROVISIONS GLOBALLY, OF WHICH OVER 150 ARE IN ASIA PACIFIC

Entrenched behaviour is a further barrier highlighted by 47 percent of business leaders in Asia Pacific. For example, adopting circular economy approaches with appliances and plastics requires significant shifts in consumer behaviour (e.g., ensuring that e-waste is not disposed of in regular trash), but this has been a key challenge in many countries across the Asia Pacific.[173]

Finally, business leaders indicate **gaps in the enabling environment** to encourage investment in nature-positive business opportunities. Technological readiness is a key gap. Many "clean" technologies today come with large "green premiums", which is the additional production cost of choosing a nature-positive technology in production as opposed to a traditional method.[XXVI] For instance, in driving efficiency in steel production, the utilisation of green hydrogen in the process (instead of grey hydrogen), combined with renewable energy, could enable carbon-neutral steel production. However, the cost of green hydrogen is still more than twice the cost of grey hydrogen.[174] Green premiums are a useful indicator for key areas where further technological innovation is required, but the prize could be significant. In the World Economic Forum's global report on The Future of Nature and Business, Fourth Industrial Revolution (4IR) technologies play an important role in enabling 80 percent of business opportunities identified, playing a critical role for opportunities such as bio-innovation, alternative meats, additive manufacturing, and blockchain in supply chains. These are also large opportunities in Asia Pacific – for instance, the rise of bio-innovation, including plant and animal genetics technology, could be worth close to US$14 billion per year in the region in 2030.

4IR TECHNOLOGIES PLAY AN IMPORTANT ROLE IN ENABLING 80 PERCENT OF THE NATURE-POSITIVE BUSINESS OPPORTUNITIES IDENTIFIED GLOBALLY

XXVI: "Green premiums" are typically associated with clean technologies for reducing greenhouse gases, but are also applicable to technologies promoting biodiversity.

3.3 BUSINESS LEADERS IN ASIA PACIFIC HAVE IDENTIFIED INNOVATIVE SOLUTIONS TO GALVANISE INVESTMENT IN NATURE-BASED SOLUTIONS AND BIODIVERSITY BUSINESS OPPORTUNITIES

The challenges highlighted in the previous section are solvable but require innovations in the capital investment process. Business and community leaders in Asia Pacific have identified a range of solutions to address the key barriers to investment today to unlock the financing required over the coming decade for a nature-positive economy. These solutions can similarly be categorised into three broader areas – regulatory solutions, market mechanisms, and information solutions (Exhibit 13). Many of the proposed solutions could mobilise sufficient capital and de-risk nature-positive investments effectively. However, further evidence on the impact potential of some solutions is needed.

Five key **regulatory solutions** have been proposed by business and community leaders. 63 percent of surveyed respondents agreed that **externality pricing models** are a key solution – the highest of any highlighted in this study. Such models would be designed to capture the true cost of natural capital and environmental externalities. Some progress has been made in recent years on factoring in externalities, with carbon pricing being the most extensively studied and implemented. Evidence has shown an impact in the form of reduced emissions. In Asia, Japan was the first country to implement a carbon tax in 2012.[175] Statistics from the National Institute for Environment Studies in Japan report a decrease in emissions by 12 percent in 2018 compared to 2013 levels, which was attributed to the use of low-carbon electricity incentivised by the carbon tax.[176] In the United Kingdom, a hike in carbon taxes from €7 per tonne to €36 per tonne over 2012 to 2018 led to a fall in electricity-related emissions by 73 percent over the same period.[177] It is estimated that for every €1 increase in carbon taxes, emissions from fossil fuel consumption could reduce by 0.73 percent over time.[178] However, beyond carbon pricing, there have been significant challenges in pricing in externalities such as water, energy, and natural resources. These challenges are largely due to large variances in the abundance of natural capital in different regions, difficulties in ascertaining the relative importance of ecosystem services to production

LOW-CARBON ELECTRICITY INCENTIVISED BY CARBON TAXES IN JAPAN LED TO A 12 PERCENT REDUCTION IN EMISSIONS OVER A FIVE-YEAR PERIOD

in specific locations, measurement challenges in determining biodiversity impact, and related difficulties in creating an understandable pricing regime. The latest research still discusses externality pricing at a theoretical level, with more effort required to develop practical solutions, including natural capital accounting systems that are discussed in greater detail later in this section.

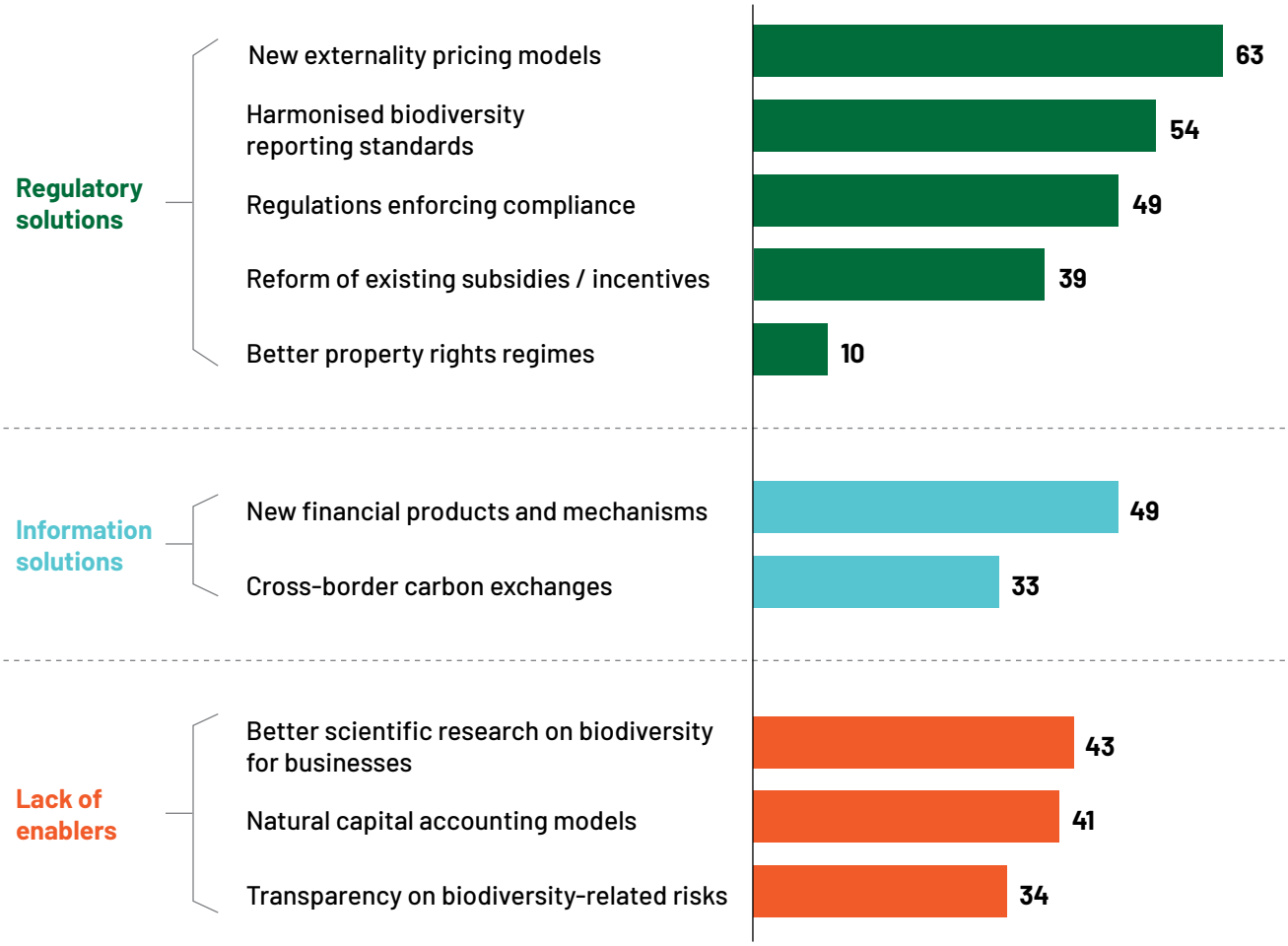
54 percent of business and community leaders agreed that **harmonisation of biodiversity standards** is of critical importance. Clear standards ensure accountability of businesses towards biodiversity goals, allowing investors to assess their performance through comparable, consistent, and reliable information. One promising initiative is the IFRS Foundation's International Sustainability Standards Board (ISSB), which is developing a global standard for sustainability-relating financial reporting standards ahead of The United Nations Climate Change Conference (COP26) in November 2021.[179] Efforts by securities regulators in Asia to address the lack of common sustainability standards are also a positive step towards harmonisation (Box 10).[180]

Policymakers have a range of other regulatory solutions at their disposal to encourage investment in a nature-positive economy and behaviour change. **Regulations enforcing compliance** with existing and future environmental policies have the support of 49 percent of the business community. More needs to be done to drive environmental law enforcement, which often lags behind policies.[181] Stricter enforcement has generated positive outcomes in the past, particularly when engaging local communities. For instance, in

EXHIBIT 13:

BUSINESS AND COMMUNITY LEADERS LEADERS IN ASIA HAVE IDENTIFIED A NUMBER OF POTENTIAL SOLUTIONS TO TACKLING THE BARRIERS TO INVESTMENT

SOLUTIONS TO GALVANISE INVESTMENT IN NATURE-BASED SOLUTIONS AND BIODIVERSITY BUSINESS OPPORTUNITIES
Percent of survey respondents identifying solution as relevant



SOURCE: AlphaBeta survey of 70 business and community leaders in Asia Pacific

BOX 10

MANDATORY SUSTAINABILITY REPORTING FOR INDIA'S TOP 1,000 COMPANIES[182]

Recognising the urgency of environmental challenges such as climate change, the Securities and Exchange Board of India (SEBI) launched industry consultations in 2020 to determine how reporting standards could be adjusted to focus on ESG performance. To do so, SEBI developed their own set of disclosure requirements for companies on water and energy usage, and greenhouse gas and air pollutant emissions. Specific metrics include disclosures on share of investments on technologies with positive environmental or social impact, share of inputs sourced sustainably, and percentage of recycled materials used in production.[183] These reporting requirements will be mandatory for the top 1,000 listed entities by market capitalisation in India by 2023. In the long-term, SEBI aims to create a sustainability index to help investors quickly assess the ESG credentials of any listed entity.

Photo source: https://tradebrains.in/what-is-sebi/

China, a water pollution reform was enacted in 2008 to manage acute water shortages, with China containing only seven percent of the world's freshwater resources but more than double the share of the world's population. Key changes include mandating local governments to maintain water quality through set targets, public information disclosure on national water quality and increased fines for water pollution.[184] To enforce these changes, "river chiefs" were identified and given responsibility for pollution monitoring in specific areas – over a million such officers are deployed as of 2018.[185] These river chiefs conduct physical inspections and are designated points of contact for local citizens to report issues with water quality or pollution. First piloted in the Taihu lake of the Jiangsu province, the share of water that was "fit for human use" from the lake increased from 35.5 percent in 2011 to 63.9 percent in 2016 as a result of the programme. Conversely, low enforcement of forest law enforcement in Indonesia due to limited budgets and field personnel contributed to an increase in primary forest loss of 12 percent in 2020, the second consecutive year of increase.[186] Effective enforcement requires tackling multiple challenges faced by governments today – ranging from limited budgets, inaccurate certifications of sustainable activities, and lack of personnel for monitoring.[187]

Reform of government subsidies that incentivise environmentally damaging business models are also critical, as highlighted in the previous section. The benefits unlocked could be significant. For instance, an ADB study of the potential impact of removing fossil fuel subsidies in Indonesia and Thailand showed that removing such subsidies could lead to a reduction in carbon emissions of 5.1 percent and 2.8 percent respectively by 2030.[188]

Additionally, **appropriate assignment of property rights** by governments could also be important as these provide incentives to local communities in preserving the natural capital on which they live. Indigenous peoples make up less than 5 percent of the total world population, but own, occupy, or use land area that is home to 80 percent of the world's biodiversity.[189] Greater ownership of their land has translated to better environmental outcomes previously in Asia Pacific. For instance, a farming community in Philippines was granted rights over water supply with farmers able to establish rules on limiting the use of water and supervise withdrawal.[190] Securing livelihoods is also often a critical step in engagement. In Indonesia, the Roundtable on Sustainable Palm Oil (RSPO) engages smallholders to promote sustainable practices, while supporting them in increasing yields and improving incomes.[191]

New market mechanisms will play a critical role in mobilising capital and driving scale, by shifting risk-return dynamics of nature-positive investments. **Well-designed mechanisms and products** have potential to address multiple market barriers, including perceived ROI risks and availability of viable projects for investment. Promising new financial models such as blended finance could potentially direct private capital towards smaller-scale investments. Blended finance combines development finance and philanthropic funding to mobilise private capital flows in emerging markets in support of the SDGs.[192] There are currently 74 pooled funds and facilities representing US$25.4 billion in blended finance assets.[193] There is a growing focus in Asia – half of all blended finance transactions were targeted at the region in 2018, compared to 26 percent in 2013.[194] Blended finance aims to de-risk the private sector's investment and can often leverage greater overall financing than traditional development projects can.

Exchange-listed funds for sustainability are a more commonly used tool used to mobilise capital. The use of exchanges drives increased access to a wider base of investors and aim to address liquidity challenges typically faced by green bonds.[195] The availability of such products open access to retail investors, previously excluded from investing in such initiatives, and crowds in more investors by decreasing average investment per investor. Such funds have shown increasing scale and fruitful performance – in China, seven of the ten best performing exchange-traded funds (ETFs) in the first half of 2021 were green energy themed ETFs.[196] Impact

IN CHINA, SEVEN OF THE 10 BEST PERFORMING ETFs IN THE FIRST HALF OF 2021 WERE GREEN ENERGY THEMED ETFs

BOX 11

BLENDED FINANCE FOR SUSTAINABLE FISHING IN SOUTHEAST ASIA[197]

The Meloy Fund for Sustainable Community Fisheries is a blended finance fund that incentivises the development and adoption of sustainable fisheries through debt and equity investments in Indonesia and the Philippines. Fishing and seafood enterprises that better manage and protect the previously undervalued marine reserves of Southeast Asia are prioritised for investment and are provided access to private funding partners. Philanthropic partners provide payouts if environmental targets are met. The Fund is managed by Deliberate Capital, LLC and works in partnership with Fish Forever, a global fisheries management programme, it creates monetisable assets for local fishermen that are accessible to private funding partners.

To date, the fund's activities have focused on 4.3 million small-scale fishers producing 2.7 million tonnes of fish across 21 million hectares of critical marine habitat. US$4 billion in latent value in small-scale fisheries could potentially be unlocked.

Photo source: https://www.meloyfund.com/about

investments aim to generate positive, measurable social and environmental impact, alongside a financial return.[198] In Southeast Asia, close to US$12 billion of impact capital was deployed by private impact investors and development finance institutions from 2012-17.[199] A growing interest in impact investments increases incentives for more businesses to shift towards a stronger focus on their environmental impact.[200]

Carbon exchanges have also emerged as a potential market mechanism to scale the carbon market, allowing organisations to access carbon credits for emissions that are challenging to address, particularly those in hard-to-abate sectors. For instance, the Climate Impact X (CIX) platform, launched by DBS Bank, the Singapore Exchange (SGX), Standard Chartered, and Temasek, aims to provide a global marketplace for high-quality carbon credits, focusing first on natural climate solutions.[XXVII] The digital platform will enable large-scale buyers, including multinational corporations and institutional investors, and suppliers to trade large volumes of carbon credits supported by transparency in risk and pricing.

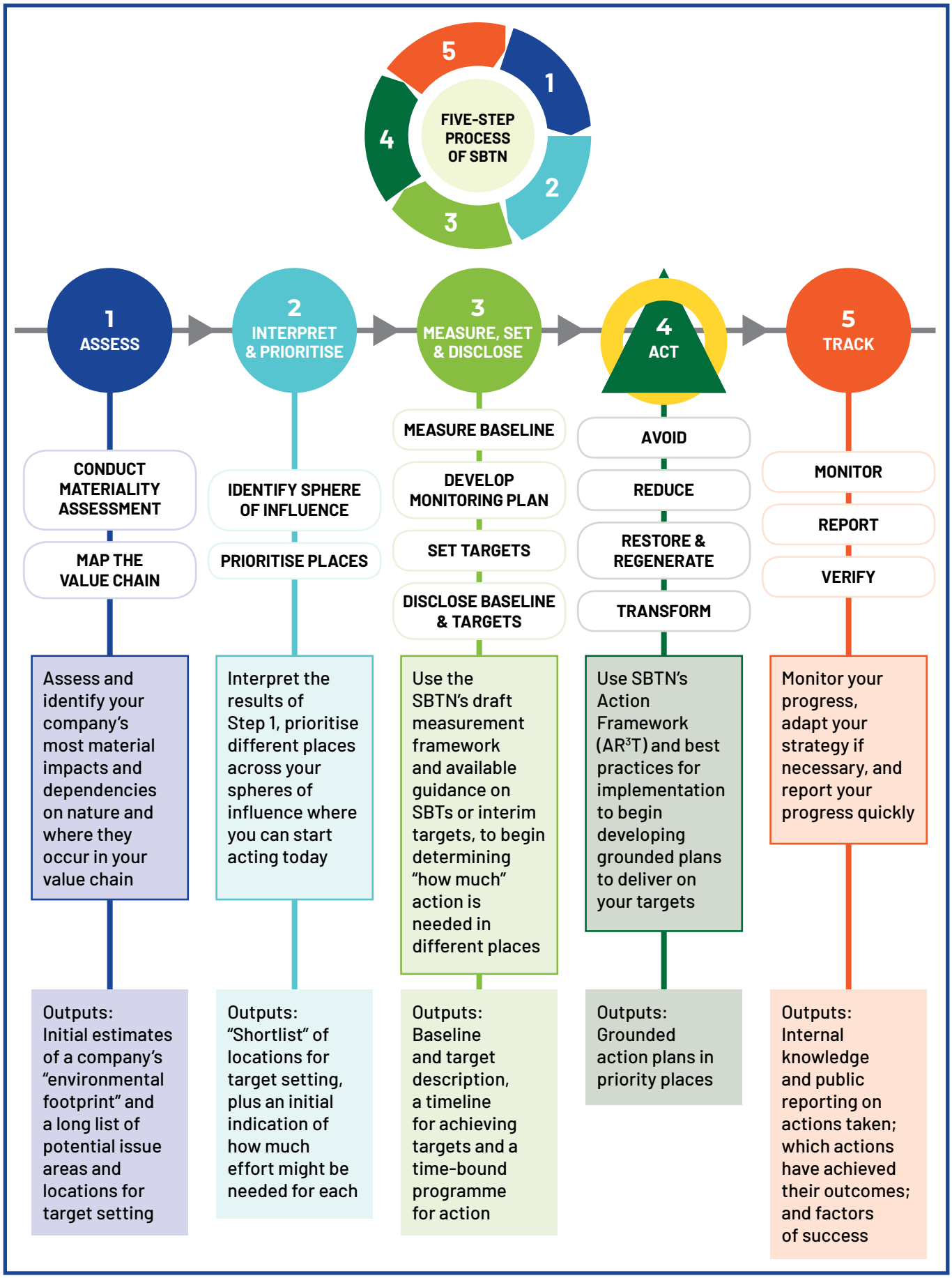
Business leaders have also indicated that **plugging information gaps**, including through **better scientific research** that contextualises biodiversity risks into actionable insights for businesses, may also incentivise greater investment in nature-positive business models. Such research has proven to be successful, particularly in actions towards emissions mitigation. For instance, more than 1,000 businesses are working with the Science Based Targets initiative (SBTi) to reduce their emissions in line with climate science, with hundreds more developing such targets.[201] Science Based Targets for Nature (SBTN) are an important step in providing companies a similar framework to align their efforts with global nature-related sustainability pathways as part of the UN Convention on Biological Diversity's (CBD) Post-2020 Global Biodiversity Framework.[202] Targets will be linked to the area and integrity of ecosystems, species risk and abundance, and maintenance or enhancement of nature's contributions to people, with frameworks already in place for businesses to assess, interpret and prioritise, measure, set and disclose, act, and track their strategies for addressing environmental issues (Exhibit 14). More research is also required to create methodologies to model biodiversity risks. Due to the complexity of quantifying such impact, tools such as the Social and Environmental Impact Assessment provide guidelines for businesses but stop short of providing ways for quantification or modelling or risks.[203]

Natural capital accounting models are another important information tool. Such models aim to provide businesses and governments with a systematic way to measure natural capital usage, which will both enable externality pricing as well as allow businesses to develop their own pathways to tackling their biodiversity impact.[204] Appropriately accounting for the value of natural capital will be essential for better economic and financial decision-making. As discussed earlier, today's financial models assume no costs of natural capital despite nature and economic growth being deeply interlinked, which incentivises environmentally damaging business models. There is increasing effort towards the development of natural capital accounting frameworks (Box 12).

XXVII. Singapore Exchange [SGX], 2021, "Introducing Climate Impact X (CIX)", https://www.sgx.com/climate-impact-x-cix

EXHIBIT 14:

THE FIVE-STEP PROCESS OF SCIENCE-BASED TARGETS FOR NATURE (SBTN)



SOURCE: Science Based Targets network

BOX 12

TOWARDS INCLUSIVE WEALTH ACCOUNTING MODELS[XXVIII]

Embedding nature-related considerations into our economic and financial decision making ultimately requires changing our measures of economic success. Standard measures such as GDP do not account for the depreciation of natural assets and are unsuitable for judging the sustainability of economic development. Governments should work towards inclusive measures of wealth – the sum of the accounting values of produced, human, and natural capital – as this measure corresponds directly to well-being across generations. Natural capital accounting is this necessary step towards inclusive wealth accounts and is particularly urgent given the overshoot in our demands on nature. It allows us to track changes in stocks of natural capital over time, which is necessary to understand whether an economy is on a path of sustainable development. It also offers a way to estimate the impact of policies on nature, and thereby understand which will best improve the lives of current and future generations.

XXVIII. Text supplied by the authors of The Dasgupta Review, an independent, global review on the Economics of Biodiversity led by Professor Sir Partha Dasgupta. The Review was commissioned in 2019 by Her Majesty's Treasury and was supported by an Advisory Panel drawn from public policy, science, economics, finance, and business. See HM Treasury, 2021, Final Report - The Economics of Biodiversity: The Dasgupta Review, *https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review*

Frameworks for natural capital accounting and assessment are in development. The UN System of Environmental-Economic Accounting Ecosystem Accounts are now an international statistical standard adopted by the UN Statistical Commission. The Natural Capital Accounting and Valuation of Ecosystem Services (NCAVES) initiative was set up by the UN, EU, and five other countries (including China and India) to advance the knowledge agenda on ecosystem accounting, with a landmark agenda set to be completed in 2021.[205] Countries are beginning to incorporate natural capital and ecosystem services into economic measures of success: China's Gross Ecosystem Product (GEP) and New Zealand's Living Standards Framework are just two examples. China's GEP programme has been piloted in three provinces with plans for broader rollout to support eco-compensation investments.[206] Natural capital accounts are especially relevant for the private sector, particularly to support financial actors in understanding the materiality of nature-related financial risks.

These are still early days for natural capital accounts. Increased investment in physical accounts and ecosystem valuation is needed. International cooperation and the sharing of data will help to improve decision-making around the world. Harmonisation of national accounts should be coupled with technical assistance. Incorporating natural capital accounts in macroeconomic surveillance undertaken by international financial institutions, for example through the International Monetary Fund's Article IV surveillance activities, would also send a strong signal, inspiring government, and private sector reform agendas to reflect the scale and urgency of the challenge our societies face.

3.4 MORE RESEARCH AND DEVELOPMENT (R&D) AND GREATER PUBLIC-PRIVATE DIALOGUE ARE CRITICAL TO A POSITIVE ENVIRONMENT FOR INVESTMENT

Further research was also conducted to identify key enablers that could overcome business' concerns with the enabling environment for investment in a nature-positive economy. Exhibit 15 shows five key enablers identified by the business community.

61 percent of surveyed respondents highlighted **more research and development (R&D) in new technologies and business models** as a key enabler. Greater R&D can drive down the "green premium" associated with sustainable technologies and production methods, bringing them on par with traditional alternatives purely on financial cost. This will be critical to unlocking a range of business models identified in this research. For instance, continued efforts to lower costs of lithium batteries will greatly reduce the cost of electric vehicles (EVs). Falling battery costs are expected to align the price of EVs with traditional gasoline cars by as soon as 2023.[207] More innovative but nascent solutions that are beyond the scope of this research can also unlocked through greater R&D. For instance, the hydrogen fuel market could grow to a US$11.6 trillion in annual global value by 2050.[208]

INVESTMENT IN R&D FOR GREEN HYDROGEN COULD UNLOCK A US$11.6 TRILLION GLOBAL MARKET BY 2050

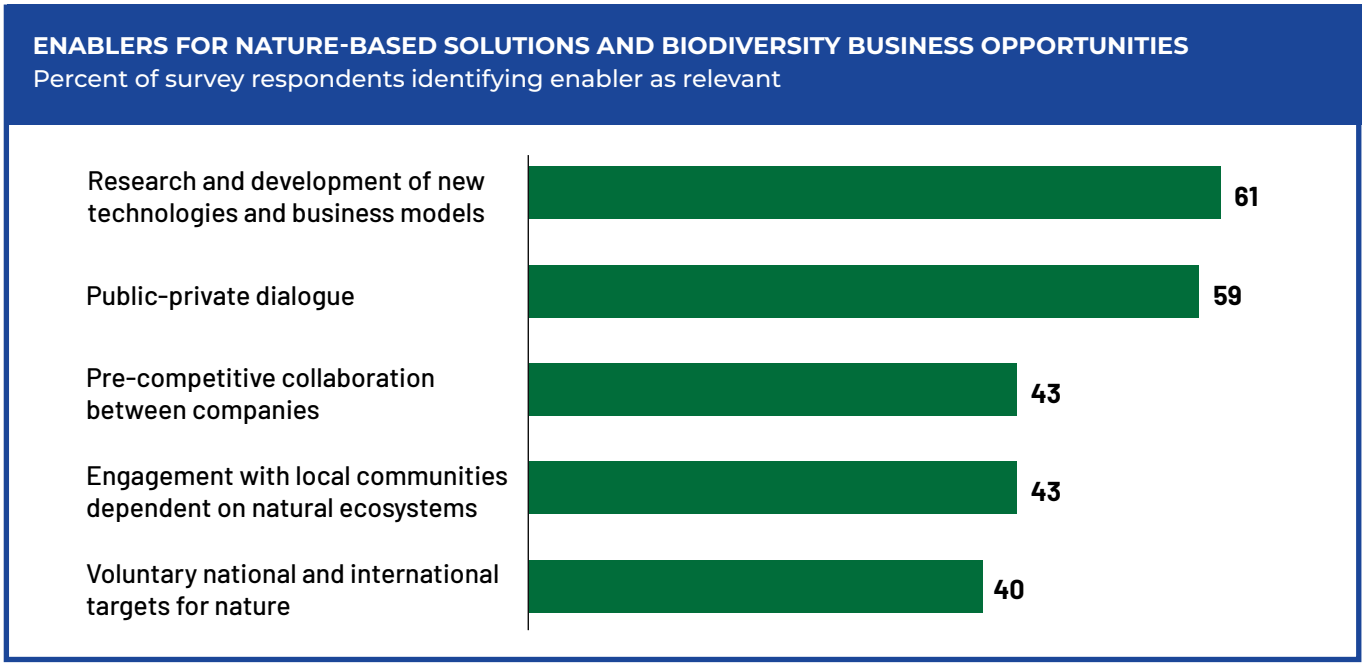
59 percent of business leaders also highlighted greater **public-private dialogue** as a key enabler, provided this leads to concrete action and collaboration, including through public-private partnerships (PPPs). Multistakeholder action remains critical to the success of the nature-positive economic agenda. The Future of Nature and Business highlighted that dialogue and collaboration is needed across sectors to enable key business opportunities. For instance, circular models require collaboration across a number of sectors, including mining, metals, chemicals, manufacturing, end-use consumer goods sectors (e.g., retail automotive, electronics, etc.), urban development, and supply chain, as well as a range of different government agencies with oversight of these sectors to coordinate policy. Business engagement in policy discussions is essential as constructive dialogue can mainstream biodiversity concerns, in turn creating appropriate policy reform, sustained funding for R&D, development of a pipeline of viable projects for investment, and commitments to biodiversity targets. Multiple such dialogues are happening around the world already. At the global level, the UN CBD's upcoming Conference of the Parties (COP 15) meeting in Kunming, China aiming to finalise the post-2020 global biodiversity framework for action.[209, XXIX] The UN Climate Change Conference (COP 26) in Glasgow, Scotland aims to finalise the "Paris rulebook" to implement commitments under the 2015 Paris Agreement.[210] As part of the "rulebook", there is a significant opportunity to strengthen the contribution of biodiversity and nature to meeting net-zero goals to which governments commit in formal negotiations, as well as by companies as contributions by non-state actors, for instance through natural climate solutions. In Asia Pacific, the Ecosperity conference by Temasek brings together leaders from the private sector, investors, government, academia, and civil society to push the agenda for sustainable development in the region.[211]

Such dialogues in turn promote commitments and **voluntary targets** towards conservation. As a result of global negotiations, the Paris Agreement secured commitment created the "pathways" for limiting GHG emissions to 1.5°C or 2°C, with agendas for action coalescing around how decarbonisation can meet these targets. Similar targets for biodiversity, however, are far more difficult to produce at the global, regional, national, or even sub-national level given that ecosystems vary significantly in terms of size, composition, genetic diversity, and importance. In the absence of broader targets, company-level commitments such as SBTN are important. Private sector-led initiatives

XXIX. The UN CBD treaty has been ratified by 195 countries.

EXHIBIT 15:

RESEARCH AND DEVELOPMENT AND PUBLIC-PRIVATE DIALOGUE WILL BE KEY ENABLERS TO UNLOCK INVESTMENT IN NATURE-POSITIVE DEVELOPMENT



SOURCE: AlphaBeta survey of 70 business and community leaders in Asia Pacific

such as the Taskforce on Scaling Voluntary Carbon Markets are a means to scale promising but technically challenging solutions.[212] Although corporate voluntary action is often not enough to achieve transformative change, a critical mass of businesses adopting ambitious standards of environmental and social responsibility moves the goalpost of what is possible and desirable. It changes the decision-making equation for policymakers, as in the case of forest-risk commodities.[213] Ecosystem-level assessments at the local level can also play an important role in creating pathways to align with nature-positive economic activities. For instance, an ongoing initiative by Future Earth pilots science-based pathways for biodiversity in France.[214] This initiative brings together 30 experts from science and practice who identified pathways for achieving the goal of zero net loss to biodiversity across various ecosystems in France by 2030, through concrete actions such as significant reduction of chemical inputs and reversal of urban sprawl.[215]

Finally, **pre-competitive collaboration** within the private sector may also play an important role in creating pathways to shared solutions focused on social or environmental impact.[216] The investor community highlighted this as the most critical enabler for investment in a nature-positive economy in the survey conducted. Pre-competitive collaboration has proven successful in the past. For instance, in Southeast Asia, the Sustainable Coconut Charter was set up for the coconut supply chain, involving companies accounting for 40 percent of the global coconut trade. The Charter harnessed industry collaboration to boost smallholder incomes, improve productivity via training, and enhance traceability along the supply chain.[217]

Asia Pacific is at a critical juncture in its relationship with nature. This report has identified the magnitude of the Asia Pacific economy at stake, the potential financial upside from taking up concerted business action on the opportunities in front of us, barriers to investment, and innovative solutions that move beyond the tried-and-tested to direct finance towards these opportunities. Now is the time to take these insights and implement collective and transformative action.

APPENDIX: METHODOLOGY

This Appendix is a short methodological note on the approach taken to derive the estimates presented in this report.

A1. REGIONAL CLASSIFICATION AND COUNTRIES ANALYSED IN THE ASIA PACIFIC REGION

This analysis has been conducted for four regions in Asia Pacific, leveraging the World Bank's classification for countries by income group using gross national income (GNI) per capita.[218] The full list of countries under each sub-region are listed below:

- **China** (including Hong Kong, Macao, and Taiwan)
- **India**
- **High-income Asia Pacific (7)**: Australia, Brunei Darussalam, Cook Islands, Japan, New Zealand, Republic of Korea, and Singapore
- **Low and middle income Asia Pacific (40)**: Afghanistan, Armenia, Azerbaijan, Bangladesh, Bhutan, Cambodia, Democratic People's Republic of Korea, Fiji, French Polynesia, Georgia, Indonesia, Kazakhstan, Kiribati, Kyrgyzstan, Lao People's Democratic Republic, Malaysia, Maldives, Marshall Islands, Micronesia (Federated States of), Mongolia, Myanmar, Nauru, Nepal, New Caledonia, Niue, Pakistan, Palau, Philippines, Solomon Islands, Sri Lanka, Tajikistan, Thailand, Timor-Leste, Tokelau, Tonga, Turkmenistan, Tuvalu, Uzbekistan, Vanuatu, Viet Nam

A2. METHODOLOGY FOR SIZING OF BUSINESS OPPORTUNITIES, JOBS, CAPITAL INVESTMENT

Nature-positive business models seek to add natural capital back to nature relative to a business-as-usual (BAU) trajectory. These business models include both those that involve direct investment in natural capital (e.g., natural climate solutions, agro-forestry, natural systems for water supply, mine rehabilitation, etc.) and those that reduce our impact on nature relative to a BAU scenario (e.g., circular production models that reduce material demand, alternative proteins, energy efficiency in buildings, etc.). These are inherently different to "green economy" business models or those that generally seek to decarbonise business and economic activities, as these may or may not be pursued by depleting natural capital. However, nature-positive business models by definition do not deplete natural capital while they may or may not contribute to decarbonisation. As a result, some "green economy" business models were excluded from this analysis, including bioenergy with carbon capture and storage (BECCS) and first-generation biofuels, due to their adverse impacts on nature (both involve

growing additional crops which require land, water, fertilisers, etc.).

The nature-positive business opportunity values presented in this report are estimates of the annual cost savings or the revenue upside generated by major opportunities (those worth at least US$15 billion in 2030) in 2030, expressed in 2019 US dollars. From the size of the global opportunity[XXX], regional "scaling factors" were used to determine the share that each region can capture. Scaling factors are essentially the best available metrics related to each opportunity that indicate the potential share of the opportunity available to each region based on its comparative advantages in production and/or exports in the case of production-related opportunities, and potential market size in relation to demand-related opportunities. For instance, the opportunity for natural climate solutions was allocated to various regions based on their share of potential carbon mitigation potential across forest, peatland, and grassland ecosystems, accounting for differences between regional ecosystems such as tropical and boreal forests as well as estimations of cost efficiency of relevant mitigation activities in each region. Employment figures are based on regional labour productivity rates, while investment estimates are based on opportunity-specific case studies. China, India, and other low- and middle-income countries in Asia Pacific generally have a greater share of the nature-positive economic opportunity because of their higher concentration of natural capital and related primary production activities (e.g., agriculture, extraction), high infrastructure needs in the coming decade, and large populations with growing middle-class consumers.

These estimates depict the incremental size of the business opportunities in a nature-positive scenario compared to what could be achieved in a BAU scenario. This is not intended to be an exhaustive assessment of business opportunities related to biodiversity, but rather to highlight some of the most important opportunities. As such, they are a subset of the total biodiversity business opportunities available. These figures are not an attempt to estimate the full value of the benefits provided by nature but instead focus on financial shifts in revenue or profit pools. It is important to note that while all of the estimated value of the opportunity can be achieved in a nature-positive manner, it is theoretically possible that some of these opportunities can be pursued in a nature-negative manner (e.g., renewable energy; these tradeoffs have been discussed in greater detail where relevant). It should also be noted that these estimates are based on existing business models and commercialised technologies. Additional opportunities are expected to arise as nascent technologies and new players emerge and markets develop (e.g., hydrogen fuel, which have not been included in this analysis). To reflect the impact of the COVID-19 pandemic, consumer demand forecasts were revised to incorporate the impact of the crisis on GDP growth in

XXX. Please refer to the Methodological Note for the Future of Nature and Business report for the full assessment of global opportunities and the methodology used to calculate these: *https://www.alphabeta.com/our-research/methodology-note-NNER-II/*

2020 and 2021 as forecasted by the International Monetary Fund.[XXXI]

Employment opportunities associated with the 59 business opportunities were calculated using of two methods:

1. **Investment opportunities method:** Where business opportunities relate to substantial investment (e.g., alternative meats, food waste in the value chain, infrastructure-related opportunities), capital expenditure (Capex) requirements were multiplied by estimates of jobs created per dollar of investment in each region (differentiated for infrastructure-related and non-infrastructure-related opportunities), using a range of regional proxies, to obtain the total number of jobs created for each opportunity.

2. **Operational improvement opportunities method:** Where business opportunities relate to operational improvements or market opportunities not requiring significant investment (e.g., organic food markets), the value of the business opportunity was divided by average labour force productivity in each region for relevant sectors and/or industries to obtain the total number of jobs created for each opportunity.

It is important to note that, given substitution effects (e.g., reduced meat consumption due to increased demand for alternative proteins that could reduce demand and labour requirements in the meat sector), not all of these jobs will translate to net increases in employment.

Capex related to each of the 59 business opportunities were calculated using one of three methods:

1. **Direct inputs:** Where business opportunities that had been sized by past literature had investment requirements estimated, these were directly utilised after making necessary adjustments to estimate annual capex requirements in 2030 in US$ 2019 values.

2. **Using net capex to sales ratios:** For new business opportunities, a range of global estimates of net capital expenditure to sales ratios by relevant sector and industry were considered to calculate capex requirements for new business opportunities.

3. **Case studies and expert inputs:** A range of case studies with capex estimates related to new business opportunities (extrapolated to global estimates) were also used. Expert inputs, particularly from the private sector, were sought to add to and "sanity test" assumptions taken.

A3. SURVEY OF BUSINESS AND COMMUNITY LEADERS

To better understand the key barriers to investment in nature-positive business opportunities, potential solutions to address these barriers, and enablers for the same, a survey of 70 business and community leaders in Asia Pacific was conducted in August and September 2021. Responses were anonymised. Respondents largely included senior representatives from private sector companies, industry groups, and investors, but also senior stakeholders from government, civil society organisations, and academia. Respondents had diverse interests across all 19 sectors of the Asia Pacific economy. All respondents had organisational interests in at least one region in Asia Pacific but were not limited to those with interests only in this region.

XXXI. This adjustment is made to the growth rates of consumer demand-related opportunities (e.g., organic food demand, eco-tourism) for the next two years, and then it is assumed the pre-COVID estimates of growth return. Fourteen of the opportunities sized, largely in the food, land and ocean use system, are impacted by these adjustments. For further details, see IMF, April 2020, World Economic Outlook, April 2020: The Great Lockdown, https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020

ENDNOTES

1. Intergovernmental Panel of Biodiversity and Ecosystem Services [IPBES], 2019, Global Assessment Report, https://www.ipbes.net/global-assessment-report-biodiversity-ecosystem-services

2. Natural Capital Finance Alliance, 2021, ENCORE – Hotspots, https://encore.naturalcapitalfinancealliance.org/map?view=hotspots

3. UN Convention on Biological Diversity [UN CBD], 2016, The State of Biodiversity in Asia and the Pacific, https://www.cbd.int/gbo/gbo4/outlook-asiapacific-en.pdf

4. UN Food and Agricultural Organisation [UNFAO], 2011, Asia-Pacific Forests and Forestry to 2020, http://www.fao.org/fileadmin/templates/rap/files/NRE/Forestry_Group/1_Forests_for_a_greener_future.pdf

5. Lenton. T. M. and H. T. P. Williams, 2013, "On the Origin of Planetary-Scale Tipping Points", Trends in Ecology & Evolution, 28, 380–382, https://doi.org/10.1016/j.tree.2013.06.001

6. Hassell, J. M. et al., 2017, "Urbanization and Disease Emergence: Dynamics at the Wildlife-Livestock-Human Interface", Trends in Ecology & Evolution, 32 (1), 55–67, https://doi.org/10.1016/j.tree.2016.09.012

7. Jones, K. E. et al., 2008, "Global Trends in Emerging Infectious Diseases", Nature, 451, 990–3, https://www.ncbi.nlm.nih.gov/pubmed/18288193

8. World Economic Forum, 2020, The Global Risks Report 2020, https://www.weforum.org/reports/the-global-risks-report-2020

9. Intergovernmental Panel of Biodiversity and Ecosystem Services [IPBES], 2019, Global Assessment Report, https://www.ipbes.net/global-assessment-report-biodiversity-ecosystem-services

10. Intergovernmental Panel of Biodiversity and Ecosystem Services [IPBES], 2017, The Assessment Report on Pollinators, Pollination and Food Production, https://ipbes.net/assessment-reports/pollinators

11. World Economic Forum and PwC, 2020, Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy, http://www3.weforum.org/docs/WEF_New_Nature_Economy_Report_2020.pdf

12. Intergovernmental Panel on Climate Change [IPCC], 2021, AR6 Climate Change 2021: The Physical Science Basis – Working Group I Contribution to the Six Assessment Report of the IPCC, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf

13. UN Environment Programme [UNEP], 2020, "Ten impacts of the Australian bushfires", https://www.unep.org/news-and-stories/story/ten-impacts-australian-bushfires

14. ABC News, 2020, "3 billion animals killed or displaced in Black Summer bushfires, study estimates", ABC Australia, https://www.abc.net.au/news/2020-07-28/3-billion-animals-killed-displaced-in-fires-wwf-study/12497976

15. Daniel Victor, 2021, "Flooding in China kills 21, as thousands escape to shelters", New York Times, https://www.nytimes.com/2021/08/13/world/asia/china-flooding-evacuations.html

16. The Food and Land Use Coalition [FOLU], 2019, Growing Better: Ten Critical Transitions to Transform Food and Land Use, https://www.foodandlandusecoalition.org/wp-content/uploads/2019/09/FOLU-GrowingBetter-GlobalReport.pdf

17. Rabobank, 2016, Asia-Pacific: Agricultural perspectives, RaboResearch – Economic Research, https://economics.rabobank.com/publications/2016/february/asia-pacific-agricultural-perspectives/

18. World Trade Organisation [WTO], 2020, World Textiles and Apparel Trade, 2020.

19. World Bank, 2021, World Development Indicators, https://databank.worldbank.org/source/health-nutrition-and-population-statistics

20. Business & Sustainable Development Commission [BSDC], 2017, Better Business Better World, https://sustainabledevelopment.un.org/content/documents/2399BetterBusinessBetterWorld.pdf

21. The Asia Foundation, 2018, "Southeast Asia's fisheries near collapse from overfishing", https://asiafoundation.org/2018/03/28/southeast-asias-fisheries-near-collapse-overfishing/

22. McKinsey, 2020, "Biodiversity: The next frontier in sustainable fashion", https://www.mckinsey.com/industries/retail/our-insights/biodiversity-the-next-frontier-in-sustainable-fashion

23. Xinhua News, 2016, "China's 26 million tons of waste clothes are thrown away every year and the recycling rate is less than 1%", http://www.xinhuanet.com//politics/2016-03/28/c_128838861.htm

24. UN Department of Economic and Social Affairs [DESA] Population Dynamics, 2019, World Population Prospects 2019, https://population.un.org/wpp/DataQuery/

25. UN Economic and Social Commission for Asia and the Pacific [UNESCAP], 2019, The Future of Asian and Pacific Cities: Transformative Pathways towards Sustainable Urban Development, https://www.unescap.org/sites/default/files/publications/Future%20of%20AP%20Cities%20Report%202019_0.pdf

26. Pricewaterhouse Coopers [PwC], 2014, Developing Infrastructure in Asia Pacific: Outlook, Challenges and Solutions, https://www.pwc.com.au/industry/infrastructure/assets/developing-infrastructure-asia-pacific-sep14.pdf

27. Critical Ecosystem Partnership Fund [CEPF], no date, "Explore the biodiversity hotspots", https://www.cepf.net/our-work/biodiversity-hotspots

28. Statista, 2021, "Number of deaths attributable to air pollution in 1990 and 2019, by region", https://www.statista.com/statistics/830910/deaths-due-to-air-pollution-in-select-region/

29. UN Economic Commission for Europe [UNECE], no date, "Air pollution, ecosystems and biodiversity", https://unece.org/air-pollution-ecosystems-and-biodiversity

30. Forman, R. T. T. and L. E. Alexander, 1998, "Roads and Their Major Ecological Effects", Annual Review of Ecology and Systematics, 29 (1998), 207–31. https://www.edc.uri.edu/nrs/classes/nrs534/NRS_534_readings/FormanRoads.pdf

31. Clements, G. R., et. al., 2014, Where and how are roads endangering mammals in Southeast Asia's forests?, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0115376; and Mongabay, 2015, "Study finds roads in Southeast Asia may be devastating forests, wildlife", https://news.mongabay.com/2015/03/study-finds-roads-in-southeast-asia-may-be-devastating-forests-wildlife/

32. Verisk Maplecroft, 2021, "Asian cities in eye of environmental storm – global ranking: Environmental Risk Outlook 2021", https://www.maplecroft.com/insights/analysis/asian-cities-in-eye-of-environmental-storm-global-ranking/

33. UN Department of Economic and Social Affairs [DESA] Population Dynamics, 2019, World Urbanization Prospects 2019, https://population.un.org/wup/DataQuery/

34. Global Facility for Disaster Reduction and Recovery [GFDRR] and World Bank, 2015, Investing in Urban Resilience: Protecting and Promoting Development in a Changing World. https://www.gfdrr.org/en/investing-urban-resilience-protecting-and-promoting-development-changing-world

35. World Wildlife Fund [WWF] and HSBC, 2017, Greening the Belt and Road Initiative: WWF's Recommendations for the Finance Sector, https://dspace.library.uu.nl/handle/1874/362894

36. International Renewable Energy Agency [IRENA], 2021, Tracking SDG 7: The Energy Progress Report (2021), https://www.irena.org/publications/2021/Jun/Tracking-SDG-7-2021

37. International Renewable Energy Agency [IRENA], 2018, Global Energy Transformation: A Roadmap to 2050, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Apr/IRENA_Report_GET_2018.pdf

38. International Resources Panel [IRP], 2019, Global Resources Outlook 2019: Natural Resources for the Future We Want, https://www.resourcepanel.org/reports/global-resources-outlook

39. Kiesecker, J., et al. 2019, Renewable Energy and Land Use in India: A Vision to Facilitate Sustainable Development, Sustainability: 12, 281. doi:10.3390/su12010281

40. Washburn, T. W. et al., 2019. "Ecological Risk Assessment for Deep-Sea Mining", Ocean and Coastal Management 176 (15 June 2019):24–39, https://doi.org/10.1016/j.ocecoaman.2019.04.014

41. World Economic Forum, 2020, The Future of Nature and Business, http://www3.weforum.org/docs/WEF_The_Future_Of_Nature_And_Business_2020.pdf

42. For more information on all business opportunities sized, please refer to the Methodological Note for the Future of Nature and Business for further details: https://www.alphabeta.com/our-research/methodology-note-NNER-II/

43. Statista, 2021, "Leading countries with the largest organic area in Asia in 2019", https://www.statista.com/statistics/910630/asia-major-countries-largest-organic-area/

44. Kirchman, H., 2019, "Why Organic Farming Is Not the Way Forward", https://www.researchgate.net/publication/331405368_Why_organic_farming_is_not_the_way_forward

45. Refer to the Methodology Note for methodology on estimating value of total food waste in 2030, https://www.alphabeta.com/our-research/methodology-note-NNER-II/. See also FAO, 2012, World Agriculture: Towards 2030/2050, http://www.fao.org/3/a-ap106e.pdf

46. The Food and Land Use Coalition [FOLU], 2019, Growing Better: Ten Critical Transitions to Transform Food and Land Use, Critical Transition 6, op. cit.

47. UN Environment Programme [UNEP], 2021, "Worldwide food waste", https://www.unep.org/thinkeatsave/get-informed/worldwide-food-waste

48. Channel News Asia Insider, 2021, "When over 7 tonnes of chicken is discarded daily — the alarming scale of food waste in Asia", https://www.channelnewsasia.com/cnainsider/edible-food-waste-ugly-asia-expiry-dates-treedots-331356

49. Kitinoja, L. and H. Y. AlHassan, 2012, "Identification of Appropriate Postharvest Technologies for Improving Market Access and Incomes for Small Horticultural Farmers in Sub-Saharan Africa and South Asia. Part 2: Postharvest Loss Assessments", Acta horticulrurae, 934: 31–40, https://www.researchgate.net/publication/261759546_Identification_of_Appropriate_Postharvest_Technologies_for_Improving_Market_Access_and_Incomes_for_Small_Horticultural_Farmers_in_Sub-Saharan_Africa_and_South_Asia

50. European Chamber, 2020, "Walmart China Blockchain Traceability Platform", https://www.europeanchamber.com.cn/en/members-news/3303/walmart_china_blockchain_traceability_platform

51. World Economic Forum, 2018, Innovation with a purpose: The role of technology innovation in accelerating food systems transformation, http://www3.weforum.org/docs/WEF_Innovation_with_a_Purpose_VF-reduced.pdf

52. Ecozen, 2020, "Ecofrost – Solar cold storage room", https://www.ecozensolutions.com/ecofrost

53. Gatto, M. et. al., 2021, Trends in Varietal Diversity of Main Staple Crops in Asia and Africa and Implications for Sustainable Food Systems, Front. Sustain. Food Syst., 23 February 2021, https://www.frontiersin.org/articles/10.3389/fsufs.2021.626714/full

54. OECD and FAO, 2021, OECD-FAO Agricultural Outlook 2021-2030, https://www.agri-outlook.org/documents/oecd-fao-outlook-regional-asia-pacific.pdf

55. Willett, W. et al., 2019, "Food in the Anthropocene: The EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems", The Lancet Commissions, 393 (10170), P447–92, https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)31788-4/fulltext

56. Eco-Business, 2016, "Rethinking production and consumption for a zero-waste Singapore", http://www.eco-business.com/news/rethinking-production-and-consumption-for-a-zero-waste-singapore/ and Zero Waste SG, 2015, "NTUC FairPrice takes the lead to measure and reduce food waste", http://www.zerowastesg.com/2015/05/28/ntuc-fairprice-takes-the-lead-to-measure-and-reduce-food-waste/#more-2274

57. ReFED, 2016, A Roadmap to Reduce US Food Waste by 20 Percent, https://refed.com/downloads/ReFED_Report_2016.pdf and World Economic Forum, 2018, Innovation with a Purpose: The role of technology innovation in accelerating food systems transformation, http://www3.weforum.org/docs/WEF_Innovation_with_a_Purpose_VF-reduced.pdf

58. WRAP, 2020, Quantification of Food Surplus, Waste and Related Materials in Supply Chain, http://www.wrap.org.uk/content/quantification-food-surplus-waste-and-related-materials-supply-chain

59. World Bank, 2013, Fish to 2030: Prospects for Fisheries and Aquaculture, https://reliefweb.int/report/world/fish-2030-prospectsfisheries-and-aquaculture

60. Thomas, N. et. al, 2017, Distribution and drivers of global mangrove forest change, 1996–2010, PLoS ONE 12(6): e0179302. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0179302

61. The Nature Conservancy, 2021, "Sustainable Aquaculture = Healthy Food for Asia Pacific", https://www.nature.org/en-us/about-us/where-we-work/asia-pacific/the-pacific-islands/stories-in-the-pacific-islands/aquaculture-in-palau/

62. The Straits Times, 2017, "Next-gen farming concepts on show at exhibition", http://www.straitstimes.com/singapore/next-gen-farming-concepts-on-show-

at-exhibition

63. Greenwave, 2020, "Our Model – Regenerative Ocean Farming", https://www.greenwave.org/our-model

64. Global Environment Facility [GEF], 2019, Safeguarding the Global Commons: Seventh Replenishment of the Global Environment Facility, https://www.thegef.org/sites/default/files/publications/GEF_safeguarding_global_commons_May2019_CRA.pdf

65. Our World in Data, 2019, "Land Use", https://ourworldindata.org/land-use

66. Forthcoming research by the Tropical Forest Alliance (TFA) and AlphaBeta, utilising data from the Global Forest Watch (GFW).

67. McKinsey Global Institute, 2011, "Resource Revolution: Meeting the World's Energy, Materials, Food and Water Needs", https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/resource%20revolution/mgi_resource_revolution_full_report. pdf

68. The Economist, 2016, "Technology Quarterly: The Future of Agriculture", https://www.economist.com/technology-quarterly/2016-06-09/factory-fresh

69. The Food and Land Use Coalition [FOLU], 2019, Growing Better: Ten Critical Transitions to Transform Food and Land Use, https://www.foodandlandusecoalition.org/wp-content/uploads/2019/09/FOLU-GrowingBetter-GlobalReport.pdf

70. Barclays, 2019, "I Can't Believe It's Not Meat", https://eu30.salesforce.com/sfc/p/#1t000000wCuV/a/1t000000Xg33/q3Bm_z_oiIm8K7s4mnGLApU.WpmqvU6rEsBaiqGRob4

71. Willett, W. et al., 2019, "Food in the Anthropocene: The EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems", The Lancet Commissions, 393 (10170), P447–92, https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)31788-4/fulltext

72. King, T., 2019, "Meat Re-Imagined: The Global Emergence of Alternative Proteins – What Does It Mean for Australia?", Food Australia, 71 (3 Jun/Aug 2019), https://search.informit.org/doi/10.3316/INFORMIT.623036364777020

73. Good Food Institute, 2021, "Record $3.1 billion invested in alt proteins in 2020 signals growing market momentum for sustainable proteins", https://gfi.org/blog/2020-state-of-the-industry-highlights/

74. AlphaBeta and Food Industry Asia [FIA], 2021, The Future of Proteins in Asia, https://alphabeta.com/wp-content/uploads/2021/07/the-future-of-proteins-in-asia.pdf

75. World Bank, 2017, "Giving Oceans a Break Could Generate US$83 Billion in Additional Benefits for Fisheries", https://www.worldbank.org/en/news/press-release/2017/02/14/giving-oceans-a-break-could-generate-83-billion-in-additional-benefits-for-fisheries

76. Rousseau, Y. et al., 2019, "Evolution of Global Marine Fishing Fleets and the Response of Fished Resources", Proceedings of the National Academy of Sciences of the United States of America, 116 (25), 12,238–43, https://www.pnas.org/content/116/25/12238

77. Gaines, S. et. al, 2019, "Underestimating the benefits of marine protected areas for the replenishment of fished populations", Frontiers in Ecology and the Environment, Volume 17, Issue 7, September 2019 pp.407-413. https://esajournals.onlinelibrary.wiley.com/doi/10.1002/fee.2075

78. General Electric, 2017, Dattabot and GE Work to Secure the Future of Agriculture in Indonesia, https://www.ge.com/digital/sites/default/files/download_assets/Dattabot-GE-Predix-case-study. pdf

79. McKinsey & Company, 2019, "Precision Fisheries: Navigating a Sea of Troubles with Advanced Analytics", https://www.mckinsey.com/industries/agriculture/our-insights/precision-fisheries-navigating-a-sea-of-troubles-with-advanced-analytics?cid=other-eml-alt-mip-mck&hlkid=40fafb2742e74bfbb0fd1b2245aa0a58&hctky=1-1541628&hdpid=a2f74055-8e57-4215-b5be-7fb872a1ecb4

80. Kearns, M., 2016, "New Survey Sees Seafood Consumers Placing Sustainability before Price and Brand", SeafoodSource, https://www.seafoodsource.com/news/foodservice-retail/new-survey-sees-seafood-consumers-placing-sustainability-before-price-and-brand

81. UN-REDD Programme, 2016, About REDD+, https://www.un-redd.org/

82. Raghav, S. et. al., 2020, The Business Case for Natural Climate Solutions: Insights and Opportunities for Southeast Asia, Temasek, https://www.ecosperity.sg/content/dam/ecosperity-aem/en/reports/Report_The-Business-Case-for-Natural-Climate-Solutions_Insights-and-Opportunities-for-SEA.pdf

83. Organisation for Economic Co-operation and Development [OECD], 2019, Biodiversity: Finance and the Economic and Business Case for Action, https://www.oecd.org/environment/resources/biodiversity/G7-report-Biodiversity-Finance-and-the-Economic-and-Business-Case-for-Action.pdf

84. The Forum's Natural Climate Solutions Alliance aims to bring together researchers and champions in both forestry and agriculture to strengthen natural climate solutions in both working and wild, degraded or

abandoned landscapes. See WEF, 2020, Natural Climate Solutions Alliance, https://www.weforum.org/natural-climate-solutions-alliance

85. Locke, H et al, 2019, "Three global conditions for biodiversity conservation and sustainable use: an implementation framework", National Science Review, Volume 6, Issue 6, Pages 1080–1082, https://doi.org/10.1093/nsr/nwz136

86. Ellen MacArthur Foundation (2019), Circular economy in cities – Urban buildings system summary. Available at: https://www.ellenmacarthurfoundation.org/assets/downloads/Buildings_All_Mar19.pd

87. International Energy Agency, 2020, Volume of carbon dioxide emissions in Asia Pacific in 2018, by sector.

88. McKinsey Global Institute, 2011, Resource Revolution: Meeting the world's energy, materials, food and water needs, https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/resource%20revolution/mgi_resource_revolution_full_report. pdf

89. UN Environment Programme [UNEP], 2015, District Energy in Cities: Unlocking the Potential of Energy Efficiency and Renewable Energy, https://wedocs.unep.org/handle/20.500.11822/9317

90. Ellen MacArthur Foundation, 2019, Circular economy in cities – Urban buildings system summary, https://ellenmacarthurfoundation.org/circular-economy-in-cities

91. Bloomberg, 2020, "This is how Singapore keeps up its cool as the city heats up", https://www.bloomberg.com/news/features/2020-12-01/singapore-climate-change-reducing-heat-takes-trees-and-technology

92. Asian Development Bank [ADB], 2010, Clean Energy in Asia: Case studies of ADB investments in low-carbon growth, https://www.globalccsinstitute.com/archive/hub/publications/155613/clean-energy-asia-case- studies-adb-investments-low-carbon-growth.pdf

93. Waste management in this instance is the safe and efficient collection, transportation, and disposal or recycling of garbage and other solid waste products. This does not include the opportunity arising from the reuse of recovered materials.

94. Asian Development Bank [ADB], 2017, "Waste management in Asia: 1 goal, 5 cities, 5 lessons", Asian Development Blog: Urban development, https://blogs.adb.org/blog/waste-management-asia-1-goal-5-cities-5-lessons

95. Lantican, F. 2020, "This Heat Map Reveals Which Cities in Asia-Pacific Are Effectively Managing Waste", Vice Creators Summit: Climate Uprise, https://www.vice.com/en/article/m7jz7y/climate-waste-management-asia-pacific-rating

96. National Environment Agency, Singapore, 2021, "Integrated Waste Management Facility", https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/waste-management-infrastructure/integrated-waste-management-facility

97. World Bank, 2019, "What a waste 2.0 – A global snapshot of solid waste management to 2050", https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html

98. Stefan Heck and Matt Rogers, 2014, Resource Revolution: How to Capture the Biggest Business Opportunity in a Century. Full report by the McKinsey Global Institute available at: https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/resource%20revolution/mgi_resource_revolution_full_report.pdf

99. International Transport Forum, 2016, Shared Mobility: Innovation for Liveable Cities, https://www.itf-oecd.org/sites/default/files/docs/shared-mobility-liveable-cities.pdf

100. AlphaBeta, 2017, Rethinking urban mobility in Indonesia: The role of shared mobility services, https://www.alphabeta.com/wp-content/uploads/2018/08/fa-uberreport-indonesia_english. pdf

101. Ra, S. and Li, Z., 2018, Closing the Financing Gap in Asian Infrastructure, ADB South Asia Working Paper Series, https://www.adb.org/sites/default/files/publication/431261/swp-057-financing-gap-asian-infrastructure.pdf

102. This assessment assumes that private investors could proportionately plug the transport gap at the same share of the overall infrastructure finance gap. See McKinsey Center for Business and Environment (2016), Financing change: How to mobilize private sector financing for sustainable infrastructure. Available at: https://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2016/04/Financing_change_How_to_mobilize_private-sector_financing_for_sustainable-_infrastructure.pdf

103 Benítez-López, A. et al., 2010, "The Impacts of Roads and Other Infrastructure an Mammal and Bird Populations: A Meta-Analysis", Biological Conservation, 143 (6), 1307–16, https://www.sciencedirect.com/science/article/abs/pii/S0006320710000480?via%3Dihub

104. William N.S. Arlidge et. al., 2018, A global mitigation hierarchy for nature conservation. BioScience May 2018, Vol. 68, No.5., https://www.cbd.int/doc/strategic-plan/

Post2020/postsbi/biodiversify2.pdf

105. Global proxies are calculated using inputs from various sources, including McKinsey Center for Business and Environment, 2016, Financing Change: How to Mobilize Private Sector Financing for Sustainable Infrastructure, https://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2016/04/Financing_change_How_to_mobilize_private-sector_financing_for_sustainable-_infrastructure.pdf; WWF and HSBC, 2017, Greening the Belt and Road Initiative: WWF's Recommendations for the Finance Sector, https://www.sustainablefinance.hsbc.com/mobilising-finance/greening-the-belt-and-road-initiative; and Aswath Damodaran, 2020, Capital Expenditures by Sector (US), http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/capex.html

106. International Renewable Energy Agency [IRENA], 2018, Renewable power generation costs in 2017, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Jan/IRENA_2017_Power_Costs_2018.pdf

107. International Energy Agency, 2020, Volume of carbon dioxide emissions in Asia Pacific in 2018, by sector.

108. Science Direct, 2021, "Second-Generation Biofuels", https://www.sciencedirect.com/topics/engineering/second-generation-biofuels

109. Mongabay, 2017, "How effective are wildlife corridors like Singapore's Eco-Link?" Available at: https://news.mongabay.com/2017/07/how-effective-are-wildlife-corridors-like-singapores-eco-link/

110. Brahma Chellaney, 2016, "Asia's megacities are running out of water", https://asia.nikkei.com/Economy/Asia-s-megacities-are-running-out-of- water

111. The Nature Conservancy, 2017, Beyond the Source: The environmental, economic and community benefits of sourcewater protection,https://s3.amazonaws.com/tnc-craft/library/Beyond_The_Source_Full_Report_FinalV4.pdf?mtime=20171025195759

112. Bloomberg Green, 2021, "How one of the world's wettest major cities ran out of water", https://www.bloomberg.com/news/features/2021-02-03/how-a-water-crisis-hit-india-s-chennai-one-of-the-world-s-wettest-cities

113. Shah, M., 2016, Urban water systems in India: A way forward, Working Paper, No. 323, Indian Council for Research on International Economic Relations (ICRIER), New Delhi, https://www.econstor.eu/bitstream/10419/176350/1/Working_Paper_323.pdf

114. Stefan Heck and Matt Rogers, 2014, Resource Revolution: How to Capture the Biggest Business Opportunity in a Century. Full report by the McKinsey Global Institute available at: https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/resource%20revolution/mgi_resource_revolution_full_report.pdf

115. Whittle, A.J. et al, 2010, WaterWiSe@SG: A Testbed for Continuous Monitoring of the Water Distribution System in Singapore", https://www.researchgate.net/publication/221936266_WaterWiSeSG_A_Testbed_for_Continuous_Monitoring_of_the_Water_Distribution_System_in_Singapore

116. Channel News Asia, 2017, "Smartphones, floating balls and monitoring sensors: How Singapore is going high-tech in detecting water leaks", https://www.channelnewsasia.com/singapore/high-tech-detecting-water-leaks-533736

117. Visenti, 2020, "Company Overview", https://www.visenti.com/overview

118. Boston Consulting Group [BCG], 2021, "Riding the renewables wave in Asia-Pacific", https://www.bcg.com/publications/2021/asia-pacific-renewable-energy-opportunities

119 Wood Mackenzie, 2021, Asia Pacific solar PV market outlook 2021, https://www.woodmac.com/reports/power-markets-asia-pacific-solar-pv-market-outlook-2021-503831
.

120. International Energy Agency [IEA], 2016, World Energy Outlook 2016, https://www.iea.org/reports/world-energy-outlook-2016

121. Energy Choice Coalition, 2020, "Wood MacKenzie, industry associations report coronavirus impact on energy transition", https://www.energychoicecoalition.org/blog/2020/4/17/wood-mackenzie-industry-associations-report-coronavirus-impact-on-energy-transition

122. International Energy Agency [IEA], 2020, Volume of carbon dioxide emissions in Asia Pacific in 2018, by sector.

123. Kiesecker, J., et al. 2019, Renewable Energy and Land Use in India: A Vision to Facilitate Sustainable Development, Sustainability: 12, 281. doi:10.3390/su12010281

124. Friends of Ocean Action, 2020, Impact Report – The Business Case for Marine Protection and Conservation, http://www3.weforum.org/docs/WEF_Business_case_for_marine_protection.pdf

125. Institute for Sustainable Futures, University of Technology, Sydney, 2019, Responsible minerals sourcing for renewable energy, https://earthworks.org/publications/responsible-minerals-sourcing-for-renewable-energy/

126. Church, C. and Crawford, A., 2018, "Green Conflict Minerals: The fuels of conflict in the transition to a low-carbon economy. International Institute for Sustainable Development", https://www.iisd.org/story/green-conflict-minerals/

127. T. W. Washburn, et al., (2019). Ecological risk assessment for deep-sea mining. Ocean and Coastal Management 176, 24–3925. Available at: https://doi.org/10.1016/j.ocecoaman.2019.04.014

128. Kang, White and Thomson (2015), "PV Module Recycling: Mining Australian Rooftops". ANU Research Publications. Available at: https://openresearch-repository.anu.edu.au/handle/1885/154061

129. Sprecher, B, 2016, "When materials become critical : lessons from the 2010 rare earth crisis", Leiden University, https://scholarlypublications.universiteitleiden.nl/handle/1887/41312

130. Smith, B. J. and Eggert, R. G., 2018, "Costs, Substitution, and Material Use: The Case of Rare Earth Magnets". Environ. Sci. Technol: 52, p.3803–3811, https://pubs.acs.org/doi/abs/10.1021/acs.est.7b05495

131. Reuters Events, 2018,"Chinese companies slow to join RE 100", https://www.reutersevents.com/sustainability/chinese-companies-slow-join-re-100

132. UN Environment Programme [UNEP], 2017, "Eco-restoration and Wealth Creation – Elion's Kubuqi Business Model, http://wedocs.unep.org/bitstream/handle/20.500.11822/21773/Kubuqi_Ecorestoration_BusinessModel.pdf

133. MIT Energy Initiative, 2020, "China's transition to electric vehicles", https://energy.mit.edu/news/chinas-transition-to-electric-vehicles/

134. UN Institute for the Advanced Study of Sustainability [UNU-IAS], 2014, The Global E-Waste Monitor 2014: Quantities, flows and resources, https://i.unu.edu/media/ias.unu.edu-en/news/7916/Global-E-waste-Monitor-2014-small. pdf

135. Accenture, 2016, Automotive's latest model: Redefining competitiveness through the circular economy, https://www.slideshare.net/accenture/automotives-latest-model-redefining-competitiveness-through-the-circular-economy-66004209

136. McKinsey Global Institute, 2011, "Resource Revolution: Meeting the World's Energy, Materials, Food and Water Needs", https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/resource%20revolution/mgi_resource_revolution_full_report. pdf

137. Richard Shaw et al., 2013, "Resource Recovery from Mine Waste", in Waste as a resource, https://pubs.rsc.org/en/content/chapter/9781849737883-00044/978-1-84973-788-3

138. McKinsey Global Institute, 2011, "Resource Revolution: Meeting the World's Energy, Materials, Food and Water Needs", https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/resource%20revolution/mgi_resource_revolution_full_report. pdf

139. Greenspec, 2021, "Steel production and environmental impact", https://www.greenspec.co.uk/building-design/steel-products-and-environmental-impact/

140. International Resources Panel [IRP], 2019, Global Resources Outlook 2019: Natural Resources for the Future We Want, https://www.resourcepanel.org/reports/global-resources-outlook

141. Kun, H. et. al., 2018, "Energy-Saving Potential of China's Steel Industry According to Its Development Plan", Energies 11(4):948, https://www.mdpi.com/1996-1073/11/4/948

143. McKinsey Global Institute, 2011, "Resource Revolution: Meeting the World's Energy, Materials, Food and Water Needs", https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/resource%20revolution/mgi_resource_revolution_full_report. pdf

144. Government of Australia, 2016, Mine rehabilitation: leading practice sustainable development program for the mining industry, https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-mine-rehabilitation-handbook-english.pdf

145. Carvalho, F., P., 2017. "Mining industry and sustainable development: time for change", Food and Energy Security, 6(2), p.61-77, https://doi.org/10.1002/fes3.109

146. The International Aluminium Institute, 2018, "Rehabilitation", http://bauxite.world-aluminium.org/mining/rehabilitation/

147. Mining Technology, 2019, "Rehabilitating Australia's Mines: Projects Leading the Way", https://www.mining-technology.com/features/australian-mine-rehabilitation/

148. Eco-Business, 2021, "Singapore's recycling rate falls to 10-year low", https://www.eco-business.com/news/singapores-recycling-rate-falls-to-10-year-low/

149. World Economic Forum, 2016, The New Plastics Economy: Rethinking the future of plastics, http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf

150. World Economic Forum, 2016, The New Plastics Economy: Rethinking the future of plastics,

http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf

151. Asian Development Bank [ADB], 2021, "ADB COVID-19 Policy Database", https://covid19policy.adb.org/

152. Business and Sustainable Development Commission [BSDC], 2017, Valuing the SDG Prize: Unlocking Business Opportunities to Accelerate Sustainable and Inclusive Growth, http://s3.amazonaws.com/aws-bsdc/Valuing-the-SDG-Prize.pdf

153. TEEB for Business Coalition, 2013, Natural Capital at Risk: The Top 100 Externalities of Business, https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/natural_capital_at_risk_the_top_100_externalities_of_business_Trucost.pdf

154. McKinsey Global Institute, 2011, "Resource Revolution: Meeting the World's Energy, Materials, Food and Water Needs", https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/resource%20revolution/mgi_resource_revolution_full_report.pdf

155. Dasgupta, P., 2021, The Economics of Biodiversity: The Dasgupta review, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962785/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf

156. Tan Y.S., Lee T.J., and Tan K., Clean, green and blue: Singapore's journey towards environmental and water sustainability. Singapore: Institute of Southeast Asian Studies, 2009.

157. International Energy Agency [IEA], 2020 "Low Fuel Prices Provide a Historic Opportunity to Phase Out Fossil Fuel Consumption Subsidies", Paris: IEA, https://www.iea.org/articles/low-fuelprices-provide-a-historic-opportunity-to-phase-out-fossil-fuelconsumption-subsidies

158. Bruegel, 2021, "For the climate, Asia-Pacific must phase out fossil-fuel subsidies", https://www.bruegel.org/2021/05/for-the-climate-asia-pacific-must-phase-out-fossil-fuel-subsidies/; and Eco-Business, 2019, "Southeast Asia's dependence on fossil fuel subsidies 'like crack cocaine'", https://www.eco-business.com/news/southeast-asias-dependence-on-fossil-fuel-subsidies-like-crack-cocaine/

159. World Bank, 2017, The Sunken Billions Revisited: Progress and Challenges in Global Marine Fisheries. Environment and Sustainable Development Series, Washington DC: World Bank.

160. Laborde, D. et al., 2020, "Modeling the Impacts of Agricultural Support Policies on Emissions from Agriculture", Unpublished draft paper, International Food Policy Research Institute [IFPRI] and World Bank.

161. Finance for Biodiversity Initiative, 2021, Greenness of Stimulus Index, https://www.vivideconomics.com/wp-content/uploads/2021/07/Green-Stimulus-Index-6th-Edition_final-report.pdf

162. Centre for Climate Finance & Investment, 2021, Clean Energy Investing: Global Comparison of Investment Returns, https://imperialcollegelondon.app.box.com/s/73em3ob3h1pu0a0ek3bay2ydiss8x0rr

163. UK Department for Environment and Rural Affairs (2019), Payments for Ecosystem Services: A Best Practice Guide. Available at: https://www.cbd.int/financial/pes/unitedkingdom-bestpractice.pdf

164. Ashish Dash (2019), "Payment for Ecosystem Services: Palampur in Himachal has a model in place". Available at: https://www.downtoearth.org.in/news/environment/payment-for-ecosystem-services-palampur-in-himachal-has-a-model-in-place-65908

165. Organisation for Economic Co-operation and Development [OECD], 2018, Financing Climate Futures – Rethinking Infrastructure, https://www.oecd.org/environment/cc/climate-futures/policy-highlights-financing-climate-futures.pdf

166. Private participation projects are defined as those owned or managed by private companies in low- or middle-income countries: https://ppi.worldbank.org/en/methodology/ppi-methodology

167. World Bank, 2017, Contribution of Institutional Investors – Private Investment in Infrastructure (2011 – H1 2017), https://ppi.worldbank.org/content/dam/PPI/documents/PPI_InstitutionalInvestors_Update_2017.pdf

168. KPMG, 2020, The KPMG Survey of Sustainability Reporting 2020, https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/11/the-time-has-come.pdf

169. EY, 2021, The Future of Sustainability Reporting Standards, https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/sustainability/ey-the-future-of-sustainability-reporting-standards-june-2021.pdf

170. McKinsey, 2019, "More than Values: The Value-Based Sustainability Reporting that Investors Want", https://www.mckinsey.com/business-functions/sustainability/our-insights/more-than-values-the-value-based-sustainability-reporting-that-investors-want

171. Development Asia, 2018, "Green Finance, Explained", https://development.asia/explainer/green-finance-explained

172. The Conference Board, 2019, Sustainability Reporting Across Asia: Trends and Challenges, https://conference-board.org/blog/sustainability/Asia-Sustainability-Reporting-Trends

173. UN Development Programme [UNDP] and Bappenas (2021), The economic, social and environmental benefits of a circular economy in Indonesia. https://alphabeta.com/wp-content/uploads/2021/03/210127-designed-english-full-report-web.pdf

174. McKinsey, 2020, "Decarbonization challenge for steel", https://www.mckinsey.com/industries/metals-and-mining/our-insights/decarbonization-challenge-for-steel

175. IHS Markit, 2021, "Carbon tax could be key to Asia's energy transition, GHG reductions: IMF", https://ihsmarkit.com/research-analysis/carbon-tax-could-be-key-to-asias-energy-transition-ghgeducti.html/

176. National Institute for Environmental Studies, Japan, 2018, Japan's National Greenhouse Gas Emissions in Fiscal Year 2018 (Final Figures), https://www.nies.go.jp/whatsnew/20200414/20200414-e.html

177. Organisation for Economic Co-operation and Development [OECD], 2021, Effective Carbon Rates 2021, https://www.oecd.org/tax/tax-policy/effective-carbon-rates-2021-brochure.pdf

178. Sen, S., & Vollebergh, H, 2018, The effectiveness of taxing the carbon content of energy consumption. Journal of Environmental Economics and Management, 92, 74-99, https://www.sciencedirect.com/science/article/abs/pii/S0095069616301759

179. EY, 2021, The Future of Sustainability Reporting Standards, https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/sustainability/ey-the-future-of-sustainability-reporting-standards-june-2021.pdf

180. S Cruz, B., 2020, "Asian securities regulators tackle sustainability standards", The Asset, https://theasset.com/article-esg/41973/asian-securities-regulators-tackle-sustainability- standards

181. Securities and Exchange Board of India, 2020, Consultation Paper on the format for Business Responsibility and Sustainability Reporting, https://www.sebi.gov.in/reports-and-statistics/reports/aug-2020/consultation-paper-on-the-format-for-business-responsibility-and-sustainability-reporting_47345.html

182. xBRL, 2021, "Mandatory sustainability reporting for India", https://www.xbrl.org/news/mandatory-sustainability-reporting-for-india/

183. Tropical Forest Alliance, 2018, The Sprint to 2020, https://www.tropicalforestalliance.org/assets/Uploads/Sprint_to_2020_Annual-Report-2018.pdf

184. Li, J. et al., 2009, "Quest for Clean Water: China's Newly Amended Water Pollution Control Law", Wilson Center, https://www.wilsoncenter.org/publication/quest-for-clean-water-chinas-newly-amended-water-pollution-control-law

185. Lee Kwan Yew School of Public Policy, 2019, "Is China leading the way forward in water management?", https://lkyspp.nus.edu.sg/gia/article/is-china-leading-the-way-forward-in-water-management

186. Maryudi, A. ,Rodrigues, R.J., Tacconi, L., 2019, Law Enforcement and Deforestation: Lessons for Indonesia from Brazil, https://www.sciencedirect.com/science/article/pii/S1389934118304623 and Goldman, E., Weisse, M., 2021,"Primary Rainforest Destruction Increased 12% from 2019 to 2020", World Resources Institute Indonesia, https://wri-indonesia.org/en/blog/primary-rainforest-destruction-increased-12-2019-2020

187. Cetera, K., Chitra, J., 2018, "Indonesia Has a Carrot to End Illegal Logging; Now It Needs a Stick", World Resources Institute, https://www.wri.org/insights/indonesia-has-carrot-end-illegal-logging-now-it-needs-stick

188. Asian Development Bank [ADB], 2016, Fossil Fuel Subsidies in Asia; Trends, Impacts and Reforms, https://www.adb.org/sites/default/files/publication/182255/fossil-fuel-subsidies-asia.pdf

189. UN Environment Programme [UNEP], 2017, "Indigenous Peoples: The unsung heroes of conservation", https://www.unep.org/zh-hans/node/477

190. Ding, H., Veit, P., 2016, "3 Reasons Property Rights Are Essential for Healthy Ecosystems", World Resources Institute, https://www.wri.org/insights/3-reasons-property-rights-are-essential-healthy-ecosystems

191. Roundtable on Sustainable Palm Oil [RSPO], 2014, "RSPO Smallholders", https://rspo.org/smallholders

192. World Economic Forum, no date, Blended Finance Vol. 1: APrimer for Development Finance and Philanthropic Funders, http://www3.weforum.org/docs/WEF_Blended_Finance_How_To_Guide.pdf

193. Organisation for Economic Co-operation and Development [OECD] and World Economic Forum, 2016, Insights from Blended Finance Investment Vehicles and Facilities, http://www3.weforum.org/docs/WEF_Blended_Finance_Insights_Investments_Vehicles_Facilities_report_2016.pdf

194. Convergence, 2019, Data Brief: Blended Finance in Asia, https://assets.ctfassets.net/4cgqlwde6qy0/5qkeWZZEopdJcTSth1oQeD/e36a284f0e86d506ecb868912611c773/Asia_Data_Brief_vFinal2.pdf

195. Luxembourg Green Exchange, Climate Bond Initiative, 2017, The Role of Exchanges in Accelerating the Growth of the Green Bond Market, https://www.climatebonds.

net/files/files/RoleStock%20Exchanges.pdf

196. Leung, C., 2021, "China green energy ETFs deliver best performance in first half", Financial Times, https://www.ft.com/content/80ffb1e9-238c-4f23-a6e4-85c3efcf8a81

197. The Meloy Fund, 2021, "About the Fund", https://www.meloyfund.com/about

198. Global Impact Investing Network [GIIN], no date, "What you need to know about impact investing", https://thegiin.org/impact-investing/need-to- know/

199. Global Impact Investing Network [GIIN], 2018, The Landscape for Impact Investing in Southeast Asia, https://thegiin.org/assets/GIIN_SEAL_full_digital_webfile.pdf

200. CFA Institute, 2021, "The Future Trends of Impact Investing in Asia", https://www.arx.cfa/en/research/2021/03/soc010321-webinar-impact-investing-Asia

201. Science Based Targets, no date, "How it Works", https://sciencebasedtargets.org/how-it-works

202. Science Based Targets Network, 2020, Science-Based Targets for Nature: Initial Guidance for Business, https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/11/Science-Based-Targets- for-Nature-Initial-Guidance-for-Business. pdf

203. International Finance Corporation, no date, The Social and Environmental Impact Assessment Process, https://www.ifc.org/wps/wcm/connect/9608497e-56e8-4074-bab6-45c61a36a4ad/ESIA.pdf?MOD=AJPERES&CVID=jkCYZ3G

204. System of Environmental Economic Accounting, no date, "What is natural capital accounting", https://seea.un.org/content/frequently-asked-questions#What%20is%20natural%20capital%20accounting?

205. System of Environmental Economic Accounting, no date, "Natural Capital Accounting and Valuation of Ecosystem Services Project", https://seea.un.org/home/Natural-Capital-Accounting-Project

206. Development Asia, 2018, "How to Mainstream Natural Capital Accounting", https://development.asia/summary/how-mainstream-natural-capital- accounting

207. ARK Invest, 2021, Big Ideas 2021, https://research.ark-invest.com/hubfs/1_Download_Files_ARK-Invest/White_Papers/ARK%E2%80%93Invest_BigIdeas_2021.pdf

208. Goldman Sachs, 2020, Green Hydrogen: The Next Transformational Driver of the Utilities Industry, https://www.goldmansachs.com/insights/pages/gs-research/green-hydrogen/report.pdf

209. Convention on Biological Diversity, 2021, "Preparations for the Post-2020 Biodiversity Framework", https://www.cbd.int/conferences/post2020

210. United Nations, 2021, COP26 Explained, https://2nsbq1gn1rl23zol93eyrccj-wpengine.netdna-ssl.com/wp-content/uploads/2021/07/COP26-Explained.pdf

211. Temasek, 2021, "About Ecosperity", https://www.ecosperity.sg/en/about.html

212. The Institute of International Finance, 2021, "The Taskforce on Scaling Voluntary Carbon Markets", https://www.iif.com/tsvcm

213. Tropical Forest Alliance, 2018, The State of the Supply Chain Movement: Progress on Corporate Commitments and Impact at the Forest Frontier. In: The Sprint to 2020 TFA 2020 Annual Report 2018

214. Future Earth, 2019, Science Based Pathways to Sustainability, https://futureearth.org/wp-content/uploads/2019/07/FINAL_ConceptNote_SBPathways24July2019.pdf

215. Paillard, S., Virat, V., Cazé, C., Moersberger, H., Sharma, H., Valin, N., 2020, Biodiversity and the 2030 Agenda: What pathway for zero net loss of biodiversity in metropolitan France?, https://futureearth.org/wp-content/uploads/2020/11/Biodiversity-and-the-2030-Agenda-Report-EN.pdf

216. Resonance Global, 2021, "Best Practices to Harness the Power of Pre-Competitive Collaboration for Sustainable Supply Chains", https://www.resonanceglobal.com/blog/best-practices-to-harness-the-power-of-pre-competitive-collaboration-for-sustainable-supply-chains

217. Hogg, A., 2021, "Industry-level market reform in Southeast Asia: Spurring pre-competitive collaboration to green the coconut supply chain", USAID Regional Development Mission for Asia, https://www.marketlinks.org/blogs/industry-level-market-reform-southeast-asia-spurring-pre-competitive-collaboration-green; and Sustainable Coconut & Coconut Oil Roundtable, no date, "Challenges and Best Practices", https://www.sustainablecoconutcharter.com/background

218. World Bank, 2021, "World Bank Country and Lending Groups", https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

ACKNOWLEDGEMENTS

Temasek and the World Economic Forum would like to acknowledge the value contributions of the following people in the development of this document:

TEMASEK INTERNATIONAL

FREDERICK TEO
Managing Director,
Sustainable Solutions

NICHOLAS ONG
Assistant Vice President,
Sustainable Solutions

ASHLEY CHAN
Vice President, Sustainability

CELINE KOH
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ALPHABETA

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EILEEN CHUA
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WORLD ECONOMIC FORUM

AKANKSHA KHATRI
Head, Nature Action Agenda

ALEXIA SEMOV
Community Lead, Food and Nature

ASIA PACIFIC BUSINESS COMMUNITY

Thanks also go to the many private sector, industry, investor, academic, civil society, and government leaders in Asia Pacific who provided their invaluable perspectives, particularly in developing insights related to the understanding the barriers and potential solutions related to investment in nature- based solutions and biodiversity business opportunities.

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