CTRL ALT DEL

A GREEN REBOOT FOR EMERGING MARKETS

KEY SECTORS FOR POST-COVID SUSTAINABLE GROWTH

IFC International Finance Corporation
WORLD BANK GROUP
Creating Markets, Creating Opportunities

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ABBREVIATIONS AND ACRONYMS

BRT	bus rapid transport
C&I	commercial & industrial
CAGR	compound annual growth rate
CCUS	carbon capture, utilization, and storage
CO_2e	carbon dioxide equivalent
COVID-19 or COVID	2019 novel coronavirus
CSA	climate-smart agriculture
DFI	development finance institution
DG	distributed generation
EDGE	Enhancing Design for Greater Efficiency
ESCO	energy service company
EU	European Union
EV	electric vehicle
FI	financial institution
FY	fiscal year
GDP	gross domestic product
GHG	greenhouse-gas
GW	gigawatt
IEA	International Energy Association
IFI	international financial institution
ITS	intelligent transportation systems
km	kilometer
LCOE	levelized cost of energy
LEILAC	low emissions intensity lime and cement
MW	megawatt
NDC	Nationally Determined Contribution
NGO	nongovernmental organization
O&M	operations and maintenance
PPP	public-private partnership
PV	photovoltaic
SAF	sustainable aviation fuels
SMEs	small and medium enterprises
SOE	state-owned enterprise
T&D	transmission and distribution
UHV	ultra-high voltage

FOREWORD

BY HANS PETER LANKES
Vice President for Economics and Private Sector Development, IFC

The human health and economic costs of the COVID-19 pandemic continue to be tragically high. But the crisis has also provided an unprecedented opportunity to change course and to rebuild a global economy that is more resilient in the face of future shocks such as climate change.

Why? Even with the pandemic raging, it is imperative that we do not let up on ambitions for a safer, low-carbon future. But what's more, it is possible to strengthen the economic recovery from COVID-19 while at the same time building greener economies. Green industries have the potential to create millions of jobs not just in the long term, but today. Rebuilding with a strategic focus on climate-smart approaches will help companies make the inevitable low-carbon transition.

That is why I am honored to present "Ctrl-Alt-Delete: A Green Reboot for Emerging Markets" that identifies 10 sectors that can support job-rich and sustainable growth across 21 emerging-market economies. These sectors are grouped around green infrastructure, green cities, and supporting the transformation of carbon-intensive industries to green operations.

The report identifies the economic benefits, investment opportunities, and commercial readiness of each sector and examines how best to unlock these opportunities. For the most part, investment could be scaled rapidly as part of the recovery, but will require varying degrees of cooperation or coordination between the public and private sectors.

The pandemic may have created lots of uncertainty, but one thing remains clear: the climate requires action. COVID-19 may have slowed our daily lives and the global economy, but it has not slowed the pace of climate change. And as Mark Carney, the former governor of the Bank of England recently said, we cannot self-isolate from climate.

That is why we should widen our focus and shift from the narrow initial rescue to factoring the climate into the recovery, even as the world continues to be in the throes of the pandemic. We should not rebuild from this virus-borne economic crisis only to face a climate-borne economic crisis down the road.

> "It is possible to strengthen the economic recovery from COVID-19 while at the same time building greener economies."

I encourage IFC's client companies, governments, development finance institutions and civil society partners to use "Ctrl-Alt-Delete" as a road map for what a successful green recovery could look like. Let's embrace this once-in-a-lifetime opportunity to put the world on a more equitable, prosperous, and cleaner path.

EXECUTIVE SUMMARY

The economic fallout associated with the COVID-19 pandemic has triggered the worst global recession in nearly a century. In response, governments around the world have carried out unprecedented fiscal interventions to provide emergency assistance to citizens and to try to stabilize their economies.

The damage caused by the pandemic serves as a warning, as it highlights the potential economic and social impact of the mounting climate change crisis. Like COVID-19, climate change is likely to cause dramatic disruption to demand, supply and financial markets. In addition, the pandemic has exposed stark inequalities among countries and within communities, including access to health care.

As countries shift from short-term pandemic relief measures towards long-term economic recovery, governments face important decisions about the type of economies they want to rebuild and how to allocate limited resources effectively. This paper suggests one approach to that rebuilding effort: prioritizing decarbonization and low-carbon pathways across emerging markets. This option offers an effective way to forge more sustainable, resilient, and equitable economies.

21* EMERGING MARKETS

INCLUDED IN THE ANALYSIS:

EUROPE
Russia, Serbia, Turkey, Ukraine

EAST ASIA AND THE PACIFIC
China, Indonesia, Philippines, Vietnam

SOUTH ASIA
Bangladesh, India

LATIN AMERICA AND THE CARIBBEAN
Argentina, Brazil, Colombia, Mexico

MIDDLE EAST AND NORTH AFRICA
Egypt, Jordan, Morocco

SUB-SAHARAN AFRICA
Côte d'Ivoire, Kenya, Nigeria, South Africa

**These 21 countries were selected as a representative sample of IFC's client countries.*

As countries shift from short-term pandemic relief measures towards long-term economic recovery, governments face important decisions about the type of economies they want to rebuild and how to allocate limited resources effectively.

FINDINGS

In partnership with Guidehouse Insights, a market research and advisory firm, IFC sought to quantify the potential investment opportunities, job creation, and greenhouse-gas (GHG) emissions reduction associated with green recovery measures across 21 major emerging-market economies. These countries represent 62 percent of the world's population and 48 percent of global emissions. The analysis across these markets shows that focusing on green investments in select sectors between 2020 and 2030 could generate:

- ☑ $10.2 trillion in investment opportunities
- ☑ 213.4 million cumulative new direct jobs
- ☑ 4 billion tons CO_2e reduction in GHG emissions

INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION BETWEEN 2020 AND 2030 IN 21 EMERGING MARKETS ACROSS KEY SECTORS FOR A GREEN RECOVERY

GREEN RECOVERY ACROSS KEY SECTORS	EUROPE (RUSSIA, SERBIA, TURKEY, UKRAINE)	EAST ASIA AND THE PACIFIC (CHINA, INDONESIA, PHILIPPINES, VIETNAM)	SOUTH ASIA (BANGLADESH, INDIA)	LATIN AMERICA AND THE CARIBBEAN (ARGENTINA, BRAZIL, COLOMBIA, MEXICO)	MIDDLE EAST AND NORTH AFRICA (EGYPT, JORDAN, MOROCCO)	SUB-SAHARAN AFRICA (CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)	TOTAL
INVESTMENT OPPORTUNITY	$0.6 TRILLION	$5.1 TRILLION	$2.8 TRILLION	$1.3 TRILLION	$0.2 TRILLION	$0.3 TRILLION	$10.2 TRILLION
NEW DIRECT JOBS	16.8 MILLION	98.8 MILLION	53.2 MILLION	27.1 MILLION	4.2 MILLION	13.3 MILLION	213.4 MILLION
GHG EMISSIONS REDUCTION (CO_2e)	324.7 MILLION TONS	2,010.7 MILLION TONS	861.6 MILLION TONS	351.5 MILLION TONS	111.7 MILLION TONS	153.8 MILLION TONS	4.0 BILLION TONS

(Source: Guidehouse Insights)

10 KEY SECTORS

GREEN EXISTING AND FUTURE ENERGY INFRASTRUCTURE

- **SECTOR 1:** Decarbonize the grid with renewable energy
- **SECTOR 2:** Scale up distributed generation and storage

BUILD CLIMATE-SMART CITIES

- **SECTOR 3:** Retrofit buildings for energy efficiency
- **SECTOR 4:** Invest in low-carbon municipal waste and water
- **SECTOR 5:** Expand green urban transport
- **SECTOR 6:** Create nature-based urban infrastructure

SPEED THE TRANSITION TO GREEN

- **SECTOR 7:** Decarbonize heavy industry with carbon capture, utilization, and storage and green hydrogen
- **SECTOR 8:** Scale climate-smart agriculture
- **SECTOR 9:** Reinvent textile and apparel value chains
- **SECTOR 10:** Incentivize low-carbon airlines and shipping

This paper focuses on 10 sectors across 21 emerging markets that can be prioritized in post-COVID green recovery efforts. These sectors are grouped around greening existing and future energy infrastructure, building climate-smart cities, and helping speed the transition of key industries to green production practices. Concerted actions by public and private players across these areas can deliver economic recovery in the short and medium term and can deliver long-term sustainable and low-carbon growth.

- The energy sector drives all other sectors. Decarbonizing the energy sector, while ensuring universal access to energy, is critical to achieving the long-term goals of sustainable and clean growth. Post-COVID recovery efforts need to prioritize expansion of grid-scale and distributed generation renewable energy. Investing in battery storage solutions will support this goal. Thanks to drastic declines in technology costs, these sectors are on a strong market growth trajectory and can generate jobs and economic recovery benefits in the immediate term.
- Around the world, cities bore the brunt of human suffering, business closures, job losses, and reduction in revenues for municipal services caused by the pandemic. Prioritizing climate-smart infrastructure investments can help cities generate jobs quickly and leverage strapped public funding with significant private sector investment, while addressing other vital issues such as pollution, congestion, flooding, extreme heat and energy access.
- Sectors such as construction materials, chemicals, and agriculture are among the most carbon-intensive industries. It is possible to support the recovery of these industries and ensure that they follow greener pathways. Future investments in carbon-intensive industries should consider best industry practices, new business models, and technology advancements to significantly reduce emissions and bolster industry sustainability.

The 10 sectors profiled in this paper already employ millions of people and have potential to employ millions more, driven by their strong market growth trajectory. Eight of these sectors are mature for private sector investment and can generate projects with short development and construction times. Two sectors—Sector 6: using nature in urban infrastructure and Sector 7: carbon capture, utilization, and storage (CCUS) and green hydrogen—are in earlier stages of commercialization but represent strong potential for investment in the medium and long term and hold significant climate benefits.

In addition to the investment, job generation, and emissions reduction potential, there are significant other economic benefits associated with focusing on green economic recovery that are yet to be quantified. Focusing on the transition to low-carbon economies now, when the global carbon budget is projected to be exhausted within 10 to 15 years, can help offset significant adaptation and mitigation costs of future climate-borne disasters. Failure to meet global climate commitments in the next decade, according to Moody's Analytics, may result in losses of $69 trillion.

A green rebuild is the best insurance policy to protect today's substantial investment in economic recovery by helping to avoid or reduce climate-borne financial and economic crises in the years to come. Even before the pandemic, there was a growing realization among financial regulators that climate sustainability is central to the long-term financial viability of companies and financial systems. Without action on climate change, the world is likely to face severe financial impacts such as borrower default, credit risk, unemployment, constraints on liquidity, and stress on insurers.

As countries prepare to channel trillions of dollars to jump-start their economies, governments have an opportunity to use these funds to create low-carbon economies. Private sector investment alone will not enable a green recovery at the growth, scale, and speed that is required without significant and robust government action. A coalition of public and private actors is required, one where government action can create the necessary regulatory and institutional framework to foster innovation and investment.

The world is at a historic crossroads. The choices made today to respond to the pandemic and its aftermath will shape the world for generations to come. The COVID crisis has created a momentous opportunity to build a more sustainable and equitable world that is able to absorb the shocks of extreme weather events and forge a prosperous future based on a green foundation.

The post-COVID recovery presents a historic opportunity to decarbonize economies.

INTRODUCTION

The economic shutdown caused by the novel coronavirus pandemic has created the worst recession since the Great Depression.[1] Governments around the world are implementing unprecedented fiscal interventions to respond to emergency needs and put in place economic stabilization measures. By the end of 2020, major economies are estimated to have pledged $13 trillion[2] in stimulus packages, nearly 10 times the amount as a percentage of GDP allocated after the 2008 financial crisis.[3] Countries face difficult decisions about diverting funds from long-planned infrastructure and other investments to bolster welfare benefits, health-care costs, and to bail out businesses.

The economic fallout from the pandemic foreshadows potential impacts presented by the mounting climate change crisis. The drivers of severe disruption across economic sectors caused by COVID-19 are similar to the disruptions we can expect from climate change—the combination of demand and supply shocks and financial market volatility—although which sectors are most exposed differ. In addition, COVID-19 has highlighted the significant health and environmental disparities and inequalities both within and between countries.

Now that countries are beginning to shift their focus from short-term relief measures towards economic recovery, there is an opportunity to tackle the economic crisis caused by the pandemic, the climate crisis, and economic and societal disparities. It is important that future stimulus resources are deployed to restore a world that is environmentally and economically sustainable, more equitable, and more resilient to shocks such as pandemics and extreme weather events. Focusing on green recovery measures will deliver these results.

As of early November 2020, Bloomberg New Energy Finance (BNEF) estimates that national and subnational governments have committed $179 billion towards spurring a green economic recovery.[4] One-third of these stimulus measures are designated for a combination of nature conservation, biodiversity, forestry, and other areas.[5] A quarter of green stimulus targets electrified transport, followed by energy efficiency, other green mobility, clean power, and hydrogen.[6] In addition, in December 2020, the EU approved the €750 billion ($830 billion) Next Generation EU Recovery Fund, 37 percent of which, or at least €277.5 billion ($307 billion), is earmarked to climate action and environmental sustainability.[7] However, green stimulus measures make up just 3.7 percent of the estimated $13 trillion in total approved stimulus funding.[8]

In emerging markets, some countries including China, India, Indonesia, Nigeria, and South Africa have incorporated green measures into their stimulus packages, albeit a small portion of the total funding.

This paper suggests that prioritizing decarbonization and low-carbon pathways offers an effective way to economic recovery and long-term sustainable and equitable growth. It highlights and quantifies the benefits of a post-COVID green recovery in emerging markets, particularly in terms of job creation, investment opportunity, and GHG reduction potential. It recommends investment in 10 key sectors in post-COVID recovery efforts to generate investment, deliver economic recovery, create millions of jobs, and help achieve the goal of limiting global temperature rise to well below 2 degrees Celsius.

Prioritizing decarbonization and low-carbon pathways offers an effective way to economic recovery and long-term sustainable and equitable growth.

Using analysis conducted in partnership with Guidehouse Insights, the paper quantifies the economic benefits, investment potential, and job creation across 21 major emerging economies, representing 62 percent of the world's population and 48 percent of global GHG emissions. It also highlights recommendations for each sector that will enable governments and companies to realize the opportunities of green growth. This analysis does not attempt to compare the potential performance and impact of green versus non-green investments and does not provide a comprehensive analysis of the impact of COVID across the covered sectors.

The authors' aim is not to provide a comprehensive set of solutions, but to spark a conversation with policy makers, multilateral institutions, and private sector players about practical steps to increase investment in job-creating green sectors of the economy. The recommendations for the eight sectors profiled in this paper that are mature for investment are inspired by the first-hand experience and knowledge of IFC industry experts, engineers and investment officers. While not exhaustive, these ideas are drawn from IFC's own investments and mobilization of private capital for climate business across multiple sectors. The remaining two sectors—nature-based urban infrastructure and carbon capture, utilization, and storage and green hydrogen—are not yet fully commercial. The recommendations offered are based on Guidehouse Insight's analysis and IFC's preliminary assessment that these sectors can represent strong medium- to long-term investment potential.

As the largest development finance institution supporting the private sector in emerging markets, IFC has experience in creating and growing markets in key areas such as clean energy, sustainable cities, climate-smart agriculture, energy efficiency, green buildings, and green finance. Thirty percent of IFC's total committed and mobilized investments is in climate business, representing $6.8 billion in FY20. In addition, IFC catalyzes markets for climate business through advisory services to private sector businesses, financial institutions, and governments. IFC works proactively to create a global market for green investments to increase climate lending through capital markets and local financial intermediaries (see text box on page 22).

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WHY BUILD BACK GREEN?

A green recovery offers a path to job creation, investment opportunities, and GHG reduction

Analysis across 21 major emerging markets* shows that focusing on key green investments in identified sectors between 2020 and 2030 can generate:

- ☑ $10.2 trillion in investment opportunities
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- ☑ 4 billion tons CO_2e reduction in GHG emissions

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(Source: Guidehouse Insights)

≠ *This analysis was commissioned by IFC and carried out by the consulting company Guidehouse Insights. The methodology for the analysis is explained in the Annex. The analysis does not include two of the sectors covered in the paper: 1) nature-based urban infrastructure and 2) textiles and apparel. The numbers used for nature-based urban infrastructure and textiles and apparel are quoted from other sources and cited separately in the paper. The available data for these two sectors are global and, thus, are not added to the 21 emerging markets totals. Each of the data tables throughout the paper references the sources of data used for each sector.*

A GREEN RECOVERY DELIVERS ECONOMIC GROWTH AND JOBS

Green investments have a proven track record of delivering economic growth in the aftermath of a crisis, demonstrated by countries that used green stimulus funding following the 2008 global financial crisis.[9] The analysis in this paper shows that support for the identified key sectors during the post-COVID recovery phase across these 21 emerging markets can generate over 213 million cumulative new jobs in the next 10 years.

In the United States, renewable energy infrastructure built after the 2008 financial crisis led to a higher number of jobs and generated higher multiplier effects across other economic sectors when compared with non-renewable energy stimulus.[10] Global estimates show that every $1 million spent on renewable energy creates between 7.5[11] and 15[12] full-time jobs and 7.7 in energy efficiency versus 2.7 in fossil fuels.[13] Significantly, renewable energy generates more jobs in the short run than fossil fuels—even in the middle of a recession—boosting consumer spending and accelerating recovery. Renewable energy investments create jobs across industries, including manufacturing, installation, and services. In addition to job creation, the energy-efficiency industry is highly responsive to new incentives and can scale up readily available technologies, achieving substantial savings and earnings for households and businesses.

In the European Union, green investments following the 2008 crisis resulted in economic benefits of up to 1.1 percent of GDP at the national level, and up to 1.5 percent of GDP at the EU level.[14] Stimulus programs targeted at renewable energy across the EU and the United States have helped create a new asset class of infrastructure investments that increasingly attract pension funds, hedge funds, and other institutional investors.[15]

In the wake of the 2008 financial crisis, South Korea spent $60 billion, or about 70 percent of its total stimulus funding, on green investments in railroads and mass transit, energy-efficient buildings, water and wastewater management, fuel-efficient vehicles, and renewable energy.[16] By the third quarter of 2009, South Korea had a growth rate of 2.8 percent, one of the highest among OECD (Organization for Economic Cooperation & Development) countries.[17] To date, South Korea has committed to release $60.8 billion in green COVID stimulus funding before 2025 to support renewable energy, electric and hydrogen-powered vehicles, and energy-efficiency retrofits in buildings.[18]

> Rebuilding emerging economies today to be green tomorrow can help avoid climate-borne financial and economic crises, protect today's investment in recovery, and produce lasting economic gains.

LOW-CARBON GROWTH CREATES INVESTMENT OPPORTUNITIES

Supporting investment and channeling recovery funds into climate-smart business in the key sectors across the 21 emerging markets represents a $10.2 trillion investment opportunity for both the public and private sectors. Green industries have a track record of generating jobs quickly and are projected to grow, even in the post-COVID environment due to declining technology costs and increasing demand. Many carbon-intensive sectors, such as coal, are facing increasing competition from lower cost renewable technologies, impacting their long-term growth potential. In the absence of costly government subsidies or transition strategies, these sectors face a future as "stranded assets" – non-performing or significantly devalued assets.

Progressive private companies and institutional investors are ready to take advantage of new green business opportunities and lead the transition to a global low-carbon economy. In May 2020, 155 companies—with a combined market capitalization of over $2.4 trillion—signed a statement urging governments around the world to align their COVID-19 economic aid and recovery efforts with current climate science.[19] Two hundred businesses in the United Kingdom called on their government to launch a green economic recovery plan to accelerate the transition to net zero.[20] Over 70 pension funds and investment managers with $16 trillion in assets, designed and will begin testing a "net zero" framework to help decarbonize their portfolios by 2050.[21] By focusing on rebuilding with a strategic focus on climate-smart approaches, governments can help the private sector transition and prepare for future growth in low-carbon and climate-resilient economies.

AN EFFECTIVE WAY TO TRANSITION TO A LOW-CARBON FUTURE

The high cost of investment in decarbonization has long stymied the transition to a low-carbon global economy. As countries prepare to channel trillions of dollars to jump-start their economies following the pandemic, they can leverage this new spending to drive transition to low-carbon economies and to avoid propping up carbon-intensive sectors either directly or indirectly through subsidies. Thus, the post-COVID recovery presents a historic opportunity to decarbonize economies in an effective way. Focusing on the transition to low-carbon economies now, when the global carbon budget is projected to be exhausted within 10 to 15 years, can help avoid significant costs associated with future climate-borne disasters.[22] Instead, countries can prioritize the decarbonization of their economies, leading to millions of new jobs and trillions in economic output, helping rebuild economies and private enterprise fit for the future.

REBUILDING GREEN REDUCES THE IMPACT OF FUTURE CLIMATE-BORNE FINANCIAL AND ECONOMIC CRISES

The severe economic disruption across sectors caused by COVID-19—demand shocks, supply shocks and financial market volatility shocks—mirrors the disruptions expected from climate change. Even before the pandemic hit, there was a growing realization that climate sustainability is central to the long-term financial viability of companies and financial systems. In recent years, leaders in the financial sector have warned that carbon-intensive assets bring greater financial risk to themselves and their investors. In January 2020, several financial sector leaders published a warning in "The Green Swan: Central Banking and Financial Stability in the Age of Climate Change."[23]

Without a course correction on climate, we are likely to face severe financial impacts such as borrower default, credit risk, unemployment, constraints on liquidity, and stress on insurers. It is estimated that up to 25 percent of the world's financial markets are in danger of being impacted by climate change. This echoes the concerns of the Financial Stability Board, an international body that monitors the global financial system, that led to the guidance for disclosure on financial-related climate risk and the growing number of climate risk disclosure regulations in many countries.

Rebuilding emerging economies today to be green tomorrow can help avoid climate-borne financial and economic crises, protect today's investment in recovery, and produce lasting economic gains.

RESTARTING ECONOMIC GROWTH ON A CLIMATE-SMART PATH IS CRITICAL TO ACHIEVING EQUITABLE GROWTH AND SHARED PROSPERITY

The pandemic has highlighted sharp disparities in the ability to cope with shocks between the developing and developed worlds and between the wealthy and poor. The human and financial toll wrought by the COVID-19 pandemic on the world's poorest and most vulnerable communities parallels the impacts of climate change. Climate change is already causing significant human suffering such as water shortages, crop failures, wildfires, extreme weather, forced migration, and pandemics. Hotter and poorer regions are hit particularly hard as they lack the means to invest in adaptation and resilience measures.

Continuing global climate commitments is critical to building a more equitable society. Many countries and communities, especially those in emerging markets, rely on income derived from fossil fuel and carbon-intensive industries. These communities are at a higher risk of seeing "stranded assets", job loss, and other negative impacts on communities in the transition to a low-carbon economy. While the green recovery will create millions of jobs, there will also be significant job losses in carbon-intensive sectors of the global economy. It is critical that green recovery efforts include support to help communities execute a just transition from employment based on fossil fuels to green jobs.

HOW TO REBUILD GREEN

10 KEY SECTORS

GREEN EXISTING AND FUTURE ENERGY INFRASTRUCTURE

- **SECTOR 1:** Decarbonize the grid with renewable energy
- **SECTOR 2:** Scale up distributed generation and storage

BUILD CLIMATE-SMART CITIES

- **SECTOR 3:** Retrofit buildings for energy efficiency
- **SECTOR 4:** Invest in low-carbon municipal waste and water
- **SECTOR 5:** Expand green urban transport
- **SECTOR 6:** Create nature-based urban infrastructure

SPEED THE TRANSITION TO GREEN

- **SECTOR 7:** Decarbonize heavy industry with carbon capture, utilization, and storage and green hydrogen
- **SECTOR 8:** Scale climate-smart agriculture
- **SECTOR 9:** Reinvent textile and apparel value chains
- **SECTOR 10:** Incentivize low-carbon airlines and shipping

This paper examines 10 sectors across 21 emerging markets that can be prioritized in the post-COVID green recovery efforts. These sectors employ millions of people and represent growth industries with the strong potential to employ millions more. Eight of these sectors are mature for private sector investment and can generate projects with short development and construction times and attract significant private capital. This is particularly important in a post-COVID budget-constrained environment where limited public funding should be carefully leveraged to create appropriate fiscal and policy incentives to encourage the growth of private enterprise across these sectors. Two sectors—carbon capture, utilization, and storage, and using nature in urban infrastructure—are in earlier stages of commercialization. However, the focus on developing these sectors today can lead to significant technology cost reductions, new investment opportunities, and climate benefits in the medium and long term.

The 10 key sectors fall within three key areas where concerted action can deliver economic recovery in the short and medium term and long-term sustainable and low-carbon economic growth. These areas are greening existing and future energy infrastructure, building climate-smart cities, and accelerating the "transition to green"—helping transition high-emitting industries to low-carbon production practices.

PUBLIC-PRIVATE PARTNERSHIP

Accelerating green recovery investment in the 10 key sectors in this paper will require action by both the public and private sectors. The private sector is uniquely positioned to help deliver on this ambitious agenda by accelerating investments commercially and at scale. We have seen this already through IFC's investments in low-cost renewable energy and green buildings, including the Scaling Solar program that delivers solar photovoltaic (PV) to countries across Africa, and the award-winning EDGE buildings certification program that helps developers reduce their buildings' energy and water consumption while lowering GHG emissions.

To enhance a green recovery, private investment could be regarded as the default option. This is all the more critical in the COVID era when governments' fiscal headroom is constrained and must compete with other public spending priorities. The private sector will be typically more efficient and deliver with greater flexibility in light of evolving technology.

Private sector investment alone will not enable a green recovery at the growth, scale, and speed that is required without significant and robust government action. A coalition of public and private actors is required, one where government action can create the necessary regulatory and institutional framework to foster innovation and investment. To help decarbonize economies, committed governments can calibrate policies to provide incentives or counter disincentives, set quality and technical standards, support skills training and development, adjust spatial and urban planning, and invest in research and information platforms. IFC's Energy Storage Regulation Network (STOREnet) is a concrete example of public and private collaboration at work. Launched in 2020 in response to a growing need for regulatory support in the energy storage sector, STOREnet has created a solid global network of regulators with a deeper understanding of regulatory needs to scale battery energy storage and investments.

Targeting blended concessional finance for projects with high initial technology risks, or in the face of residual regulatory uncertainty and significant externalities that create disincentives for investors, presents a further opportunity for the public and private sectors. Through new approaches like blended finance investments—supported by the IDA18 Private Sector Window (PSW)—development finance institutions (DFIs) like IFC can step up their game in the most difficult geographies and achieve impact at scale. The World Bank Group's "Cascade" approach seeks first to maximize private sector solutions to address development challenges—where such solutions are advisable and can be effective—and to reserve public financing for projects only when other options are suboptimal. IFC's 3.0 strategy emerged from this approach and focuses the institution on creating markets and mobilizing private capital, with increased support to countries where private capital flows are the most inadequate to address major development gaps.

Launched in 2020 in response to a growing need for regulatory support in the energy storage sector, STOREnet has created a solid global network of regulators with a deeper understanding of regulatory needs to scale battery energy storage and investments.

GREEN EXISTING AND FUTURE ENERGY INFRASTRUCTURE

BETWEEN 2020 AND 2030 IN 21 EMERGING MARKETS:

SECTOR 1

DECARBONIZE THE GRID WITH RENEWABLE ENERGY

ECONOMIC AND CLIMATE BENEFITS

$1.6 TRILLION IN INVESTMENT OPPORTUNITY

18.9 MILLION NEW DIRECT JOBS

812.6 MILLION TONS CO_2e EMISSIONS REDUCTION

SECTOR 2

SCALE UP DISTRIBUTED GENERATION AND STORAGE

ECONOMIC AND CLIMATE BENEFITS

$0.9 TRILLION IN INVESTMENT OPPORTUNITY

23.9 MILLION NEW DIRECT JOBS

348.3 MILLION TONS CO_2e EMISSIONS REDUCTION

(Source: Guidehouse Insights)

Lessons from the 2008 financial crisis response demonstrate that incentivizing the deployment of grid-scale renewable energy produces fast and lasting economic benefits.[24] Today, the renewable energy sector is in an even stronger position to help drive recovery.

Even with current low oil and gas prices, the plunging costs of solar, wind, and battery storage have made renewable energy extremely competitive and firmly placed the sector on a long-term growth trajectory. Renewable energy infrastructure has become an attractive investment asset class, with many projects currently in advanced stages of development that could be rolled out quickly. The analysis of the 21 emerging markets estimates the sector's investment potential to be $1.6 trillion in the next 10 years, with the potential to create nearly 19 million new direct jobs and more than twice as many indirect jobs.

The distributed generation of renewable energy and storage has emerged as a solution to deliver energy to locations with weak or non-existent electricity grids and stimulate local economies. These sectors have the potential to create nearly 24 million new direct jobs and as many indirect jobs, and generate $900 billion in investment opportunities by 2030. In addition, distributed generation systems can help utilities save on investments in expanding grid infrastructure, an important consideration in the post-COVID capital-constrained environment.

BUILD CLIMATE-SMART CITIES

BETWEEN 2020 AND 2030
IN 21 EMERGING MARKETS:

SECTOR 3

RETROFIT BUILDINGS FOR ENERGY EFFICIENCY

ECONOMIC AND CLIMATE BENEFITS

$1.1 TRILLION IN INVESTMENT OPPORTUNITY

24.9 MILLION NEW DIRECT JOBS

1 BILLION TONS CO_2e EMISSIONS REDUCTION

SECTOR 4

INVEST IN LOW-CARBON MUNICIPAL WASTE AND WATER

ECONOMIC AND CLIMATE BENEFITS

$2 TRILLION IN INVESTMENT OPPORTUNITY

23.4 MILLION NEW DIRECT JOBS

313.7 MILLION TONS CO_2e EMISSIONS REDUCTION

SECTOR 5

EXPAND GREEN URBAN TRANSPORT

ECONOMIC AND CLIMATE BENEFITS

$2.7 TRILLION IN INVESTMENT OPPORTUNITY

53.4 MILLION NEW DIRECT JOBS

223.9 MILLION TONS CO_2e EMISSIONS REDUCTION

SECTOR 6*

CREATE NATURE-BASED URBAN INFRASTRUCTURE

ECONOMIC AND CLIMATE BENEFITS

$1.1 TRILLION IN INVESTMENT OPPORTUNITY BETWEEN 2020 AND 2030 GLOBALLY

42 MILLION JOBS BETWEEN 2020 AND 2030 GLOBALLY

(Sources: Sectors 3, 4, & 5: Guidehouse Insights; Sector 6: World Economic Forum)

** Data for this sector are global.*

The pandemic has wrought a particularly adverse economic impact on urban areas due to widespread business closures, job losses, and reduction in revenues for municipal services, placing a significant strain on already limited budgets. Prioritizing climate-smart infrastructure investments can help cities generate jobs quickly and leverage strapped public funding with significant private sector investment, while addressing other vital issues such as pollution, congestion, flooding, extreme heat, and energy access.

The energy-efficient retrofits of buildings, low-carbon municipal waste and water, and green urban transport can deliver benefits to cities in the short and medium term. Combined, these sectors represent nearly $6 trillion in investment opportunity across the 21 emerging markets over the next 10 years and can help create more than 100 million new direct jobs and nearly one and a half times as many indirect jobs in supporting industries. Investments in energy-efficient retrofits bring additional benefits in reducing household and business energy bills, translating into an increase in disposable income to be put back into economies.[25]

Integrating nature-based solutions, such as tree planting, greening roofs, and reforesting watersheds, into city environments and municipal infrastructure is gaining attention. Combining nature with traditional built infrastructure can deliver significant savings for municipalities in upfront capital investments and maintenance costs and deliver comparable or better results in terms of water quality and quantity, storm surge and flood prevention, and protecting property when compared to only human-built infrastructure. Investment in nature as infrastructure and nature-positive built environments could generate a global $1.1 trillion in annual business opportunities—both through generating positive economic benefits and avoiding economic losses—and create 42 million jobs globally by 2030, according to the World Economic Forum.[26] Nature-based solutions have the added benefit, compared to traditional infrastructure, of creating climate mitigation and adaptation gains and economic value in other sectors.

Climate-smart infrastructure investments can help cities generate jobs quickly and leverage strapped public funding with significant private sector investment, while addressing other vital issues such as pollution, congestion, flooding, extreme heat, and energy access.

SPEED THE TRANSITION TO GREEN

BETWEEN 2020 AND 2030 IN 21 EMERGING MARKETS:

SECTOR 7

DECARBONIZE HEAVY INDUSTRY WITH CARBON CAPTURE, UTILIZATION, AND STORAGE AND GREEN HYDROGEN

ECONOMIC AND CLIMATE BENEFITS

$671.4 BILLION IN INVESTMENT OPPORTUNITY

22.5 MILLION NEW DIRECT JOBS

544.6 BILLION TONS CO_2e EMISSIONS REDUCTION

SECTOR 8

SCALE CLIMATE-SMART AGRICULTURE

ECONOMIC AND CLIMATE BENEFITS

$1 TRILLION IN INVESTMENT OPPORTUNITY

40.2 MILLION NEW DIRECT JOBS

279.9 MILLION TONS CO_2e EMISSIONS REDUCTION

SECTOR 9*

REINVENT TEXTILE AND APPAREL VALUE CHAINS

ECONOMIC AND CLIMATE BENEFITS

$1.1 TRILLION GLOBALLY

60 MILLION MAINTAINED JOBS IN GLOBAL SUPPLY CHAIN

1 BILLION TONS CO_2e EMISSIONS REDUCTION GLOBALLY

SECTOR 10

INCENTIVIZE LOW-CARBON AIRLINES AND SHIPPING

ECONOMIC AND CLIMATE BENEFITS

$217.8 BILLION IN INVESTMENT OPPORTUNITY

6.1 MILLION NEW DIRECT JOBS

223.9 MILLION TONS CO_2e EMISSIONS REDUCTION

(Sources: Sectors 7, 8 and 10: Guidehouse Insights; Sector 9: Boston Consulting Group and McKinsey)

** Data for this sector are global.*

Carbon-intensive industries, including cement, steel, and chemicals, lay the foundation for many economic activities such as construction, manufacturing, infrastructure, and agriculture. It is possible to support these industries and to ensure that they follow greener pathways. Future investments in carbon-intensive industries as part of emerging-market development pathways should consider best industry practices, new business models, and technology advancements to significantly reduce emissions and bolster industry sustainability.

For some sectors, such as agribusiness, this will ensure long-term sustainability of the sector as climate-smart production practices have demonstrated productivity gains and increasing resilience to shocks associated with the changing climate. For others, such as manufacturing, building materials, apparel, and transport, transitioning to low-carbon production practices ensures competitiveness in low-carbon future economies.

Heavy industry, including the production of ammonia, cement, ethylene, steel, chemical manufacturing, refining, and iron production, accounts for 21 percent of global GHG emissions.[27] We see two significant opportunities for decarbonization in this space, both of which remain in the early stages for IFC client countries but have growing support in OECD countries. First, and arguably more near-term for IFC client countries, is CCUS technology. This technology holds promise, representing $671.4 billion in potential investment opportunities across the 21 emerging markets in the next 10 years. The deployment of CCUS can create 22.5 million new direct jobs and one and a half times as many indirect jobs over the same period. Governments can help incentivize the growth of the CCUS sector, just as government support gave rise to the renewable energy sector in the aftermath of the 2008 financial crisis.

In addition to CCUS, hydrogen will be essential to achieving broad decarbonization. Hydrogen is already commonly used globally, but the majority is produced using fossil fuels. Green hydrogen is produced through a process known as electrolysis powered by renewable energy. Green hydrogen produced in this manner has zero emissions and can be used just like any other hydrogen across sectors (industry, shipping, transport, energy storage, and more). Importantly, green hydrogen production is set to increase over the next decade in response to European announcements of significant green stimulus funding (8 percent of total announced)[28] directed towards improving technology costs and building a green hydrogen economy across the EU.

Future investments in carbon-intensive industries as part of emerging-market development pathways should consider best industry practices, new business models, and technology advancements to significantly reduce emissions and bolster industry sustainability.

STIMULATE A POST-COVID RECOVERY WITH GREEN FINANCE

Green finance – finance by banks and capital markets to climate projects – will be critical to fuel a post-COVID green recovery. Green financial products and instruments will play a key role across all identified key sectors. These include green bonds and green loans that allocate the use of proceeds to eligible climate investments. New products have been developed including municipal resilience bonds, sustainability-linked bonds, and loans that offer variable interest rates based on achieving quantified climate results. Transition bonds are emerging as a new product to help heavy-emitting sectors make a transition to cleaner production practices.

Traditional lending that targets climate-smart businesses, technologies, and financing specific climate-related improvements remains critical. Given the increasing importance of global trade flows, trade finance instruments will play a key role in the overall greening needed. Governments' enabling policies, regulations, and financial support across the reviewed key sectors will play a key role in helping build a pipeline of investable and bankable green asset classes. Financial policies and regulations that require climate risk disclosures for banks and investors can accelerate the rebalancing of financial portfolios away from high-emitting sectors towards low-carbon assets. Both approaches are needed to support the growth of green finance to power a global green recovery.

IFC CLIMATE BUSINESS

IFC is one of the world's largest private sector financiers of climate-smart projects for emerging markets and is a leader in mobilizing private sector finance. IFC mobilizes private finance for climate projects directly through syndication platforms, green bond funds, and advisory services, and indirectly through non-syndicated co-finance. IFC also uses blended concessional finance as a de-risking tool to bridge gaps in commercial markets—these concessional funds can help catalyze private financing that would not otherwise be available to projects with high climate impact.

IFC has built a robust climate business portfolio over the last decade. In FY20 (ended on June 30, 2020), amid the COVID-19 crisis, IFC finished the year with strong climate performance—30 percent climate business for own account investments, exceeding its 29 percent target and investing over $700 million more than in FY19. In addition, 31 percent of mobilized financing by IFC was in climate business. Between FY21 and FY25, IFC's climate business target is to invest an average of 35 percent of its own investment in climate.

To meet these targets and accelerate the mobilization of climate finance, IFC will continue to grow its core business and develop new products to build climate markets, focusing on technologies and business models that can deliver results at scale. New product examples include blue bonds, transition bonds, and biodiversity finance.

IFC's core climate business focuses on five strategic areas: clean energy, climate-smart cities, climate-smart agriculture, green buildings, and green finance. Energy efficiency and new technologies and innovation cut across all five focus areas. IFC is also working to create markets and to facilitate market entry for private investment in disruptive renewable technologies, such as offshore wind, floating PV, distributed generation and energy storage solutions, electric vehicles, resilience in buildings, green hydrogen, and marine plastics.

In addition to direct climate investments, IFC leverages its more than 750 financial intermediary clients, holding $5 trillion in banking assets in emerging markets, to expand financing available for climate projects. IFC provides dedicated credit lines for on-lending to climate projects and helps build internal systems, tools, and capacity to significantly grow client banks' green portfolios. In addition, IFC has developed a new approach to greening equity investments in financial institutions (FIs). This approach is designed to increase climate lending and reduce exposure to coal in financial clients where IFC has equity, or an equity-like, exposure.

IFC further supports the establishment of local green finance markets by issuing local currency bonds. It helps banks issue their own green bonds by providing guarantees, acting as an anchor investor, and providing advisory services and tools to help clients develop, issue, and track green bonds. This enables emerging-market clients access to a wider investor base and paves the way for future issuances without enhancement. IFC will leverage its experience with the financial sector to support the green bond issuances of manufacturing, agribusiness, and commercial services clients. In addition, IFC is developing criteria for its investments in transition bonds and blue bonds.

To advance green finance beyond its own clients and at a market-wide level, IFC serves as the secretariat for the Sustainable Banking Network (SBN), which brings together financial regulators and banking associations from 40 emerging markets that collectively hold $43 trillion or 85 percent of the total banking assets in emerging markets. SBN members develop and implement policies to advance sustainable and green finance in line with international best practice. IFC has also established a new alliance of green commercial banks, based on the SBN model, which will be piloted in Asia in 2021.

IFC—BLENDED CONCESSIONAL FINANCE FOR CLIMATE IMPACT

IFC is a global leader in crowding-in private finance to deliver sustainable impact in the developing world. Blended finance is one of the most significant tools that, in cooperation with government partners and other contributors, IFC uses to address market failures and mobilize private investment in pioneering projects and challenging environments. IFC defines blended finance/blended concessional finance as the combination of concessional finance from donors or third parties alongside its own account finance and commercial finance from other investors, to develop private sector markets, address the Sustainable Development Goals, and mobilize private resources.

Blended finance can support and incentivize the transition to low-carbon economies to build back better in the post COVID-19 crisis. Since 2004, IFC has established strong partnerships with bilateral and multilateral donors that support blended finance in the climate space—including the governments of Canada, Finland, and the United Kingdom; the Climate Investment Funds; and the Global Environment Facility—and has become an accredited entity with the Green Climate Fund. IFC manages funds from 11 blended finance facilities focusing on climate, with portfolios surpassing $600 million in more than 65 projects. For each dollar invested from blended finance climate facilities, IFC has leveraged $3 from its own account and $8 from third parties.

IFC's blended finance has supported the transition to a greener economy in several ways. For example, it has helped introduce innovative green technologies in emerging markets, like the solar PV in the early 2000s or energy storage more recently, as described on page 34, "Distributed generation and storage electrifies new possibilities across emerging markets." Blended finance helped this transition by offsetting some of the higher costs and risks of an unproven technology or a new business model. IFC also uses blended finance to incentivize additional green impact, for instance, by deploying performance-based incentives to encourage its financial institution clients to provide finance to retrofit buildings for energy efficiency or build green.

IFC has used blended finance in support of a green recovery in almost all sectors mentioned in this report, such as climate-smart agriculture, waste management and waste-to-energy, plastics recycling, and distributed generation. While the blended finance facilities mentioned earlier are explicitly directed toward target climate adaptation and mitigation sectors, other facilities provide flexibility in terms of supporting climate opportunities for the private sector to pursue, such as the IDA Private Sector Window and the Netherlands-IFC Middle East & North Africa Private Sector Development program. These climate-specific and broader facilities can also help in those sectors that were most hit by the COVID-19 crisis (such as tourism and certain manufacturing sectors like textiles, among others) by uplifting the most vulnerable populations while ensuring a just, sustainable, and green transition.

Regardless of what sectors IFC uses blended finance in, it is particularly important to highlight IFC's rigorous application of the DFI Enhanced Blended Concessional Finance Principles for Private Sector Projects (the DFI Principles) agreed by more than 20 DFIs. The DFI Principles include i) the Economic Rationale for Blended Finance, ii) Crowding-in and Minimum Concessionality, iii) Commercial Sustainability, iv) Reinforcing Markets, and v) Promoting High Standards. These Principles help use scarce blended finance resources in the most effective, efficient, and transparent manner, while adapting solutions to specific needs. In the context of a COVID-19 response, adherence to the DFI Principles by IFC and other DFIs remains vital.

A more detailed description of the Principles can be found at *https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/bf/bf-details/bf-dfi.*

SECTOR 1

DECARBONIZE THE GRID WITH RENEWABLE ENERGY

SECTOR 1

DECARBONIZE THE GRID WITH RENEWABLE ENERGY

COVID-19 has hit the global economy hard, with energy demand dropping 3.8 percent in the first quarter of 2020, coinciding with the strictest lockdown periods in North America and Europe.[29] Coal was the hardest hit, experiencing an 8 percent drop compared to 2019, followed by oil which dropped by 5 percent, and gas by 2 percent.[30] The renewable energy sector had a different experience. Initially, the sector experienced supply chain disruptions and construction delays. However, recent analysis from the International Energy Agency (IEA), an international organization committed to securing a sustainable energy future for all, found that renewables have proven more resilient than initially anticipated.

GRID-SCALE RENEWABLE ENERGY: INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION IN 21 EMERGING MARKETS BETWEEN 2020 AND 2030.

EUROPE
(RUSSIA, SERBIA, TURKEY, UKRAINE)

$83.7 BILLION
INVESTMENT OPPORTUNITY

1.4 MILLION
JOBS CREATED

106.7 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

MIDDLE EAST AND NORTH AFRICA
(EGYPT, JORDAN, MOROCCO)

$46.3 BILLION
INVESTMENT OPPORTUNITY

0.5 MILLION
JOBS CREATED

33.8 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

EAST ASIA AND THE PACIFIC
(CHINA, INDONESIA, PHILIPPINES, VIETNAM)

$786.5 BILLION
INVESTMENT OPPORTUNITY

7.9 MILLION
JOBS CREATED

410.2 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

LATIN AMERICA AND THE CARIBBEAN
(ARGENTINA, BRAZIL, COLOMBIA, MEXICO)

$187.1 BILLION
INVESTMENT OPPORTUNITY

2.5 MILLION
JOBS CREATED

39.5 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SUB-SAHARAN AFRICA
(CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)

$63.6 BILLION
INVESTMENT OPPORTUNITY

2.2 MILLION
JOBS CREATED

46.5 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SOUTH ASIA
(BANGLADESH, INDIA)

$423.5 BILLION
INVESTMENT OPPORTUNITY

4.3 MILLION
JOBS CREATED

175.8 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

TOTAL	$1.6 TRILLION INVESTMENT OPPORTUNITY	18.9 MILLION JOBS CREATED	812.6 MILLION TONS CO_2e GHG EMISSIONS REDUCTION POTENTIAL

(Source: Guidehouse Insights)

In November 2020, the IEA estimated that renewable energy generation will grow by nearly 7 percent in 2020, in sharp contrast to all other fuels.[31] Investor appetite remains strong, with auctioned renewable capacity 15 percent higher between January and October 2020 compared to the same period in 2019.[32] The same IEA analysis indicated that 2021 could be an even more impressive year, with an estimated 10 percent expansion in new renewable capacity additions. This is largely attributable to steady progress in previously delayed projects combined with a strong pre-COVID pipeline in select markets.[33]

The longer-term outlook is positive as well. Plunging prices for solar, wind, and batteries will drive an eleven-fold increase in renewable energy generation globally by 2050.[34] In 2050, the global power system could derive 61 percent of its energy from renewable resources, up from less than a quarter today.[35] IFC's own-account investments in renewable energy in the last two years alone have totaled $1.8 billion while mobilizing a further $5.7 billion.

The continued support and deployment of utility-scale renewable energy presents a rare opportunity to avoid carbon lock-in for years to come. Compared to fossil fuels, renewable energy prices have avoided the negative economic impacts of COVID-19 and are expected to remain cheap. According to estimated levelized cost of energy (LCOE)[‡], solar PV and onshore wind are now the cheapest sources of new bulk power generation in countries that make up two-thirds of the world's population, 72 percent of global GDP, and 85 percent of electricity demand.[36] Energy storage, specifically utility-scale, will scale up significantly as it becomes increasingly competitive with gas peaker plants[§] and new-build thermal assets. While a diverse energy mix is ideal, emerging-market countries that use green recovery funding to support fossil fuels risk missing the opportunity to harness steady progress made on low-cost renewable energy and could place themselves further from a sustainable development pathway.

Compared to fossil fuels, renewable energy prices have avoided the negative economic impacts of COVID-19 and are expected to remain low.

‡ *The **levelized cost of energy,** commonly referred to as **LCOE,** measures lifetime costs divided by energy production. It communicates the present value of the cost of building an energy asset over its entire lifetime. Importantly, it allows the comparison of different types of assets (wind, solar, gas) of different lifetimes, size, risk, capital cost, return, and capacity. Source: https://www.energy.gov/sites/prod/files/2015/08/f25/LCOE.pdf*

§ ***Gas peaker plants** refer to the natural gas-powered energy assets used to meet periods of high demand, also referred to as peak demand. They can be quickly ramped up and down depending on needs, and tend to command a higher price per kilowatt hour than baseload assets that run more consistently and can be powered by other energy sources.*

OPPORTUNITIES AND DRIVERS

The pace of investment in clean energy technologies must significantly increase in order to meet global energy demand and achieve the goals set under the Paris Agreement. Emerging markets can take advantage of low-cost renewable energy as they rebuild from COVID-19 and meet growing energy demand. Bolstering the existing pipeline and expanding new renewable energy with storage capacity will be essential to keeping the world below 2 degrees Celsius. Renewable energy can create new jobs, help improve energy security, and support ongoing government commitments to expand clean energy.[37]

ECONOMIC IMPACTS

Between now and 2030, utility-scale renewable energy technologies—including solar, offshore and onshore wind, biomass, hydro, renewable hydrogen, storage, and geothermal—will represent a steadily increasing investment opportunity across all regions. Our analysis across 21 emerging market countries found a $1.6 trillion investment potential over the next 10 years in utility-scale renewable energy, accounting for 18.9 million new direct jobs. Continued government support through incentives and the opening of the markets to increased stakeholder participation can help the private sector realize this potential investment.

Renewable energy revenues are growing at a 7.4 percent compound annual growth rate (CAGR) across the 21 emerging markets analyzed in this paper. Regionally, East Asia and the Pacific represents nearly half, or $786.5 billion, of total investment potential among the 21 markets over 10 years. This is largely driven by China, which has the largest share of utility-scale solar PV revenues in the world. South Asia follows with 27 percent ($423.5 billion), and Latin America and the Caribbean with 12 percent ($187.1 billion).

Per dollar invested, solar PV can produce nearly two to three times more jobs compared to fossil fuels.[38] The same holds true per megawatt (MW) generating capacity. In the United States, solar requires 3.84 workers per MW and wind requires 1.17 workers per MW, while natural gas requires 0.4 workers per MW.[39] Emerging markets, particularly those that are energy import dependent, will require even more demand for highly skilled renewable energy jobs, representing significant economic development potential.

The utility-scale renewable energy sector has a high multiplier effect across related industries, particularly manufacturing and technical service-related industries. Investing in renewable energy could generate twice the number of jobs in related industries. This impact can be further amplified in regions where technical development can occur at the local level. As countries continue to plan and implement their stimulus, it is important to note that clean energy spending is most effective when closely coordinated and linked to skills development and training at an early stage.[40]

CLIMATE IMPACTS

With the potential to reduce 812.6 million tons of CO_2e, utility-scale renewable energy has the second-highest GHG reduction potential across the 10 sectors, second to energy-efficient buildings. When combined with storage, renewable energy can achieve broad decarbonization.

Between now and 2030, utility-scale renewable energy technologies—including solar, offshore and onshore wind, biomass, hydro, renewable hydrogen, storage, and geothermal—will represent a steadily increasing investment opportunity across all regions.

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

SUPPORT THE EXISTING PIPELINE AND ACCELERATE NEW DEPLOYMENT

Recovery efforts by the public and private sectors should focus first on supporting the deployment and implementation of projects already in the pipeline. At the time of this report's publication, over 385 gigawatts (GW) of global solar and wind projects are permitted and ready to advance.[41] Governments can support private sector actors by accelerating and expanding tenders for power delivery contracts and renewable portfolio standards among other supporting policies.[42]

Renewable energy, specifically emerging technologies like offshore wind and floating PV, offer the highest bang per stimulus buck, considering that their job creation potential surpasses fossil fuel industries.[43] Governments can increase private sector appetite in emerging markets by launching competitive auctions to open markets, increasing capacity, and decreasing prices while reducing generation costs. With grid-scale renewable energy in focus, utilities should continue to retire their dependence on fossil fuels.

INVEST IN SKILLS TRAINING

Ramping up grid-scale renewable installations will require local jobs across multiple construction and operation phases. Sixty percent of the 11 million renewable energy workers worldwide are located in China, the EU, and Brazil. Just over 4 million of those workers are in China alone.[44] As these technologies expand, there will be extensive demand for qualified installers, who remain in short supply even in OECD markets. Investment in local training for activities like storage installation will be a marketable skill. Retraining will also be an important consideration. Germany and Spain have established public sector training programs focused on transitioning workers away from legacy power sources like coal, towards new energy jobs. Additional private investment in smart-grid technologies can cut costs and facilitate decentralized energy systems and will also require another set of expertise for workers trained in digital technology.[45]

BUILD REGULATORY ENVIRONMENTS

Streamlining permitting and regulatory processes can help increase renewable energy penetration, reduce emissions, and generate jobs. Additionally, improving trade and import policies and avoiding local content requirements that may unfairly penalize private sector renewable energy players can support sector-wide scale-up. Energy storage technologies provide one example. To be economically viable, these technologies require specific regulations from the public sector that enable private assets to charge for multiple revenue streams. Countries like the United States and Australia are leading the way in this regard, and emerging markets can learn from their experience.

INVEST IN TRANSMISSION AND DISTRIBUTION SYSTEMS

The grid is the most complex infrastructure system in any economy. It is also one of the most important, representing the backbone of the energy system. The supply of intermittent renewable energy, which can quickly and substantially change depending on the availability of sun or wind, is not as flexible as traditional fossil fuels that can be ramped up and down on demand. While this can pose some challenges to aging grid infrastructure with lower response times, newer smart grids can easily handle these variability challenges. However, beyond the significant technical expertise required to manage transmission and distribution (T&D) operations, grids are also subject to geographical contexts and sociopolitical forces. Many grids are owned and operated by state-owned enterprises (SOEs) that have monopolistic characteristics and can crowd out private sector participation. This could sometimes reduce the amount of new renewable energy that can access the grid due to low competition.

Green infrastructure rebuilding programs post-COVID will inevitably include the grid in some form—to increase capacity and resilience, to improve access to electricity, and to reduce emissions. This can be achieved by simultaneously prioritizing grid improvement projects already in the pipeline and pursuing long-term planning and investment in T&D. In China, ultra-high voltage (UHV) transmission lines are being prioritized and BNEF estimates that some $27 billion will be invested in such grid projects in 2020. In February 2020, a UHV line connecting Shaanxi and Hubei (1,137 kilometers/8 GW) is expected to create 40,000 jobs. More broadly, reinforcing transmission nationally can improve balancing between regions.

SCALE UP ENERGY STORAGE DEPLOYMENT

Scaling up the deployment of battery energy storage systems will facilitate the expansion of renewable energy. Batteries offer supplementary power to meet peak demand and provide important ancillary services to grids such as frequency control, spinning reserves, and reactive voltage. Together, these services can ensure a stable, uninterrupted supply of variable, weather-dependent renewable energy to users while safeguarding the integrity of the power grid.

The growth of the battery storage market depends heavily on government policies and regulations to create enabling conditions, as well as fiscal incentives for investment and deployment. Policies that liberalize ownership structures, support wholesale price arbitrage, and enhance ancillary markets have the potential to substantially strengthen the market for battery storage.

IFC is currently leading work in Latin America and the Caribbean where grid-scale renewable energy has seen tremendous success but where storage assets struggle due to a lack of supporting regulations and policies. By building a collaborative global network to share lessons learned, countries in this region can replicate approaches taken in places like Australia, California, and Hawaii.

IFC CONVERTS POTENTIAL INTO POWER WITH UTILITY-SCALE RENEWABLE ENERGY

IFC is a leading financier of low-cost renewable energy and has decades of experience financing, structuring, and leading complex renewable energy transactions in emerging markets. From *solar panels in the West Bank* to *wind farms in Pakistan*, IFC's own-account investments in renewable energy in the last two years alone have totaled $1.8 billion while mobilizing a further $5.7 billion more. Leading projects include *Scaling Solar*, a joint initiative with the World Bank and the Multilateral Investment Guarantee Agency that accelerates the deployment of renewable energy through bringing together advisory, financing, and risk mitigation into a one-stop solution, with 1,000 MW of solar power projects under development in Sub-Saharan Africa and beyond. IFC is at the forefront of a global transition towards renewable energy, working to create new markets for disruptive technologies including offshore wind, floating PV, distributed generation, and energy storage and efficiency. The World Bank and IFC recently launched the UK-supported Offshore Wind program, a £20 million package to *accelerate the uptake of offshore wind in emerging markets.* In addition, IFC is scaling its energy-efficiency finance through financial products such as credit lines, green bonds, and green loans.

SECTOR 2

SCALE UP DISTRIBUTED GENERATION AND STORAGE

SECTOR 2

SCALE UP DISTRIBUTED GENERATION AND STORAGE

The distributed generation of renewable energy transforms how energy is delivered and used. Behind-the-meter generation like rooftop solar and energy storage blur the traditional distinctions between energy producers and consumers, decreasing reliance on fuels, and creating more resilient grids. In emerging markets, distributed generation represents a low-cost approach, in part by replacing significant upfront investment in hardware by more affordable ongoing payments, to improving energy access while decreasing GHG emissions and creating job opportunities.

DISTRIBUTED RENEWABLE ENERGY GENERATION AND STORAGE: INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION IN 21 EMERGING MARKETS BETWEEN 2020 AND 2030.

EUROPE
(RUSSIA, SERBIA, TURKEY, UKRAINE)

$33.4 BILLION
INVESTMENT OPPORTUNITY

0.9 MILLION
JOBS CREATED

45.7 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

MIDDLE EAST AND NORTH AFRICA
(EGYPT, JORDAN, MOROCCO)

$7.3 BILLION
INVESTMENT OPPORTUNITY

0.2 MILLION
JOBS CREATED

14.5 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

EAST ASIA AND THE PACIFIC
(CHINA, INDONESIA, PHILIPPINES, VIETNAM)

$525.4 BILLION
INVESTMENT OPPORTUNITY

13.2 MILLION
JOBS CREATED

175.8 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

LATIN AMERICA AND THE CARIBBEAN
(ARGENTINA, BRAZIL, COLOMBIA, MEXICO)

$52.7 BILLION
INVESTMENT OPPORTUNITY

1.9 MILLION
JOBS CREATED

16.9 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SUB-SAHARAN AFRICA
(CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)

$10 BILLION
INVESTMENT OPPORTUNITY

0.5 MILLION
JOBS CREATED

19.9 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SOUTH ASIA
(BANGLADESH, INDIA)

$282.9 BILLION
INVESTMENT OPPORTUNITY

7.1 MILLION
JOBS CREATED

75.3 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

TOTAL	$911.7 BILLION INVESTMENT OPPORTUNITY	23.9 MILLION JOBS CREATED	348.3 MILLION TONS CO_2e GHG EMISSIONS REDUCTION POTENTIAL

(Source: Guidehouse Insights)

OPPORTUNITIES AND DRIVERS

Distributed generation, primarily solar PV, and storage can relieve stress on grid infrastructure, add resiliency, and provide much-needed 24/7 access to electricity in off-grid locations or weak grid contexts. These represent attractive incentives as countries work to get the biggest bang for their green stimulus buck. As the costs of hardware drop, the industry has developed modular solutions with stackable inverters and battery packs that can be recombined for different configurations of power and duration ratings. Modular designs change the risk and complexity profile of distributed generation from a project model to a product model, making it easier and faster to finance by private sector actors.

By storing excess energy, customers can avoid purchasing energy from the grid during evening peak demand when electricity rates may be highest in markets with dynamic pricing, like Brazil. In many cases, distributed generation combined with storage can reduce energy bills by up to 40 percent. Increased availability of renewable resources also reduces reliance on expensive and difficult-to-transport fuels, making energy cheaper and available to more people and businesses.

ECONOMIC IMPACTS

Distributed generation represents a combined opportunity of $911.7 billion, generating 23.9 million jobs across the 21 emerging markets over the next 10 years. Of this investment opportunity, $570.4 billion lies in the residential market and $341.3 billion in the commercial and industrial (C&I) market. Costs for distributed generation and storage technologies including low-cost solar panels, batteries, and the software systems to effectively, and efficiently, manage them are consistently falling. Distributed solar PV makes up about 83 percent of the total global renewable energy revenues across selected emerging markets, growing at a CAGR of 7 percent.

Regionally, East Asia and the Pacific presents the most significant investment opportunity with an estimated cumulative market size of $525.4 billion between 2020 and 2030, followed by South Asia at $282.9 billion. While the Middle East and North Africa and Sub-Saharan Africa have smaller market potentials ($7.3 billion and $10 billion respectively), they represent the largest CAGRs, both estimated at 7.3 percent between 2020 and 2030.

Most jobs created by distributed generation and storage will be in East Asia and the Pacific (13.2 million) and South Asia (7.1 million). The job creation potential in the Middle East and North Africa is 210,000 with the potential to generate 273,000 indirect jobs. Unlike extractive industries, distributed generation and clean energy jobs can be developed across regions, helping to generate a diversified economy. Distributed generation jobs also require a variety of skills including construction, manufacturing, engineering, and investment.[46]

CLIMATE IMPACTS

If scaled up, distributed generation plus storage could reduce 350 million tons of CO_2e, potentially displacing diesel generation. In addition to pollution, diesel is difficult to transport, and at times expensive, particularly in remote (including island and off-grid) applications. As these solutions increase in scale, they represent an increasing opportunity to transition from traditional thermal power plant generation used to meet peak demand and reduce GHG emissions. The largest GHG reductions are estimated at 175.8 million tons of CO_2e in East Asia and the Pacific, followed by South Asia at 75.3 million tons of CO_2e from 2020 to 2030.

If scaled up, distributed generation plus storage could reduce 350 million tons of CO_2e, potentially displacing diesel generation.

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

DEVELOP CONSISTENT QUALITY AND TECHNICAL STANDARDS TO AGGREGATE PROJECTS AND REDUCE TRANSACTION COSTS FOR PRIVATE INVESTMENTS

A nascent, fragmented technology and developer ecosystem complicates the deployment of integrated distributed generation and storage projects in many emerging countries. Since distributed generation systems in these countries are mostly installed by a variety of local developers and technicians, the technical performance and reliability of smaller installations varies considerably and ensuring consistency in quality standards remains challenging. This makes it costly and difficult for potential project sponsors and investors to assess and deal with the operational risk connected to financing the construction, operation, or sale, of portfolios of small assets.

The small size of individual distributed generation projects represents a further financing challenge. Efficient private sector investment, whether from an institution like IFC or other actors, requires some level of aggregation. The investment per site for PV and batteries varies depending on scale, from as little as $5,000 to cover a small telecommunications base station, to more than $10 million for a mini grid serving an industrial campus or island. In many cases, loans from commercial banks for distributed PV systems in emerging-market countries are rare.

For capital to be mobilized, transaction volumes can be increased by aggregating pools of assets into larger distributed generation portfolios. A standardized and widely accepted approach to the rating of distributed generation projects is necessary to facilitate such aggregation and a portfolio approach to financing (and refinancing). A robust, standardized approach to technical risk assessment for distributed generation transactions would considerably reduce processing time, overheads, and advisory costs associated with it.

OFFER SUPPLY CHAIN INCENTIVES AND TRAINING TO SWITCH FROM DIESEL GENERATORS TO DISTRIBUTED GENERATION

One of the main barriers to the wider adoption of renewable energy distributed generation are the implicit and explicit subsidies for diesel fuel, making it harder to displace diesel generators. Additionally, PV and batteries have a perception of low reliability and private sector players could benefit from awareness-building about the ease of operating distributed generation solutions as an alternative to diesel. Depending on the context, a potential solution could be to create a specific national savings fund to subsidize or provide technical training to scale up distributed generation and storage.

There are established commercial networks benefiting from diesel generator and fuel sales, distribution, and after-sales service. These networks have a vested interest in the continued use of generators. Novel business models can align interests and enlist existing distributed generation distribution networks for the conversion to renewable energy. For example, maintenance (panel cleaning and battery cell replacements) could be offered by generator operations and maintenance (O&M) providers.

A significant technical risk in the field is a lack of O&M capacity. Retraining generator O&M personnel for renewable energy distributed generation maintenance can assist private sector vendors in pivoting towards increased renewable energy generation. Green recovery plans could incorporate training programs and educational campaigns to increase awareness.

DISTRIBUTED GENERATION AND STORAGE ELECTRIFIES NEW POSSIBILITIES ACROSS EMERGING MARKETS

IFC plays a catalytic role in creating markets for distributed generation and energy storage. In 2017, the institution made its first foray into grid-connected distributed generation with an equity investment of $15 million in the Indian rooftop solar specialist, *CleanMax Solar.* Since then, IFC has worked to de-risk distributed generation projects, helping to mobilize external capital and create familiarity among commercial funders. Using blended concessional finance solutions, IFC also works with donors and concessional investors to take first loss or provide guarantees to enhance private finance investment in distributed generation.

IFC remains one of a small but growing number of global investors engaged in energy storage opportunities across all emerging markets. In 2020, *IFC made an investment of $87 million in Yoma Micro Power,* a solar plus battery mini-grid operator in Myanmar. Using blended concessional finance, this investment will enable Yoma Micropower to set up hundreds of solar-based micro power plants across Myanmar, helping remote communities connect to the outside world. IFC is also working to create new markets for energy storage by improving the global regulatory environment in tandem with IFC's Upstream business development team and through the World Bank *Energy Storage Program,* which has committed $1 billion to accelerate investments in battery storage.

IFC plays a catalytic role in creating markets for distributed generation and energy storage.

SECTOR 3

RETROFIT BUILDINGS FOR ENERGY EFFICIENCY

SECTOR 3

RETROFIT BUILDINGS FOR ENERGY EFFICIENCY

Retrofitting existing buildings represents another sizeable investment opportunity and plays a key role in reaching global climate goals. To bring the buildings sector onto a 1.5 degrees Celsius compatible pathway, 3 to 5 percent of the existing global building stock would need to be renovated every year until 2050. Most of the buildings constructed today will still be in use in 2050.[47] This means that almost every building that is not carbon neutral would need to be retrofitted at some point in the next 30 years in order to better meet occupant needs and to increase energy efficiency.

RETROFIT BUILDINGS FOR ENERGY EFFICIENCY: INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION IN 21 EMERGING MARKETS BETWEEN 2020 AND 2030.

EUROPE
(RUSSIA, SERBIA, TURKEY, UKRAINE)

$125.1 BILLION
INVESTMENT OPPORTUNITY

3.4 MILLION
JOBS CREATED

49.8 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

MIDDLE EAST AND NORTH AFRICA
(EGYPT, JORDAN, MOROCCO)

$27.8 BILLION
INVESTMENT OPPORTUNITY

0.7 MILLION
JOBS CREATED

9 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

EAST ASIA AND THE PACIFIC
(CHINA, INDONESIA, PHILIPPINES, VIETNAM)

$526.8 BILLION
INVESTMENT OPPORTUNITY

9.7 MILLION
JOBS CREATED

696.7 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

LATIN AMERICA AND THE CARIBBEAN
(ARGENTINA, BRAZIL, COLOMBIA, MEXICO)

$91.2 BILLION
INVESTMENT OPPORTUNITY

3.6 MILLION
JOBS CREATED

40.4 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SUB-SAHARAN AFRICA
(CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)

$38.2 BILLION
INVESTMENT OPPORTUNITY

2.3 MILLION
JOBS CREATED

12.4 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SOUTH ASIA
(BANGLADESH, INDIA)

$283.7 BILLION
INVESTMENT OPPORTUNITY

5.2 MILLION
JOBS CREATED

298.6 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

TOTAL	$1.1 TRILLION INVESTMENT OPPORTUNITY	24.9 MILLION JOBS CREATED	1 BILLION TONS CO_2e GHG EMISSIONS REDUCTION POTENTIAL

(Source: Guidehouse Insights)

OPPORTUNITIES AND DRIVERS

ECONOMIC IMPACTS

The cumulative investment in energy-efficiency retrofits over the next 10 years across the 21 markets in the scope of this report is estimated at $1.1 trillion, with a CAGR of 6.4 percent and the potential to generate 24.9 million new jobs. In addition to generating direct cost savings, energy-efficiency retrofits have attractive returns on investment as these upgrades result in an increase in the overall value of the building. According to a publication by the UNEP FI Property Working Group, a 30 percent improvement in building efficiency could result in an internal rate of return of 28.6 percent over a 10-year period.[48]

High quality renovations can be done quickly to make buildings more efficient and to deliver higher safety and comfort to owners. Green retrofit practices to achieve these goals include thermal insulation of the building envelope, increased fresh air supply, replacement of windows and doors, improved lighting systems, water-saving faucets, ultraviolet-disinfected or filtered air circulation systems, and the installation of energy-efficient heating and air conditioning systems. While residential retrofits inside the home may not be immediately possible because of stay-at-home and social distancing rules, there is still the opportunity to undertake external work.

Investment in the sector can stimulate the economy by providing a sustainable growth of new jobs, long-term value for investors, lower operating costs to consumers, and a reduction of energy and water use. Government tax incentives to upgrade building systems can provide healthier building environments while making efficiency gains. Future government stimulus funding for resource efficiency retrofits can leverage existing private sector financing and move the construction practices of the industry onto a more sustainable path. The current lower occupancy in offices, hotels, and schools due to COVID-19 means that energy-efficiency retrofits can be more easily carried out, reducing significant business interruption costs and inconveniences.

In emerging markets, direct job creation through efficiency retrofitting is high and the labor force is predominantly concentrated in small and medium businesses.[49] Analysis by the IEA suggests that around 60 percent of expenditure on home energy-efficiency retrofits goes towards local labor, delivering strong employment growth.[50] Required labor for construction work, materials, and equipment manufacturing is estimated to create nearly 25 million new direct jobs in the 21 emerging markets between 2020 and 2030. Due to the labor-intensive nature of the building sector, a global average of 31.4 jobs can be created per $1 million invested in building retrofits. The growth of the construction sector also has a strong multiplier effect through its supply chain industries.

CLIMATE IMPACTS

At 1 billion tons CO_2e, buildings offer the single largest global opportunity to make deep emissions cuts at low cost. With energy and water use reduction, buildings in the 21 emerging markets have the potential to reduce GHG emissions by 20.4 percent, equivalent to 1 billion tons of CO_2e by 2030. This is in relation not only to residential and office buildings but to other structures including schools, hospitals, warehouses and manufacturing facilities. The Rocky Mountain Institute projects that a 50 percent reduction in global building emissions is needed by 2030, and zero-carbon emissions are required by 2050.

To help meet these more ambitious targets, future government stimulus funding can help ramp up the pace of retrofits of privately owned buildings by streamlining regulations, creating incentives, and raising awareness of low-cost, energy-efficiency technologies and materials. Governments can also lead through example by retrofitting inefficient and poorly ventilated government buildings including schools, government offices and hospitals. This has the added effect of addressing immediate health and safety concerns from COVID-19.

COST SAVINGS FOR END-USERS AND GOVERNMENTS

Efficient buildings create significant energy and water savings, reducing the cost and usage of utilities. Typical building retrofits reduce energy use by up to 25 percent while deep retrofits can sometimes save more than 50 percent.[51] Recent performance improvements in green technologies in lighting, heating, ventilation, air conditioning, and heat pumps when combined with reductions in the cost of efficient equipment have shortened pay-back periods and increased returns on investment. Reduction in energy demand allows governments to redirect money to other parts of the economy reducing the need for investments in new transfer stations, power plants, or subsidies to utilities. Building retrofits will also benefit businesses and households in the medium term as they translate into lower energy bills. Such energy and water savings create more disposable income for consumers, leading to increased spending which further stimulates economies.

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

DEVELOP A RETROFIT COST SOLUTIONS DATABASE

The principal concern for investors and homeowners to undertake retrofitting projects is upfront investment versus the payback period for potential benefits. The presumed costs of retrofitting are often higher than actual expenditures due to falling costs and higher technology efficiencies. Retrofit cost and benefit analysis of green building technologies can help educate developers and owners about the payback options for homes, hotels, offices, hospitals and schools. Multilateral institutions in partnership with equipment suppliers and contractors are well positioned to provide this information. This will enable building owners to decide the level of energy-efficiency improvements and investment budgets. Equipment suppliers and contractors can also provide ready-made retrofit packages to different building asset classes.

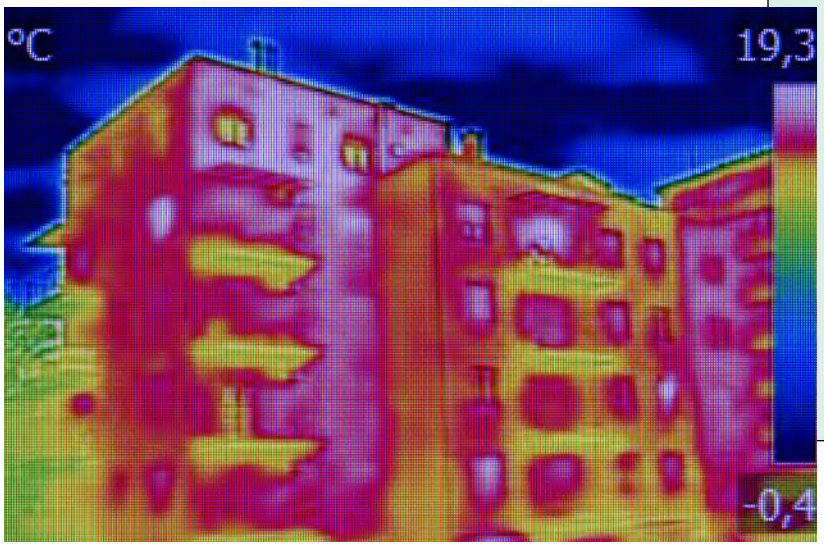
INCREASE ACCESS TO FINANCE AND THE AVAILABILITY OF GREEN FINANCING INSTRUMENTS

In some emerging markets, FIs are reluctant to finance energy-efficiency projects as they often provide only asset-based loans and do not regard energy savings as tangible collateral. Recent innovations in public and private financial products such as on-bill utility financing programs, property assessed clean energy financing and green micro finance all support the monetization of the energy savings of building retrofits. Future stimulus funds can be used to support local financial institutions to build capacity and awareness of these green financial products while stricter emissions regulations can help bring them to scale. FIs such as ABN AMRO and ING have financed retrofits as a way of accessing the green bond market, complying with stricter emission regulations and reducing their exposure to carbon-intensive assets in their portfolios. Professional bodies such as engineering associations can provide quality control on building retrofit system standards to reduce risk and complexity for governments and lending institutions. Multilateral institutions can provide financing—including blended concessional finance—to local banks and financial institutions targeted at developing and supporting green financing instruments.

DEVELOP GOVERNMENT POLICIES AND INCENTIVES TO BOOST RETROFITS

Governments can develop and streamline regulations and policies to enable energy-efficient retrofits and provide fiscal incentives to boost a wave of building retrofits. Blended concessional finance—government funds that work in tandem with private sector finance by providing guarantees, grants and subsidies to lower the interest rate for borrowers—is one solution. Tax incentives can also play a powerful role in motivating the fast uptake in green retrofits.

IFC HELPS COUNTRIES RETROFIT FOR ATTRACTIVE RETURNS AND CLIMATE IMPACT



While IFC has achieved significant success with EDGE, the flagship certification program for new green buildings, the institution is increasingly focused on the retrofitting market that has shown attractive returns on investment, even for short-term investors. In 2019, IFC—in partnership with the EU—helped support the *Ukraine Energy Efficiency Fund (EEF)*, to facilitate energy-efficient renovations of residential buildings in Ukraine. Before this program was implemented, IFC worked with the Ukrainian government to prepare and adopt laws to create the legislative framework for energy-efficiency market development. IFC also works with banks to tailor products and services to help homeowners' associations carry out energy-efficiency upgrades. Last year, Ukraine's state-owned Ukrgasbank joined the EEF program to assist homeowners in making their buildings more energy efficient. This year, KredoBank, a part of the PKO Bank Polski Group, became the first private bank in Ukraine to join the EEF.

SECTOR 4

INVEST IN LOW-CARBON MUNICIPAL WASTE AND WATER

SECTOR 4

INVEST IN LOW-CARBON MUNICIPAL WASTE AND WATER

Since the pandemic, many municipal waste collection and disposal systems have become overwhelmed or have backtracked on sustainability goals due to a lack of sufficient recycling and waste management infrastructure. There is growing recognition by municipal governments that the environmental and social concerns associated with existing waste collection systems, combined with diminishing landfill availability, require a more circular approach to waste management and water systems. The private sector is responding to this trend, with companies across the waste value chain committing to more circular policies and goals.

World Bank estimates suggest that by 2050 annual waste generation will increase globally by 70 percent relative to current levels, reaching 3.4 billion tons. The volume of waste in low-income countries is expected to triple within the same time frame, particularly in Sub-Saharan Africa. Functioning and efficient waste management and water systems are essential to meet the sanitation needs of growing cities and it is important to ensure that these systems prioritize circular approaches.

LOW-CARBON MUNICIPAL WASTE AND WATER: INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION IN 21 EMERGING MARKETS BETWEEN 2020 AND 2030.

EUROPE
(RUSSIA, SERBIA, TURKEY, UKRAINE)

$5 BILLION
INVESTMENT OPPORTUNITY

0.1 MILLION
JOBS CREATED

41 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

MIDDLE EAST AND NORTH AFRICA
(EGYPT, JORDAN, MOROCCO)

$13.9 BILLION
INVESTMENT OPPORTUNITY

0.1 MILLION
JOBS CREATED

17 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

EAST ASIA AND THE PACIFIC
(CHINA, INDONESIA, PHILIPPINES, VIETNAM)

$873.8 BILLION
INVESTMENT OPPORTUNITY

10.7 MILLION
JOBS CREATED

112.1 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

LATIN AMERICA AND THE CARIBBEAN
(ARGENTINA, BRAZIL, COLOMBIA, MEXICO)

$582.4 BILLION
INVESTMENT OPPORTUNITY

6.1 MILLION
JOBS CREATED

72.1 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SUB-SAHARAN AFRICA
(CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)

$19.1 BILLION
INVESTMENT OPPORTUNITY

0.7 MILLION
JOBS CREATED

23.4 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SOUTH ASIA
(BANGLADESH, INDIA)

$470.5 BILLION
INVESTMENT OPPORTUNITY

5.7 MILLION
JOBS CREATED

48 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

TOTAL	$2 TRILLION INVESTMENT OPPORTUNITY	23.4 MILLION JOBS CREATED	313.7 MILLION TONS CO_2e GHG EMISSIONS REDUCTION POTENTIAL

(Source: Guidehouse Insights)

OPPORTUNITIES AND DRIVERS

ECONOMIC IMPACTS

Over the next 10 years across the 21 emerging markets, the solid waste management (recycling, incineration, and landfills) and wastewater sector will enjoy a high compounded annual growth rate of 26.8 percent, representing a $2 trillion investment opportunity and creating 23.4 million new direct jobs. This investment opportunity is supported by the reality that improved solid waste management and wastewater management can reduce flood risk, improve drainage, and increase renewable energy penetration (where waste-to-energy is involved). The improved environmental status of communities with well-managed waste systems can also improve health, property values and deliver other benefits to the local economy.

Investment in waste and water management has the potential to increase jobs across the value chain, adding 23.4 million new direct jobs between now and 2030. This will improve the livelihoods of low-income workers in the small-business and informal sectors. Solid waste management heavily depends on informal workers, who tend to operate independently of formal systems and can suffer from a lack of access to social services. There is a strong need to formalize and upgrade this sector through green practices. This process presents an opportunity for job training and "up-skilling" for workers that would result in poverty reduction and the potential for social mobility.

CLIMATE IMPACTS

Investments in low-carbon waste and water management could reduce the sector's GHG emissions by 313.7 million tons of CO_2e between now and 2030, as compared to a business-as-usual scenario. This is proportionally more GHG reductions than any other sector in this report except for CCUS. GHG emissions from the waste sector come primarily from the inadequate disposal of waste in landfills which leak methane. Emissions from methane leaks (with a global warming potential 84 times greater than CO_2) and other waste and water management practices account for nearly 5 percent of global GHG emissions. In 2016, the waste sector accounted for 1.6 billion tons of carbon dioxide equivalent (CO_2e). The analysis in this paper puts the emissions reduction potential of investments in this sector at 313.7 million tons of CO_2e.

Functioning and efficient waste management and water systems are essential to meet the sanitation needs of growing cities. It is important to ensure that these systems prioritize circular approaches.

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

STABILIZE EXISTING WASTE MANAGEMENT AND WATER OPERATIONS AND PROACTIVELY MANAGE PROJECTS UNDER CONSTRUCTION

The economic shutdown has resulted in implementation delays and negative impacts on water companies' revenues due to reduced volumes and delayed payments. For both the waste and water sectors there are several risks to operational continuity and flexibility, including restrictions on site access, a smaller labor force due to COVID infections and government lockdowns, reduced activities from large waste and water users, supply chain disruptions, and foreign exchange fluctuations. Stabilizing exiting operations and proactive portfolio management of projects currently under construction by municipal or private operators can reduce these risks.

ENABLE PRIVATE SECTOR COMPANIES TO WORK WITH MUNICIPALITIES TO MANAGE WASTE

The pandemic is leaving many countries and municipalities with reduced tax revenues, increased debt, and competing demands for economic stimulus funding across sectors. Ongoing waste management expenditures of municipalities, including contractual payments for waste public-private partnerships (PPPs), may be impacted negatively. PPPs can help municipalities harness the financial, technical, and managerial resources of the private sector in a customized solution for their waste value chain. Private sector investments can complement limited public budgets to help meet this demand for waste management services. Future stimulus funding could be directed toward establishing a mechanism of cost recovery for waste services, particularly where households lack the capacity to pay. The aggregation of platforms by private sector contractors for multiple projects could also help to minimize transaction costs and encourage sponsors to develop pipelines on a national and/or regional level.

CROWD-IN FINANCIAL SUPPORT FOR WASTE PROJECTS

Development finance institutions, including IFC, can reduce the cost of financing through blended concessional finance instruments, green bond issuances, carbon finance, and working through commercial financing from domestic and international sources. Short-term liquidity instruments could be deployed to ensure a continuity of services and to help municipalities and waste service providers address immediate improvements in new waste collection business models, storage, and disposal practices and technologies as a result of the crisis.

INCORPORATE INFORMAL WORKERS IN SOLID WASTE MANAGEMENT AND WATER INVESTMENT PLANS

In emerging markets, the waste management sector depends on informal workers—typically society's poorest and most vulnerable—who make a living from collecting and selling commodities to waste aggregators. It is estimated that more than 15 million people globally fit this category, living in unhealthy conditions with no social protection. Future stimulus funding can be used to help formalize the sector by investing in robust waste collection systems, including waste sorting and recycling operations into municipal contracts.

BUILD SUPPORTIVE REGULATORY ENVIRONMENTS FOR LOW-CARBON WASTE AND WATER INVESTMENTS AND SHARE BEST PRACTICES

Governments can help attract investments by implementing policies and regulations that prioritize low-carbon solid waste management and direct resources and expertise to local municipal authorities. Best practices and knowledge sharing can facilitate scaling up across similar markets, particularly those related to generating formal recycling markets. As these operations become more efficient, they can guarantee a reliable source for recyclable products to enter the growing recycling markets, helping meet strong global demand for recycled feedstock of sufficient quality and quantity. Improving the connection between off-takers and suppliers can help increase the amount of waste that is reused, generating a more circular economy.

IFC INVESTS IN LOW-CARBON MUNICIPAL WASTE AND WATER

With a global expertise in developing inclusive, safe, resilient and sustainable cities, IFC has a competitive edge in helping municipal authorities strengthen their waste and water management while leveraging the private sector. Take for example, the *Belgrade Waste-to-Energy project*, an IFC investment that is transforming the Vinča landfill, the largest open dump in Europe, into a new sanitary landfill and waste-to-energy plant compliant with EU standards. This project was built on prior engagements by the World Bank to improve the efficiency of Serbia's state-owned utilities and by IFC-led reforms of Serbia's PPP and renewable energy legislation. IFC not only helped structure and tender the project, but also mobilized a long-term financing package from other development institutions

IFC's strategic priorities for the waste sector include strengthening the municipal solid waste value chain from collection to disposal, particularly in areas where this infrastructure is limited and heavily reliant on the informal sector; promoting sustainable resource recovery solutions, including recycling, refuse-derived fuel, landfill gas capture and use, and waste-to-energy; and developing capacity to manage specialty waste streams such as electronic waste and hazardous waste. These investments will enable emerging markets to tackle their current and growing waste management concerns, while also laying the groundwork for a transition to circular economy principles. For municipalities, IFC will continue to finance the development of urban infrastructure, especially in expanding rainwater drainage systems where flooding frequently occurs.

IFC has a competitive edge in helping municipal authorities strengthen their waste and water management while leveraging the private sector.

SECTOR 5

EXPAND
GREEN URBAN
TRANSPORT

SECTOR 5

EXPAND GREEN URBAN TRANSPORT

Cities depend on public forms of transport as well private mobility to provide workers and the general public access to urban metropolitan areas. COVID-19-related lockdowns globally have caused a massive drop in urban transport use, in both automobiles and public transportation. Globally, public buses and light rail have seen as high as a 90 percent[52] drop in ridership, while nearly all countries have experienced a severe drop in traffic—around 70 percent.[53]

Transportation is an essential component of the global economy. The transport and logistics sector contributes over 5 percent of national GDP in the EU[54] and United States.[55] In India, the sector employed 7.3 million people in 2011, estimated to reach 24 million by 2020.[56] Analysts predict that nearly all global automakers will report significant losses during the second quarter of 2020, estimating global light vehicle sales to drop between 15 and 20 percent.[57] According to the Society of Motor Manufacturers and Traders, an automotive industry organization, the UK auto industry could lose one in six jobs, with a third of all automotive workers on furlough as of June 2020.[58] At the same time, the benefit of less road congestion has resulted in significant reductions in air pollution and GHG emissions around the world. Across emerging markets, IFC has strengthened its commitment to help countries scale up investments in green urban transport and to form strategic partnerships with cities that wish to invest in transportation infrastructure.

GREEN URBAN TRANSPORT: INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION IN 21 EMERGING MARKETS BETWEEN 2020 AND 2030.

EUROPE
(RUSSIA, SERBIA, TURKEY, UKRAINE)

$214.8 BILLION
INVESTMENT OPPORTUNITY

7.6 MILLION
JOBS CREATED

12.8 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

MIDDLE EAST AND NORTH AFRICA
(EGYPT, JORDAN, MOROCCO)

$13.7 BILLION
INVESTMENT OPPORTUNITY

0.4 MILLION
JOBS CREATED

6.6 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

EAST ASIA AND THE PACIFIC
(CHINA, INDONESIA, PHILIPPINES, VIETNAM)

$1,604.2 BILLION
INVESTMENT OPPORTUNITY

28.2 MILLION
JOBS CREATED

113.4 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

LATIN AMERICA AND THE CARIBBEAN
(ARGENTINA, BRAZIL, COLOMBIA, MEXICO)

$32.8 BILLION
INVESTMENT OPPORTUNITY

1.1 MILLION
JOBS CREATED

33.4 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SUB-SAHARAN AFRICA
(CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)

$18.9 BILLION
INVESTMENT OPPORTUNITY

0.8 MILLION
JOBS CREATED

9.1 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SOUTH ASIA
(BANGLADESH, INDIA)

$863.8 BILLION
INVESTMENT OPPORTUNITY

15.2 MILLION
JOBS CREATED

48.6 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

TOTAL	$2.7 TRILLION INVESTMENT OPPORTUNITY	53.4 MILLION JOBS CREATED	223.9 MILLION TONS CO_2e GHG EMISSIONS REDUCTION POTENTIAL

(Source: Guidehouse Insights)

OPPORTUNITIES AND DRIVERS

ECONOMIC IMPACTS

The market size of the urban green transport sector, both private and mass transit, in the 21 emerging markets across all subsectors is estimated to be $2.7 trillion dollars with the potential to create 53 million direct jobs. This represents a compounded annual growth rate of 14.4 percent between 2020 and 2030. For every $1 million invested in the sector, an additional $1.2 million in economic value is created. Significant employment gains in the semi-skilled and unskilled labor force provide relief for communities hardest hit by the COVID-19 pandemic and help the recovery provide more equitable benefits.

For this analysis, urban transportation includes both public modes of transport as well as private automobiles and delivery trucks. With historically low retail gasoline prices in most emerging markets, governments have less incentive to convert public and personal transport to green sources of energy. Over the long term, reducing city congestion by making public transportation options efficient, accessible, and appealing will be key to attracting and retaining businesses and consumers. Governments should improve the reach and connectivity of the public transport network within cities without locking in polluting technologies. Replacing old bus fleets with new electric vehicles (EVs) featuring intelligent transportation systems (ITS) and cashless payments provides an incentive to bring riders back onto public transportation by making it safer and more convenient to pay, in addition to reducing GHG emissions.

The auto industry is one of the largest private sector employers in the manufacturing sector in these countries, making it a critical sector to support with government stimulus funding that encourages fuel efficiency. Unlike during the 2008 financial crisis, EVs are now on the cusp of financial viability. The appropriate set of regulatory and financial instruments to accelerate customer adoption of EVs are required by governments during this recovery period. Future stimulus funding tied to an EV transition can be a timely and cost-effective way to rebuild the industry along a greener path.

Traditional automotive and components manufacturing industries are well equipped to transition to EVs. Automotive and components manufacturing industries in middle-income emerging markets such as Mexico, Thailand, Vietnam, and Brazil are well developed and can add significantly to each countries' national GDP and manufacturing sector employment rate as they expand into supplying the new EV market.
The recent economic downturn has been particularly severe for the semi-skilled and unskilled labor force in the transportation, automotive and component manufacturing sectors. This downturn has impacted drivers, maintenance staff, and construction workers and assemblers. A green transportation infrastructure renewal program offers opportunities for significant gains in employment. By 2030, it is estimated that the green transportation sector across emerging-market countries will create 53.4 million direct jobs. Each direct job in the sector will create 1.2 jobs external to the sector.

CLIMATE IMPACTS

A transition to a low-carbon transportation sector could result in a nearly 19 percent reduction in GHG emissions in the sector across the 21 emerging markets. A total of 223.9 million tons of carbon dioxide over the next 10 years is equivalent to taking nearly 48 million[59] passenger cars off the road. The transportation sector relies heavily on fossil fuel-powered vehicles, contributing to upwards of 25 percent of GHG emissions globally. Many emerging-economy cities suffer some of the world's worst air quality levels, partly because of the pollution from transport vehicles. In India alone, there are over 74,000 deaths annually due to vehicle pollution.[60]

A green transportation infrastructure renewal program offers opportunities for significant gains in employment.

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

EXPAND PUBLIC TRANSIT SOLUTIONS

Public transport provides the most affordable travel option for large sections of the global population. New bus rapid transport (BRT) systems are efficient, low-cost solutions that can be created at a fraction of the time and cost of light rail and underground metro transport. Not only can a BRT program create millions of semi-skilled and unskilled jobs, it also can generate white-collar jobs related to ITS and digital payments systems. These payment systems make public transit more "user-friendly" for passengers and can help entice riders back onto public transport. Municipalities could use future stimulus funding for infrastructure to accelerate the use of BRT systems and green their bus fleets.

GREEN EXISTING PUBLIC TRANSPORT CORRIDORS

In addition to making the public transport system more efficient through BRT, aging bus fleets can be replaced with EV buses. This technology is ready for deployment, although full implementation takes time, training and targeted subsidies. Developing bankable contracts and standardized financial terms for public transport renewal programs will help scale the size of these programs and create incentives for banks and private sector operators to participate. DFIs and FIs can help governments develop these bankable contracts as well as provide blended concessional finance options to help reduce the cost of fleet replacement.

REBUILD GREEN WITH ELECTRIC VEHICLES

Electrifying the transport sector is an important part of a post-COVID green economic recovery. With high costs attached to EVs in emerging markets, the challenge is working with banks and other financial institutions to lower the cost of financing. While national governments can increase gas mileage regulations and other incentives to encourage EV expansion, DFIs and other FIs can create suitable financial instruments to enable EV financing in emerging markets. This will drive demand for EVs while signaling the need for manufacturers to accelerate EV product development investments.

Municipal governments can invest stimulus money in building EV charging stations, particularly around bus and rail hubs. Thousands of jobs can be created by installing and maintaining this new infrastructure. Banks and FIs most experienced in dealing with the automotive manufacturing sectors and with training on new technologies and risk reduction instruments can be engaged to distribute government-backed low-interest soft-loan packages for manufacturing industries. DFIs along with government donors are best situated to provide the necessary training to local FIs.

ELECTRIFY LAST-MILE DELIVERIES AND BIKE TAXI OPERATIONS

E-commerce has witnessed a nearly 60 percent increase during COVID-19 lockdown in various cities, in addition to a corresponding increase in the need for last-mile deliveries. This rise in e-commerce has increased the demand for drivers, creating additional jobs. In emerging markets, several e-commerce companies understand that EVs contribute to a reduction in the cost of last-mile deliveries, especially when using two and three-wheeler EVs. Similarly, cities that operate bike taxi services can benefit through the introduction of EV two-wheelers. Program implementation to fund EVs in emerging markets could be carried out in the next 12 to 18 months through corporate debt programs introduced through local banks. Future government stimulus programs can create incentives for fleet renewal in the logistics sector through attractive vehicle scrappage policies to create manufacturing jobs and replace polluting vehicles with more fuel-efficient ones.

SUPPORT MANUFACTURING JOBS AND SUPPLY CHAINS

Countries with automotive manufacturing capacity have seen demand for automobiles drop by up to 30 percent or more, on a year-to-year basis. This has led to thousands of job losses, especially among blue-collar workers in original equipment manufacturers and their suppliers and dealerships. Financial packages linked to conditions for investments into green-tech products like EVs could support and help transition these industries. This financing could spur local production of EV products and components including batteries, motors and controllers.

INCREASE CYCLING AND WALKING OPPORTUNITIES

Cycling and walking are the greenest and least costly modes of non-motorized "private" mobility. COVID-19 has increased the need for private modes of transport that are non-motorized, affordable and safe. Cycling can result in significant CO_2 emissions savings in addition to clean-air benefits for the city and health improvements for cyclists. The creation of bicycle lanes and additional pedestrian areas can be shovel-ready in less than 15 months and will have significant long-term benefits. Local governments can leverage national stimulus funding through requisition of land allotment or acquisition for non-motorized mobility projects. Municipalities with large city centers can also implement congestion and/or commuting fees to discourage additional car use and encourage cycling and walking.

REALIGN WORKING HOURS TO AVOID "RUSH HOUR"

A no-cost solution to reducing congestion and associated pollution is to tie future stimulus funding in major metropolitan areas to a workforce travel management plan. To accomplish this, city administration officials and business leaders could agree on a plan to stagger work hours in a way that lightens the load on both public transport and road systems.

GREENING URBAN TRANSPORT PUTS EMERGING MARKETS ON A NEW TRACK

As the world experiences rapid urbanization, transport systems in developing cities face major challenges. IFC has strengthened its commitment to help country clients scale up investments in green urban transport and create a positive investment climate. With a long-term strategic focus, IFC is forming partnerships with cities around the world, thanks to The Cities Initiative that creates a pipeline of bankable urban infrastructure investment projects to address urban challenges, including transportation. In the Argentine capital, Buenos Aires, *IFC forged a strategic partnership with the city to provide a $50 million loan to finance critical infrastructure such as the Metrobus and bicycle routes.* In Izmir, Turkey's third-largest metropolis, *IFC has provided $500 million*—including funds mobilized from other investors—in financing for nine infrastructure projects, mainly to improve the public transport system.

With the recent addition of *an electric transport expert to IFC's team of industry specialists*, the institution is focused on promoting fiscal and non-fiscal policy incentives for faster EV adoption, a critical pillar of the green transport space. This will include developing practical operating models for electric buses, charging infrastructure, and piloting customized solutions for electric two-and-three wheelers that provide last mile connectivity in markets such as India.

SECTOR 6

EXPAND
NATURE-BASED
URBAN
INFRASTRUCTURE

SECTOR 6

EXPAND NATURE-BASED URBAN INFRASTRUCTURE

One of the key lessons of the COVID-19 pandemic is the importance of preparedness and resilience in the light of predictable physical and economic risks. The cost of natural disasters continues to rise and the price of adaptation in developing countries could reach $300 billion by 2030,[61] with 80 percent concentrated in major cities.[62] Delaying investments in climate resilience and adaptation could further threaten economic stability and recovery efforts. Nature-based solutions represent low-cost and climate-friendly approaches to help protect cities from storms, control floods, and secure supply of clean water.

Nature-based solutions are defined as "actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits."[63] In urban settings nature-based solutions include preservation and restoration of nearby natural ecosystems, such as wetlands and mangroves to provide storm and flood protection, or forests along the watershed to regulate rainfall and purify water supply. Deploying these solutions can generate millions of low-skilled jobs and generate significant climate, biodiversity and health benefits as well as create economic opportunities in other sectors that rely on nature. Incorporating natural elements into urban build environment, such as constructed rain gardens, green roofs, or permeable surfaces for sidewalks, can help cities manage flooding, sewer and stormwater runoff into local waterways.

OPPORTUNITIES AND DRIVERS

ECONOMIC IMPACTS

Investment in nature as infrastructure and nature-positive built environment could generate a global $1.1 trillion** in annual business opportunities, both through generating positive economic benefits and avoiding economic losses, according to the World Economic Forum. Nature-based solutions also represent a potential 42 million new jobs globally.** An analysis of 534 of the world's largest cities estimated that restoring upland forests and watersheds and using nature to filter and purify water could save each city $890 million annually in avoided investments in water treatment infrastructure facilities.[64]

The preservation and restoration of forests and watersheds naturally improve and manage floods and regulate water flows, making water resource management more resilient. This is particularly important for many emerging-markets cities that already experience water scarcity and face constrained budgets for water infrastructure investments. In 2018, the city of Cape Town, South Africa, enacted severe city-wide water restrictions following extensive regional droughts. Estimates suggest that restoration of Cape Town's natural watersheds to improve the city's water security would cost one-tenth of alternative solutions such as desalination, water recycling, and groundwater exploration.

Nature-based solutions such as tree planting, greening roofs, and restoring watersheds can be implemented immediately, with very little training and resulting in a quick uptake in jobs.

While our modeling did not calculate the job creation potential of nature-based solutions across the 21 emerging markets in focus, other sources have found that they can create 42 million jobs by 2030 globally.[65] Typically, these are low-skill jobs that can be filled quickly. According to data from the United States, on average, an estimated 40 full-time jobs are created per $1 million invested in nature-based solutions.[66] The rate of return on nature-based solutions typically exceeds those of traditional infrastructure, presenting benefit-cost ratios above 4:1.[67]

CLIMATE IMPACTS

Nature-based solutions can provide up to 37 percent of the emissions reductions needed by 2030 to keep global temperature increases under 2 degrees Celsius,[68] while improving air quality and promoting people's well-being. Nature-based solutions could also improve natural ecosystems that underpin sectors that rely on nature for inputs—such as construction, agriculture, and food and beverage—that generate $44 trillion or half of global GDP.[69]

Nature-based solutions can provide up to 37 percent of the emissions reduction needed by 2030 to keep global temperature increases under 2 degrees Celsius, while improving air quality and promoting people's well-being.

** *Data used in this sector were not provided by Guidehouse Insights but drawn from publicly available sources that are cited. These figures are not added to the 21 emerging market totals.*

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

INCREASE NATURE-BASED SOLUTIONS IN NEW-BUILD URBAN PLANNING OPPORTUNITIES

Sixty percent of areas that will be urban by 2030 remain to be built.[70] This offers an opportunity to plan, design, and build cities using innovative green infrastructure approaches such as streetscapes, bioswales, and raingardens, at a lower cost than some of the more traditional grey infrastructure investments. It is important for the future built environment to incorporate green infrastructure elements to capitalize on the benefits they provide for many decades over the lifetime of buildings and structures. Equally important, green infrastructure can be used to retrofit existing built environments. Regulations including urban master planning, zoning, and mandatory building and energy-efficiency codes, in addition to other incentives will be critical.

Green building certification plans can further promote green infrastructure uptake by the construction industry. Including green roofs as part of green certification requirements, for example, can help reduce energy costs and mitigate flood risk while reducing air pollution and urban heat. The green roof market is estimated to reach $9 billion in 2020 and to grow 12 percent annually over the next decade, creating an annual investment opportunity of $15 billion.[71] For an annual investment of $100 million in urban gardens, cities could create enough shade to cut average temperatures by 1°C for 77 million people around the world[72] and cut air conditioning costs by up to 40 percent.[73]

INVEST IN GREEN COASTAL PROTECTION AGAINST SEA LEVEL RISE

Globally, mangrove forests provide more than $82 billion per year in avoided losses from coastal flooding and create up to $50 billion per year in benefits for fisheries, forestry, and ecotourism while generating additional revenue from carbon and biodiversity credits. Combined, the benefits from mangrove preservation and restoration are up to 10 times the costs. Restoring the mangrove forests that protect coastal assets from sea level rise and storm surges is two to five times cheaper than building engineered structures.[74] Investing in mangrove and coastal wetland protection and restoration also brings significant benefits to the insurance industry. The reduction in flooding risks presented by these natural systems could reduce the insurance payout for losses by up to $20 billion annually.[75] Multilateral FIs have a role to play with governments and the private sector to develop projects that can leverage limited public funding to catalyze private investment in nature-based solutions to enhance resilience of coastal assets.

SCALE UP INNOVATIVE DEAL STRUCTURES AND INSTRUMENTS TO ATTRACT PRIVATE INVESTMENT IN NATURE-BASED SOLUTIONS

Investing in natural infrastructure has traditionally been the domain of public funds. In the post-COVID budget-constrained environment, it will be critical to attract private financing. Estimates suggest that investment in sustainable infrastructure could return 2.5 to 3.5 times the initial investment to private investors.[76] Governments can create policies and regulations that facilitate private investment, particularly in collaboration with DFIs like IFC. Such partnerships can assist in overcoming technical and financing bottlenecks that slow or stop the development of resilient nature-based solutions in forest or coastal ecosystems.

By making stimulus funding to other high-emitting sectors conditional on meeting GHG emissions reduction targets, some industries will look to carbon offsets to achieve their goals. These offsets will create a pool of capital available to finance conservation and services to help restore natural ecosystems. There are some challenges that currently hinder the deployment of private capital to carbon credit projects, including a lack of widely accepted methodologies to verify carbon credits and a lack of internationally agreed-on mechanisms to sell carbon credits. Other challenges relate to the difficulties in calculating a financial value of services provided by ecosystems that could then be monetized and attract private investors. In the short-term, these challenges can be overcome through using voluntary carbon markets and proxy indicators, where data are not available, to calculate the financial value of ecosystem services. Multilateral development institutions can play a critical role in bringing transparency and credibility to such approaches. Furthermore, applying emerging financial products, such as environmental impact bonds and sustainability-linked loans, will make investment in nature-based solutions more accessible to private investors and financial institutions.

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IFC NURTURES NATURE-BASED URBAN INFRASTRUCTURE

Biologically diverse ecosystems play a critical role in climate change mitigation, adaptation, and resilience. Their protection and restoration are expected to play a significant role as a means of achieving countries' climate objectives in the revised Nationally Determined Contributions (NDCs) due in 2021. To expand its own investments and to help guide private sector investments towards sustainable business models that protect biodiversity, IFC is preparing a basic taxonomy of investment activities that can contribute to protecting, maintaining, and enhancing biodiversity and ecosystem services and sustainably managing living natural resources. The investment activities reviewed in this taxonomy fall into the following categories: 1) investments in established business operations for activities that generate biodiversity co-benefits, that could include sustainable production and operation practices that rely on natural ecosystems, manufacturing of products that reduce pollution harmful to biodiversity, waste and pollution prevention, and recycling, 2) investments in biodiversity conservation as the primary objective, directly financing conservation or conservation-related services, and 3) investments in nature-based solutions where biodiversity is used to enhance ecosystem services to address a number of challenges—from water purification to climate resilience and adaptation—and generate economic value for public and private stakeholders.

In partnership with the World Bank, IFC is also a member of the Informal Working Group to form the *Taskforce for Nature-related Financial Disclosures (TNFD).* Modeled on the Taskforce for Climate-related Financial Disclosures, the TNFD will develop a reporting framework for financial institutions to enable them to understand their risks, dependencies and impacts on nature and help redirect financial flows away from activities with negative impact on nature and biodiversity. The TNFD will work to build awareness and capacity to reduce the negative impacts of the financial sector on nature and biodiversity.

SECTOR 7

DECARBONIZE HEAVY INDUSTRY WITH CARBON CAPTURE, UTILIZATION, AND STORAGE AND GREEN HYDROGEN

SECTOR 7

DECARBONIZE HEAVY INDUSTRY WITH CARBON CAPTURE, UTILIZATION, AND STORAGE AND GREEN HYDROGEN

COVID-19 has had a significant impact on heavy industry in two major ways: many manufacturing processes require on-site labor that cannot be carried out remotely, and a global reduction in economic activity has reduced demand for industrial products. As heavy industry, and the countries they operate in, plan their recovery approach to these two major challenges, there is an opportunity to integrate decarbonization strategies like carbon capture utilization and storage (CCUS). Captured and stored CO_2 can be used as a feedstock for fuels, chemicals, and building materials, or combined with bioenergy to support carbon removal and negative emissions.[77]

Charting a green future for the industrial sector is essential to meeting global climate goals, as it accounts for 28 percent of global GHG emissions. Most of this sector's emissions derive from the production of ammonia, cement, ethylene, and steel.[78] Additional industrial processes in need of decarbonization include the manufacturing of bulk chemicals, refining, and iron. In many cases, electrification is not an adequate solution to decarbonize heavy industry, as some processes require higher temperatures best produced by combustion rather than electric power. For these applications that are harder to decarbonize, CCUS and hydrogen technologies represent a promising solution.

CARBON CAPTURE, UTILIZATION AND STORAGE: INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION IN 21 EMERGING MARKETS BETWEEN 2020 AND 2030.

EUROPE
(RUSSIA, SERBIA, TURKEY, UKRAINE)

$50 BILLION
INVESTMENT OPPORTUNITY

0.7 MILLION
JOBS CREATED

40.8 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

MIDDLE EAST AND NORTH AFRICA
(EGYPT, JORDAN, MOROCCO)

$21.4 BILLION
INVESTMENT OPPORTUNITY

0.7 MILLION
JOBS CREATED

17.2 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

EAST ASIA AND THE PACIFIC
(CHINA, INDONESIA, PHILIPPINES, VIETNAM)

$304.7 BILLION
INVESTMENT OPPORTUNITY

11.9 MILLION
JOBS CREATED

266 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

LATIN AMERICA AND THE CARIBBEAN
(ARGENTINA, BRAZIL, COLOMBIA, MEXICO)

$101.8 BILLION
INVESTMENT OPPORTUNITY

1.5 MILLION
JOBS CREATED

83 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SUB-SAHARAN AFRICA
(CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)

$29.4 BILLION
INVESTMENT OPPORTUNITY

1.4 MILLION
JOBS CREATED

23.7 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SOUTH ASIA
(BANGLADESH, INDIA)

$164.1 BILLION
INVESTMENT OPPORTUNITY

6.4 MILLION
JOBS CREATED

114 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

TOTAL	$671.4 BILLION INVESTMENT OPPORTUNITY	22.5 MILLION JOBS CREATED	544.6 MILLION TONS CO_2e GHG EMISSIONS REDUCTION POTENTIAL

(Source: Guidehouse Insights)

OPPORTUNITIES AND DRIVERS

ECONOMIC IMPACTS

Although traditional carbon capture and storage and CCS with enhanced oil recovery are proven technologies, it has not yet been commercialized at the scale needed to meet the goals of the Paris Agreement. Although there has been particularly limited uptake in emerging markets, CCUS represents a $671.4 billion market potential and 22.5 million new jobs across the 21 emerging markets in the next decade. Concerted focus on this sector can lead to benefits in the medium and long term and holds the potential for substantial GHG emissions reduction, helping accelerate the transition to low-carbon economies.

The global market size for CCUS has the potential to be $800 billion by 2030.[79] The largest investment opportunity is in the building materials sector. Potential global annual revenues in the concrete sector (i.e., carbonates to strengthen ready-mix concrete or production of non-Portland cements) range from $150 billion to $400 billion in 2030. The market size for aggregates (the load-bearing filling or infiltrating material in concrete) is expected to be as much as $150 billion in 2030. As of 2018, the global aggregates market stood at 25 to 35 billion tons, with 2030 projections of 50 billion tons.[80] Waste CO_2 can be used to coat or form aggregates. CCUS technology can be a particularly impactful option for decarbonizing heavy industry in emerging markets as it can unlock broader economic growth while avoiding many of the negative environmental impacts that developed economies contributed during their own industrialization phases.

The IEA estimates that more than 2,000 new CCUS facilities will be needed by 2040, a 100-fold scale-up from the 19 globally today.[81] As these facilities are built, each project will generate significant local employment opportunities, enabling a just transition for communities that rely on emissions-intensive industries. Post-construction phases will require fewer jobs, but there will still be substantial opportunity in operations and maintenance as well as indirect jobs across the supply chain.[82] Importantly, some of the skills required for CCUS, including pipeline work, already exist in the oil and gas sectors.[83] Job creation in the green hydrogen sector will grow as countries begin to implement their recovery plans and opportunities exist to link CCUS operations with the production of low-emission hydrogen. Analysis in this paper suggests that CCUS has the potential to generate 22.5 million new jobs between now and 2030.

CLIMATE IMPACTS

The potential of CCUS lies in its ability to eliminate emissions, and when used in the cement sector it can have a substantial impact. However, while its impact is well understood, it is not yet economically viable without subsidies and still requires the development of a technological path to address end-of-life CO_2e to avoid potential leakages. Analysis shows that CCUS has an emissions reduction potential of 544.6 million tons CO_2e across the 21 emerging markets. Regionally, Asia is expected to lead the way, with 90 percent in CO_2e reduction attributable to Bangladesh, China, India, Indonesia, Philippines, and Vietnam.

GROWING PUBLIC SECTOR SUPPORT FOR GREEN HYDROGEN CAN SUPPORT PRIVATE SECTOR DEPLOYMENT IN EMERGING MARKETS

Hydrogen produced using renewable energy to power electrolyzers, also known as green hydrogen, has received considerable portions of announced stimulus funding. For example, the EU aims to build 40GW of green electrolyzer capacity by 2030.[84] As of September 18, France has approved the largest stimulus package of any European country. Of this package, €30 billion is "green", of which €7.2 billion will fund low-carbon hydrogen.[85]

DEVELOPING A GREEN HYDROGEN ECONOMY REQUIRES SIGNIFICANT SCALING UP IN DEMAND, PRODUCTION AND USAGE

With support from OECD countries like France, green hydrogen technologies could rapidly reach maturity, increasing deployment in emerging markets. While hydrogen was not included in our opportunity analysis for industrial processes in emerging markets, there are potential applications that could prove to be more economically feasible in the short term, provided electrolyzer costs continue to fall. The economics of green hydrogen improve when developed for applications across sectors. For example, a proposed green hydrogen hub in the Northern Netherlands aims to build an entire hydrogen value chain, including production (via an electrolyzer powered by nearby offshore wind and solar PV), distribution (via existing gas networks), storage (salt caverns), and local end-use (hydrogen fueling stations for heavy transport, as a feedstock for local industry, and electricity for nearby communities).[86]

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

WORK WITH THE PRIVATE SECTOR TO GENERATE INCENTIVES TO INVEST IN CCUS

With 85 percent of worldwide CO_2 emissions operating outside of a carbon pricing scheme[87], companies are unlikely to invest in the upfront research or installation costs of CCUS technology without government support or concessional financing. However, some high-profile corporations are lending their support to further developing CCUS technology. In January 2020, Microsoft announced its goal to be carbon-negative by 2030, and that as part of its efforts it would also invest $1 billion through its Climate Innovation Fund for carbon removal technologies.[88] The corporation will deploy equity, debt, and other financial mechanisms.

In May 2020, the European Commission released a report on how Europe could "Repair and Prepare for the Next Generation."[89] The plan includes a new strategic investment facility that will "invest in technologies key for the clean energy transition, such as renewable and energy storage technologies, clean hydrogen, batteries, CCUS and sustainable energy infrastructure." Financial incentives, such as tax credits or grants, can spur the industry as previously occurred in the renewables industry. European countries have also sent a clear message that green hydrogen will be central to their recovery. Of Germany's €130 billion stimulus package, €26.4 billion has been pledged to low-carbon investments focused on reducing emissions from industry as well as buildings and transport. A further €9 billion will be directed towards developing hydrogen infrastructure.[90]

DEVELOP INDUSTRY STANDARDS AND GOVERNMENT PROCUREMENT REQUIREMENTS

In the United States, approximately 90 percent of cement and concrete is purchased by federal, state, and city governments.[91] Government procurement standards on a national and subnational level can be an effective tool to accelerate the uptake of cement and concrete produced in a low-carbon way. Industry standards can also provide an important stimulus. Most of the concrete produced globally uses Portland cement[92], an established and well-understood product often referenced in local building codes. Revising performance standards to include lower carbon cement products can facilitate the entry of newer products. This is contingent on meeting safety requirements. There are efforts underway by industry stakeholders to introduce new, low-carbon cement products.[93] The LEILAC (Low Emissions Intensity Lime and Cement) project in Belgium (2016 to 2020) received funding from the EU and consortium partners to pilot innovative CCUS technology without significantly increasing energy consumption or capital requirements. The findings will be applied to the cement industry in Europe and can potentially be transferred to other settings.

ASSESS THE GEOLOGICAL STORAGE POTENTIAL IN EMERGING MARKETS

While markets for CO_2 utilization will be part of the solution, these markets are unlikely to absorb the volumes of CO_2 that will be necessary to keep global warming within 1.5 degrees Celsius. Most of the mitigation potential in CCUS belongs to traditional carbon capture and geological storage. The Intergovernmental Panel on Climate Change (IPCC) estimates that up to 10,000 million tons of CO_2 would need to be removed annually by 2050, but the maximum potential utilization volume in 2050 is only 700 million tons.[94] However, the permanent geological storage potential in many of IFC's client countries remains unknown.[95] Academic institutions, the IEA, and others could prioritize fully mapping the resource potential in developing countries. This will assist in the siting and location of carbon capture hubs, where infrastructure that enables the storage and safe transport of captured carbon is built around emitting facilities such as cement, steel, and power plants. One example of such a hub is Net Zero Teesside in the United Kingdom, which aims to capture up to 10 million tons of CO_2.[96]

TRANSFER TECHNOLOGY TO EMERGING MARKETS

Multilateral development institutions can assess technologies and conduct feasibility studies for clients unable to provide their own capital for this work. Donor financing, especially from IFC shareholders that have made CCUS national priorities, can finance technology transfer. Development banks can contribute important financing and technical inputs. For example, the Asian Development Bank has a Carbon Capture and Storage Fund that promotes capacity development, geological investigations and environmental studies, and undertakes community awareness and support programs. In partnership with the private sector, IFC can deploy demonstration projects that will disseminate knowledge in our client markets. Demonstration projects will enable local industry to familiarize themselves with CCUS technology.

IFC EXPLORES THE FUTURE OF CARBON CAPTURE AND GREEN HYDROGEN

In 2019, IFC formed an internal Carbon Capture Interest Group, bringing together investment and industry expert staff from across regions and sectors. This group is exploring potential investment opportunities, especially the role that project finance and advisory plays in decarbonizing heavy industry as well as equity investments in technologies that could provide meaningful, low-carbon pathways for developing countries to continue industrializing. IFC is also collaborating with the World Bank CCS Trust Fund (established in 2009 with support from the governments of Norway and the United Kingdom) to identify opportunities for prospective CCUS investment. In addition, IFC is providing inputs to the Trust Fund's study Decarbonizing Natural Gas Using Carbon Capture and Storage. In addition, IFC is working on external education, such as an Innovate4Climate event in September 2020 with the Global CCS Institute to explain the role that carbon capture can have in the low-carbon development pathways for emerging markets.

As green hydrogen gains international momentum, IFC and the World Bank are working together to better understand the unique needs of emerging markets. In 2019, the World Bank's Energy Sector Management Assistance Program launched a Green Hydrogen Working Group consisting of experts from across the World Bank and IFC, incorporating staff from multiple industries to enhance the World Bank Group's ability to build a global green hydrogen economy and decarbonize across sectors. In 2020, the working group released the first publication from a development institution on green hydrogen: *Green Hydrogen in Developing Countries.* Within IFC, investment staff and industry experts are focused on understanding the economics of various green hydrogen applications to achieve bankable solutions in emerging markets.

SECTOR 8

SCALE
CLIMATE-SMART
AGRICULTURE

SECTOR 8

SCALE CLIMATE-SMART AGRICULTURE

The COVID-19 pandemic has tested, and in some cases significantly impacted, the optimal functioning and resilience of global food supply chains. Over the initial months of the pandemic, the food distribution system performed well but it is now showing signs of strain. In the short term, many companies need liquidity and working capital to keep the food supply chain functioning. In the longer term, as the world's population continues to grow, the global agribusiness industry needs to produce 50 percent more food by 2050 according to the Food and Agriculture Organization (FAO).[97] To remain sustainable and not exacerbate global warming, this must be accomplished without any significant additions to agricultural lands or deforestation. At the same time, the 2019 IPCC Special Report on Food Security confirms that climate change is already affecting food security through increasing temperatures, changing precipitation patterns, and greater frequencies of extreme weather events.

CLIMATE-SMART AGRICULTURE: INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION IN 21 EMERGING MARKETS BETWEEN 2020 AND 2030.

EUROPE
(RUSSIA, SERBIA, TURKEY, UKRAINE)

$79.4 BILLION
INVESTMENT OPPORTUNITY

2.5 MILLION
JOBS CREATED

15.1 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

MIDDLE EAST AND NORTH AFRICA
(EGYPT, JORDAN, MOROCCO)

$58.3 BILLION
INVESTMENT OPPORTUNITY

1.3 MILLION
JOBS CREATED

7 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

EAST ASIA AND THE PACIFIC
(CHINA, INDONESIA, PHILIPPINES, VIETNAM)

$415 BILLION
INVESTMENT OPPORTUNITY

14.3 MILLION
JOBS CREATED

123.1 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

LATIN AMERICA AND THE CARIBBEAN
(ARGENTINA, BRAZIL, COLOMBIA, MEXICO)

$170.5 BILLION
INVESTMENT OPPORTUNITY

9.3 MILLION
JOBS CREATED

72.3 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SUB-SAHARAN AFRICA
(CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)

$80.1 BILLION
INVESTMENT OPPORTUNITY

5 MILLION
JOBS CREATED

9.7 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SOUTH ASIA
(BANGLADESH, INDIA)

$223.5 BILLION
INVESTMENT OPPORTUNITY

7.7 MILLION
JOBS CREATED

52.7 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

TOTAL	$1 TRILLION INVESTMENT OPPORTUNITY	40.2 MILLION JOBS CREATED	279.9 MILLION TONS CO_2e GHG EMISSIONS REDUCTION POTENTIAL

(Source: Guidehouse Insights)

The World Bank Group defines climate-smart agriculture (CSA) as an approach to managing landscapes—cropland, livestock, forests and fisheries—to achieve three "wins": 1) increased productivity to improve food security and boost farmers' incomes; 2) enhanced resilience to drought, pests, disease and other shocks; and 3) reduced GHG emissions. Based on the World Bank Group definition, IFC views CSA as an approach that can increase productivity sustainably, taking into consideration climate change concerns and impacts. IFC's CSA strategy is to provide investments and advisory operations that contribute to the three strategic focus areas. To achieve a green recovery, governments could prioritize the creation of a resilient, sustainable food production and distribution system.

To achieve a green recovery, governments should prioritize the creation of a resilient, sustainable food production and distribution system.

OPPORTUNITIES AND DRIVERS

ECONOMIC IMPACTS

The investment opportunities in food value chains are driven by local and global crop considerations. Market size ranges between regions, from $415 billion in East Asia and the Pacific between 2020 and 2030 to $80 billion in Sub-Saharan Africa and in Eastern Europe respectively. The market size for the 21 emerging market economies identified in this report is around $1 trillion over the next decade, with the potential to create 40.2 million new jobs. The compounded growth rate for CSA is 8.7 percent with a significant multiplier effect.

While CSA has a strong potential to add sustainable food security and financial value to the economy, proactive government assistance is required to harvest the full benefits. Many public good CSA interventions, including lower deforestation, higher soil carbon sequestration, and reduced water consumption that do not accrue for private sector companies and their supply chains, including farmers, cannot be captured in financial models. Concrete revenue streams or upfront resources to help incentivize and internalize these positive externalities are required. Targeted blended concessional finance programs are needed to support technical assistance in emerging markets to offset perceived and actual risks, reduce the high cost of adoption, and incorporate public good co-benefits of CSA investments.

In 2020, more than a quarter of the global population was employed in the agricultural sector, according to World Bank estimates.[98] Given traditional agriculture's large labor force, climate-smart agriculture has the potential to maintain employment levels, particularly in rural and underserved regions. Of the 10 sectors analyzed in this paper, climate-smart agriculture has the highest green job creation potential at 40 jobs per million dollars invested, expected to create 40.2 million new jobs in the 21 emerging markets between 2020 and 2030. In addition, for every new direct job created in CSA, another indirect job is added in the economy. However, a lack of knowledge and capacity to implement sustainable agricultural practices limits market readiness of the sector. Any future government stimulus program to promote CSA could include resources for developing tools and deploying the appropriate expertise to help implement and scale CSA solutions on the ground. It is also essential to identify proven business models for aggregation and for effective risk-sharing where private sector financing is concerned.

CLIMATE IMPACTS

It is estimated that CSA practices and technologies could reduce GHG emissions in the 21 merging markets by 279.9 million tons of CO_2e by 2030. The FAO estimates that around a quarter of annual global GHG emissions are associated with the agricultural, forestry, and land use sector.[99] The World Bank estimates that 80 percent of deforestation worldwide is driven by agriculture and that without action, deforestation and forest degradation could rise substantially as farmers encroach on forestland to compensate for falling yields.[100]

While climate-smart agriculture has a strong potential to add sustainable food security and financial value to the economy, proactive government assistance is required to harvest the full benefits.

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

Without shifting to climate and nature friendly production practices, our global food supply will be at risk due to droughts, crop failures, poor soils, and the threat to pollinators. While there is no one-size-fits-all solution to climate-smart agriculture, there are a few key recommendations for governments to direct stimulus funding towards.

SUSTAINABLY INCREASE CROP PRODUCTIVITY WHILE REDUCING INPUT USE AND GHG EMISSIONS

Precision farming involves a combination of technologies and management practices that are new, expensive, and require capacity building that is often lacking in developing countries. Future government stimulus packages and donor support programs can include funding for technical assistance programs offered by nongovernmental organizations (NGOs) or development institutions to help farmers' uptake of new technologies and ensure that positive climate mitigation or adaptation measures are adopted. Forest management and crop sustainability certifications to ensure traceability and transparency can be promoted and sometimes be used as a proxy for CSA benefits. In order to overcome the above barriers, donor funding is essential, especially in developing countries (including middle-income ones) with large agricultural sectors, to bridge the many obstacles that CSA faces and to promote food security with climate co-benefits.

Financial institutions, including banks, non-bank FIs, microfinance entities, and funds, are essential to scale climate-smart agriculture practices by providing access to credit for smallholders as well as to small and medium enterprises (SMEs) that sell or provide CSA technologies. Farmers, especially smallholders, are often considered by DFIs and FIs as too risky to finance. These farmers often lack land title or assets that can be used as collateral. High interest rates, when financing is offered by banks, are often unworkable. Government stimulus money combined with the support of development institutions and donor countries can leverage private sector resources to ensure adequate funding of smallholders. It is critical to ensure that technical assistance by DFIs is provided alongside funding. Small loans aggregation and risk-sharing solutions will also align interests.

REDUCE SUPPLY CHAIN FOOD LOSSES FROM FARM TO FORK

In many emerging markets, most food losses occur during production, handling and storage, processing, and distribution—parts of the value chain that are usually handled by the private sector. These post-harvest losses can be reduced by supporting projects that 1) improve food transport logistics and distribution; 2) promote appropriate packing and packaging solutions; and 3) promote the effective use of storage facilities including through improved inventory management, the adoption of efficient cooling and cold chain that utilizes natural refrigerants, and the construction of "green" warehouses (certified green buildings).

In particular, the development of sustainable cold storage chains can help reduce food loss throughout the distribution chain. Moving food through the supply chain is a complex process involving different business models and ownership structures. An improvement in supply chain management requires significant financial investments but more importantly it requires collaboration and alignment of interests and incentives between farmers, traders, processors, suppliers, distributers, food retailers, and the government. Infrastructure is often either lacking or owned by a mix of public and private entities and outsourced. This makes it hard to align different stakeholder interests and implement comprehensive solutions across supply chains. Governments could create an enabling environment through regulations and policies that help align interests and set clear rules. Policies and programs could be designed to boost private sector opportunities and investment. Government investment is needed in the form of infrastructure, possibly through PPPs, as well as through incentives that will help to scale implementation of waste reduction programs.

REDUCE THE GHG INTENSITY AND RESOURCE FOOTPRINT OF ANIMAL PROTEIN PRODUCTION

Animal protein production is a major contributor to GHG emissions and a driver of deforestation by converting land use for grazing. To reduce the potential climate impact and to satisfy the world's increasing demand for protein, it is necessary to reduce the GHG intensity and resource footprint of animal protein production; in other words, to sustainably increase animal productivity (yield per animal) without increasing GHG emissions or causing landuse change. It is also vital to reduce energy and water use and promote renewable energy in the animal protein supply chain. This includes supporting interventions that promote energy/water efficiency, better animal waste management, and bio-digesters with methane capture/utilization. This is still a nascent and developed market-focused space; its evolution and trajectory will be consumer demand-driven.

AMPLIFY RESEARCH, MONITORING, AND INFORMATION DISSEMINATION

Unlike a climate mitigation case based on wind or solar power, CSA is more nuanced, for example, through the incorporation of adaptation approaches. While many CSA technologies present considerable mitigation opportunities, they must be implemented properly to reduce resource use while achieving targeted GHG emissions reduction. From an adaptation perspective, CSA practices and technologies can also improve resilience to extreme weather events. Establishing a CSA case (regardless of sub-sector) that achieves both types of benefits requires several variables, among them reliable data, establishing a baseline, and determination of project boundaries. This requires technical capacity to properly adopt new technologies and ensure that desired impacts are achieved. Post-COVID stimulus packages could include funds to establish data, monitor results, and disseminate best practices.

IFC HELPS SCALE UP CLIMATE-SMART AGRICULTURE

Strengthening climate-smart agriculture is an important strategic priority for IFC. In 2017, IFC became the first private sector multilateral development bank to develop a private sector-oriented approach for climate-smart agriculture. This approach is focused on three critical themes: i) helping to improve yield and productivity of land/crops while reducing input use and GHG emissions per ton of output, especially through precision farming practices, ii) sustainably increasing the productivity of animal protein operations to reduce the GHG intensity and resource footprint of animal protein production, and iii) reducing post-harvest losses, as currently about one-third of the food grown is lost in the supply chain globally. In 2020, *IFC made a $15 million investment in Apeel Sciences,* which developed a plant-derived coating to help growers, suppliers and retailers to significantly extend the shelf life of fresh fruits and vegetables, reducing losses and the need for refrigeration, thereby reducing related GHG emissions. Apeel's technology lengthens supply chains and helps farmers to access markets and get better value for their crops. For IFC, expanding the volume of projects and investments in climate-smart agriculture will entail, in part, transferring both disruptive technologies and proven interventions like precision agriculture, as well as supporting business models that overcome the complex barriers facing investments in this sector. IFC recently led an initiative to develop a food loss calculator that will help IFC and its clients to quantify the GHG benefits and *cost savings of projects that reduce food losses.* This is a complex space in emerging markets, but the need for financially viable, scalable solutions is more relevant than ever due to the COVID-19 crisis.

SECTOR 9

REINVENT TEXTILE AND APPAREL VALUE CHAINS

SECTOR 9

REINVENT TEXTILE AND APPAREL VALUE CHAINS

Before COVID-19, the textile and apparel industry enjoyed an era of high growth. In recent months, however, there has been a collapse in demand, resulting in retail closures, the cancellation of orders, factory shutdowns, and layoffs. Between March and April 2020, sales in the fashion and luxury industry decreased by 60 to 70 percent, raising concerns about the financial viability of many firms. According to a survey of over 500 manufacturing facilities across all main production regions, 86 percent of all facilities have been affected by cancelled or suspended orders and 40 percent now struggle with paying employees.[101] In Europe and the United States, more than 65 percent of consumers expect to decrease their spending on apparel,[102] further impacting the near-term liquidity and profitability of the sector.

OPPORTUNITIES AND DRIVERS

ECONOMIC IMPACTS

Before COVID-19, the textile and apparel value chain represented a $2.2 trillion industry. According to a pre-COVID report on the fashion industry by Boston Consulting Group, the global apparel and textile industry has the potential to reach $3.3 trillion in 2030,[‡‡] growing at a CAGR of 3.5 percent.[103] While these numbers have not been updated to consider the impact of the recent downturn, textiles remain an important engine of growth in many emerging-market countries, representing as much as 70 percent of total exports in countries such as Bangladesh.[104] Textile manufacturing has traditionally served as a gateway into formal manufacturing for companies, countries, and workers. While the industry's production footprint is mostly concentrated in Asia, there is opportunity for expansion into Africa and Latin America and the Caribbean.[105]

Sustainable manufacturing will be a key success factor for countries' ability to reboot their textile and apparel industries. Brands are increasingly seeing their consumers focused on the sustainability of their purchases.[106] The focus on sustainability will be especially prominent for Gen-Z and millennial shoppers, where 31 percent and 26 percent respectively reported a willingness to pay more for sustainably made clothing.[107] To appeal to this demographic and support the textile and apparel industry, countries would need to focus on creating green energy infrastructure. Companies should incorporate more sustainable inputs such as using organic cotton or redesigning the blends of materials and how they are put together with an eye toward end-of-life recycling.[108]

CLIMATE IMPACTS

Worldwide, the textile and apparel industry employs over 60 million workers along its value chain. These jobs are mostly filled by women, who make up two-thirds of the global garment workforce and are predominantly low wage earners employed by small local companies. Sustaining these jobs is an important objective for government support of the industry. By partnering with major brands, governments can leverage foreign direct investment with stimulus funding toward the improvement of working conditions, providing living wages, and reducing the industry's environmental impact.

The global textile and apparel sector accounts for about 2.1 billion tons of GHG emissions, accounting for 4 percent of total global emissions and equal to annual emissions from France, Germany, and the United Kingdom combined.[109] If no steps are taken to increase sustainability, GHG emissions in the fashion industry are on track to rise to about 2.7 billion tons a year by 2030, reflecting an annual growth rate of 2.7 percent.[110] In addition, the industry consumes 79 trillion liters of water per year. Many major brands have formally adopted climate and sustainability targets for their entire sustainability chains. In 2018, IFC joined the Fashion Industry Charter for Climate Action, under the auspices of the United Nations, to develop financial products to help the textile industry transition to climate-smart practices. Members of the charter envision the achievement of net-zero emissions by 2050 and have targeted a 30 percent decrease in GHG emissions globally by 2030.[111]

Sustainable manufacturing will be a key success factor for countries' ability to reboot their textile and apparel industries.

[‡‡] *Data used in this sector were not provided by Guidehouse Insights but drawn from publicly available sources that are cited. These figures are not added to the 21 emerging-market totals.*

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

The revival of the textile and apparel industry partly depends on its ability to adapt to a growing demand for more sustainable products. The biggest potential for sustainability gains exists in 1) increased use of renewable energy and improved energy efficiency; 2) the usage of more sustainable materials; and 3) implementation of circular economy approaches. For each of these gains, green rebuild stimulus packages can focus on policies, upstream market development, and favorable financing.

POWER THE FASHION INDUSTRY THROUGH RENEWABLE ENERGY AND ENERGY-EFFICIENT SYSTEMS

According to McKinsey, energy-efficiency and energy-transition actions can result in about 1 billion tons of GHG emissions reduction in 2030 and are fundamental to creating a sustainable textile industry.[112] Regulations that support and enable increased on-site renewable energy (either owned or leased by the end-user) or independent power production that can tie into long-term purchase agreements with end consumers can increase the acceleration of renewable energy use. There is ample demand from brands to buy from suppliers who have access to renewable energy. In countries where electricity regulation allows for innovative renewable energy policy, tax law can be instrumental in enabling greater and faster adoption of renewable energy. In the meantime, renewable energy markets need to get a head start despite regulatory restrictions. Countries should foster innovative financing, technical assistance, and improved access to competitive financing.

SUPPORT TRANSITION TO MORE SUSTAINABLE MATERIALS

Cotton accounts for 40 percent of the world's fabric production and sustainable farming practices can help reduce the environmental impact of the apparel industry.[113] Organic cotton is about half as emissions intensive as conventional cotton because it does not use pesticides or fertilizer, which both generate significant GHG emissions. Farms need three years of organic practices before they can become certified organic. Governments can provide a cushion for the three-year period when cotton suppliers stop using non-organic inputs but are not yet certified organic. Future government stimulus packages can also fund and provide research and development for new materials.[114] Early stage working capital and low-rate loans are some options that can build momentum for a shift to increased use of low-carbon materials.

INVEST IN NEW MATERIALS AND THE CIRCULAR ECONOMY

How materials are produced, and where they end up, is a key part of the sustainability of the fashion industry. Today, only 1 percent of material used to produce clothing is recycled. There is growing pressure for companies to meet consumer demand for sustainable products and abide by new policies and regulations. In response, industry leaders can enhance focus on the creation of products that are made for durability, disassembly, and reuse, increasing the share of recycled fibers in their products. Green rebuild packages can provide concessional capital and financial tools to allow companies to invest in new technologies for materials and assembly practices.

PARTNER WITH BRANDS TO SCALE IMPACT

Given that their high emissions and supply chains weave throughout many economies, the textile industry is an important component of a green rebuild strategy. Brands are a key partner to governments to work through their supply chains and create demand for clean energy, sustainable agriculture, and the infrastructure for a circular economy—key components of a global green rebuild.

The revival of the textile and apparel industry partly depends on its ability to adapt to a growing demand for more sustainable products.

IFC TAILORS ENERGY SOLUTIONS FOR THE GLOBAL APPAREL VALUE CHAIN

Transitioning the apparel industry to a low-carbon future is a complex problem that involves a vast interconnected global supply chain. In 2018, fashion stakeholders and IFC created the *Fashion Industry Charter for Climate Action* under the auspices of the United Nations. The charter goes beyond previous industry-wide commitments. It includes a target of 30 percent GHG emissions reduction by 2030 and a commitment to analyze and set a decarbonization pathway for the fashion industry. IFC plays a key role in the charter by *developing financial products to support the transition to climate-smart practices* in the global apparel industry.

In 2018, IFC signed a *$2.3 million cooperation agreement with Levi Strauss & Co* to help 42 suppliers and mills across 10 emerging economies to identify and implement appropriate renewable energy and water-saving interventions to reduce GHG emissions. The work—spread across Pakistan, Bangladesh, Sir Lanka, India, Mexico, Lesotho, Colombia, Turkey, Egypt and Vietnam—will incorporate IFC's Partnership for Cleaner Textiles approach for reducing resource consumption and wastewater pollution. In 2017, *IFC partnered with fashion giant H&M* to help textile and apparel companies in H&M's supply chains in emerging markets reduce their carbon footprint and adopt more sustainable practices. This partnership also helped develop a road map for H&M's other 1,300 strategic suppliers in Bangladesh, China, and India increase their renewable energy use.

SECTOR 10

INCENTIVIZE LOW-CARBON AIRLINES AND SHIPPING

SECTOR 10

INCENTIVIZE LOW-CARBON AIRLINES AND SHIPPING

The connectivity provided by airports, airlines, and international shipping[§§] is essential to the development of countries and regions. Combined, air travel and tourism contribute 10 percent of global GDP and support 330 million jobs worldwide.[115] Shipping carries around 80 percent of global trade by volume and 70 percent by value.[116] The economic shutdown in response to COVID-19 has had an immediate and dramatic impact on their business. In a global effort to reduce the spread of the virus, government restrictions have led to fewer people and goods moving around the world, causing private sector companies to cut capacity and their revenues to decline.

Since the outbreak of the pandemic, total airport revenues dropped by an estimated 35 percent in Q1 2020 (equivalent to $14 billion) and 90 percent in Q2 2020 globally compared business as usual.[117] In some cases, governments have closed airports to contain the spread of the virus. Due to these closures, airlines are operating at a reduced capacity. In the United States, for example, air passenger traffic was 95 percent lower on April 7, 2020 compared to 2019.[118] The global airline industry is forecast to lose a record $84 billion this year, more than three times higher than during the 2008 global financial crisis.[119]

LOW-CARBON AIRLINES AND SHIPPING: INVESTMENT OPPORTUNITIES, JOB CREATION, AND GHG EMISSIONS REDUCTION IN 21 EMERGING MARKETS BETWEEN 2020 AND 2030.

EUROPE
(RUSSIA, SERBIA, TURKEY, UKRAINE)

$8.8 BILLION
INVESTMENT OPPORTUNITY

0.1 MILLION
JOBS CREATED

12.8 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

MIDDLE EAST AND NORTH AFRICA
(EGYPT, JORDAN, MOROCCO)

$4.4 BILLION
INVESTMENT OPPORTUNITY

0.2 MILLION
JOBS CREATED

6.6 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

EAST ASIA AND THE PACIFIC
(CHINA, INDONESIA, PHILIPPINES, VIETNAM)

$103.8 BILLION
INVESTMENT OPPORTUNITY

2.9 MILLION
JOBS CREATED

113.4 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

LATIN AMERICA AND THE CARIBBEAN
(ARGENTINA, BRAZIL, COLOMBIA, MEXICO)

$38.9 BILLION
INVESTMENT OPPORTUNITY

1.1 MILLION
JOBS CREATED

33.4 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SUB-SAHARAN AFRICA
(CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA)

$6 BILLION
INVESTMENT OPPORTUNITY

0.3 MILLION
JOBS CREATED

9.1 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

SOUTH ASIA
(BANGLADESH, INDIA)

$55.9 BILLION
INVESTMENT OPPORTUNITY

1.6 MILLION
JOBS CREATED

48.6 MILLION TONS CO_2e
GHG EMISSIONS REDUCTION POTENTIAL

TOTAL	$217.8 BILLION INVESTMENT OPPORTUNITY	6.1 MILLION JOBS CREATED	223.9 MILLION TONS CO_2e GHG EMISSIONS REDUCTION POTENTIAL

(Source: Guidehouse Insights)

§§ This section includes airlines and maritime and air cargo shipping. Freight is included in Sector 5: Expand green urban transport.

OPPORTUNITIES AND DRIVERS

Incorporating the airlines and shipping sectors into green recovery efforts will be vital to rebuilding economies. Emphasizing green solutions like sustainable fuels, retrofits, and more efficient supply chains (including scaling up local logistics and e-logistics) can help reduce the transport sector's emissions, which contribute 16.2 percent of GHG emissions globally.[120]

Incorporating the airlines and shipping sectors into green recovery efforts will be vital to rebuilding economies.

ECONOMIC IMPACTS

Analysis across the 21 emerging markets found that green airlines and shipping presented a cumulative investment potential of $217.8 billion and 6.1 million new jobs between now and 2030. Leading up to COVID-19, there was a global push to identify greener and more sustainable fuels for shipping and air transport. As these industries recover and get back to business, there will be a significant opportunity to harness new technologies and business models that are less carbon intensive. Of the 6.1 million new direct jobs, employment opportunities will vary, ranging from the development of port infrastructure, to the manufacturing of new and retrofitting of existing capital assets such as airplanes and ships.

CLIMATE IMPACTS

Perhaps the biggest opportunity presented by this industry's market potential is to harness green approaches to drastically reduce global emissions. The billions of dollars of already announced and future public recovery funding could include "green strings" like carbon footprint reductions that would require aviation and shipping to pursue more sustainable fuels instead of simply relying on offsets. Currently, air transport accounts for about 2 percent of global carbon emissions with shipping just over 3 percent[121] and, in a business-as-usual case, these percentages are expected to increase over time. The use of alternative fuels and improved efficiency will contribute to a reduction of 223.9 million tons of emissions between 2020 and 2030 in the 21 emerging markets.

RECOMMENDED ACTIONS FOR PUBLIC AND PRIVATE SECTOR PLAYERS

PRIORITIZE INVESTMENT IN SUSTAINABLE AVIATION FUELS

Sustainable aviation fuels (SAF) can cut lifecycle emissions up to 80 percent compared with conventional jet fuel.[122] However, SAF production to date has not occurred at the level needed to meet the International Air Transport Association's (IATA)[123] goal to cut aviation emissions to half of 2005 levels by 2050. Airlines have conducted significant research and development into SAF, with some 250,000 SAF-powered flights completed to date.[124] To increase uptake in production, costs must become more competitive with traditional fuels. IATA estimates that to reach this tipping point, global production needs to reach 7 billion liters or 2 percent of 2019 consumption. Today, annual production is just 50 million liters.[125]

The severe adverse impact of COVID-19 on the airline sector presents a challenge for increased private investment in developing alternative fuels and technology. The current uncertainty around recovery scenarios, with expectations of a protracted crisis, means there will be less capital to spend on innovation and technology as airlines focus on survival. A range of public incentives will be needed to direct continued investment in innovation in climate-smart air travel and generate employment along the way.

DEVELOP BUSINESS MODELS AND INVESTMENTS TO SUPPORT AMBITIOUS CORPORATE COMMITMENTS AND MEET ENVIRONMENTAL REGULATIONS

In April 2018, after years of negotiations, the International Maritime Organization (IMO) reached an agreement to cut the shipping industry's carbon emissions by at least half of 2008 levels by 2050.[126] Six months later, 34 private sector shipping industry leaders including executives from Cargill, Gaslog, and AP Moller-Maersk committed to reduce carbon emissions by at least 50 percent by 2050.[127] Maersk—the world's largest container shipping company—has subsequently pledged to cut their carbon emissions to zero by 2050. This unified call to action has emphasized the need to ramp up technological and business model innovation to generate opportunities and to meet these goals as well as national goals set under the Paris Agreement.[128]

Industry-led efforts like these are particularly important, given that the aviation and shipping industries are not included in the Paris Agreement due to the difficulty in attributing the source of emissions to countries. Green conditions and incentives attached to airline bailout packages as well as airlines making carbon-neutral commitments will be important to move the airline sector toward a lower-carbon footprint.

SUPPORT TECHNOLOGICAL INNOVATION AND INVESTMENT IN ALTERNATIVE SHIPPING FUELS AND EFFICIENCY MEASURES

Ships are powered by bunker fuel, a thick, sulfur-laden petroleum distillate that is usually cheaper and dirtier than regular fuel.[129] Corporate commitments and new regulations are encouraging a shift away from bunkers towards alternative fuels and eco-friendly technologies, representing a significant investment opportunity. Some shipping companies are examining new fuel sources such as biogas made from fish,[130] or hydrogen and ammonia.[131] Some operators have also deployed vessels powered by liquefied natural gas, although there is some question within the industry about whether it ultimately reduces GHGs once methane leakage along the supply chain is considered. Other potential solutions include electric ships and batteries. While viable for road travel, these technologies have not yet been proven for long-distance deep-sea vessels. However, they could be particularly impactful for barges, short sea ferries, and offshore supply vessels that spend much of their time on standby on location in the open water.[132] Additional efforts to green shipping include efficiency measures, such as innovative design approaches to hulls and the deployment of a new generation of sails that reduce fuel use. While many of these innovations remain in the development stage, some technologies could significantly reduce shipping fuel costs.

Despite the current crisis facing the global aviation and shipping industries, IFC is committed to strengthening the environmental sustainability of both sectors.

SETTING SAIL ON A GREENER ROUTE

Despite the current crisis facing the global aviation and shipping industries, IFC is committed to strengthening the environmental sustainability of both sectors. In 2014, IFC partnered with Mediterranean Shipping Company (MSC), the world's second-largest shipping line, to lighten MSC's ecological footprint and set new benchmarks for the global shipping industry. IFC's first loan of $150 million to MSC helped the company increase operational efficiency and reduce fuel use. The project entailed retrofitting 140 vessels to improve the ships' hydrodynamics by replacing propellers and bulbous bows. Those changes reduced fuel consumption by 10 percent to 12 percent and saved an estimated 1.2 million to 1.5 million tons of CO_2 per year — the largest GHG reduction by a single IFC investment to date.

In 2015, *IFC provided a further $70 million to MSC* to help the company comply with the IMO's Ballast Water Management Convention. This investment allowed MSC to install 150 water treatment systems aboard its ships to stop the transfer of invasive species that can travel in ballast water. IFC's support helped MSC pursue an environmentally motivated project faster than it could otherwise, allowing them to catalyze a trend in the industry by adopting IMO standards before they went into effect.

CONCLUSION

As the world works to minimize the continuing fallout of the COVID-19 pandemic, the path to economic recovery can be found in investing green.

This paper highlights and quantifies the economic and climate benefits of a green recovery across 21 emerging markets in eight sectors that are mature for private sector investment in the short term, and two sectors that have a strong potential for investment in the medium to long term. Concerted actions by public and private players in these sectors between 2020 and 2030 can deliver $10.2 trillion in investment opportunities, create 213.4 million new jobs, and reduce GHG emissions by 4 billion tons CO_2e across the analyzed markets.

The 10 sectors analyzed in this paper focus on:

- Decarbonizing existing and future energy infrastructure through the expansion of grid-scale and distributed generation renewable energy and supported by investments in energy battery storage solutions.
- Building climate-smart cities through prioritizing climate-smart infrastructure investments in energy-efficient building retrofits, waste and water management, green urban transport, and nature-based solutions.
- Helping speed the transition of key industries to green production practices through deploying CCUS and green hydrogen technologies, adopting CSA practices, greening textiles and apparel value chains, and incentivizing low-carbon airlines and shipping.

This analysis demonstrates how pursuing a green recovery can help rebuild economies in the short term and lay the foundation for longer-term sustainable growth, enabling countries to withstand future disruptions from pandemics or extreme weather events related to climate change. Rebuilding with a strategic focus on climate-smart approaches can help governments and companies prepare for a cleaner, prosperous, and more equitable future. A green recovery can also protect today's substantial investment in economic recovery by helping avoid or reduce climate-borne financial and economic crises.

The high cost of investment in decarbonization has long hindered the transition to a low-carbon global economy. As countries channel trillions of dollars to jump-start their economies, the post-COVID recovery phase presents a unique opportunity to decarbonize economies in an effective way. The private sector is uniquely positioned to help deliver on this ambitious agenda by accelerating investments commercially and at scale. However, private sector investment alone will not enable a green recovery at the growth, scale, and speed that is required without significant and robust government action. A coalition of public and private actors is required, one where government action can create the necessary regulatory and institutional framework to foster innovation and investment.

This paper outlines suggested actions to increase investments in job-creating green sectors of the economy by public and private sector players. It is intended to spark a conversation with policy makers, multilateral institutions, and the private sector about how to implement these recommended actions.

More than ever, as COVID-19 has taught us, familiar ways of doing business will not pay dividends in the long term. To recover from this pandemic, and to align profit with the planet's best interests, business leaders have to transform their mindset and adapt to a new landscape. Governments and companies that overcome current hurdles to offer low-carbon technologies, goods and services—and the banks that fund them—will be the front-runners of the post-COVID future. IFC looks forward to working alongside our private sector clients, governments, multilateral development banks, and NGO partners to help deliver on the green recovery suggested actions outlined in this paper.

ANNEX

DEFINITIONS

REGIONS

REGIONAL SCOPE	COUNTRIES INCLUDED
EUROPE	RUSSIA, SERBIA, TURKEY, UKRAINE
EAST ASIA AND THE PACIFIC	CHINA, INDONESIA, PHILIPPINES, VIETNAM
SOUTH ASIA	BANGLADESH, INDIA
LATIN AMERICA AND THE CARIBBEAN	ARGENTINA, BRAZIL, COLOMBIA, MEXICO
MIDDLE EAST AND NORTH AFRICA	EGYPT, JORDAN, MOROCCO
SUB-SAHARAN AFRICA	CÔTE D'IVOIRE, KENYA, NIGERIA, SOUTH AFRICA

MARKET INDICATORS

KEY MARKET INDICATORS	DEFINITIONS
MARKET SIZE 2020 TO 2030	• Total current and forecasted annual market investment (in $ million) • Based on market drivers and barriers and key technological development within each sector
CAGR	• Compound annual growth rate (2020 to 2030) • Calculated as a percentage growth of market revenues
GREEN JOB CREATION POTENTIAL	• Potential new direct job creation by sector (new direct jobs per million $ invested in the sector) • Does not give an indication of net impacts and does not include retained jobs • Based on internal Guidehouse Insights assessments, using third-party input data (national input-output matrix and nominal wage rates)
CUMULATIVE NEW DIRECT JOBS CREATED BETWEEN 2020-2030	• Cumulative new direct jobs created in the sector over the period between 2020 and 2030 • Based on internal Guidehouse Insights assessments, using third-party input data (national input-output matrix and nominal wage rates)
GHG EMISSIONS REDUCTION POTENTIAL % (UNTIL 2030)	• Sector's ability to deliver a reduction of GHG emissions • Technical potential of each sector to reduce GHG emissions between 2020 and 2030 • Based on Guidehouse Insights analysis
GHG EMISSIONS REDUCTION IN CO_2e (UNTIL 2030)	• Actual reduction of GHG emissions (per year) • Based on applying a technical potential of each sector to reduce GHG emissions between 2020 and 2030 • Applied to the percentage share of green build in each sector within a region

METHODOLOGY

The analysis included in this report was conducted by Guidehouse Insights. The methodology incorporated a range of resources, all of which are summarized by sector in the following sections. Using these data sources, Guidehouse Insights applied a sector-specific approach to determining market potentials, and a general approach to determine employment and GHG reduction figures.

THE SECTORS ARE DEFINED AS FOLLOWS:

UTILITY-SCALE RENEWABLE ENERGY	DISTRIBUTED GENERATION AND STORAGE	ENERGY-EFFICIENT BUILDINGS AND RETROFITS	GREEN URBAN TRANSPORTATION
• Solar • Wind • Onshore • Offshore • Biomass • Hydro • Hydrogen • Storage • Geothermal	• Hydrogen fuel cells • Solar PV • Wind • Other renewables • DESS	• ESCO services • Energy-efficient retrofit services • Energy-efficient home services • Zero-energy buildings • Energy-efficient water heating • Energy-efficient lighting • Smart appliances • Building energy-management systems	• Plug-in electric vehicles • Hybrid electric vehicles • Fuel cell vehicles • Electric bicycles • Electric vehicle (EV) batteries • Bus rapid transport • EV charging equipment • Electric scooters and motorcycles • Shared micro-mobility services • Smart transport and logistics • Smart parking systems
LOW-CARBON MUNICIPAL WASTE AND WATER	**CLIMATE-SMART AGRICULTURE**	**CARBON CAPTURE, UTILIZATION, AND STORAGE**	**AIRLINES AND SHIPPING**
• Municipal waste landfill • Waste incineration • Waste recycling • Wastewater systems	• Precision farming • Livestock monitoring • Smart greenhouses • Food loss/optimization logistics • Water and fertilizer management • HVAC management • Soil management/carbon sequestration • Regenerative agriculture • Yield monitoring • Remote sensing • Weather monitoring • Field mapping	• Pre-combustion • Post-combustion • Oxy fuel combustion	• Cargo shipping • Ship and boat building • Air cargo transportation • International air passenger transportation • Commercial aircraft manufacturing • Airport operations

METHODOLOGY BY INDICATOR

MARKET POTENTIAL

While Guidehouse Insights took a sector-specific approach to defining market potentials, they generally used the following methodology:

2020 TO 2030 FORECAST × INVESTMENT COSTS/CAPITAL EXPENDITURE = $ MARKET POTENTIAL FOR A SECTOR

The total market potential of $10.2 trillion is the cumulative sum of all sectors annually from 2020 to 2030 for 21 emerging-market countries. These costs were estimated at a regional level before they were aggregated in global estimates for each sector. The methodology for calculating each sector's growth rate and capex varies. In addition to expert opinion, the following measurements were used to indicate market size:

1. **UTILITY-SCALE RENEWABLE ENERGY:** MW capacity, renewable energy targets, installed cost of technology
2. **DISTRIBUTED GENERATION AND STORAGE:** MW capacity, renewable energy targets, installed cost of technology
3. **ENERGY-EFFICIENT BUILDINGS AND RETROFITS:** Building stock (Square footage), GDP growth rates
4. **GREEN URBAN TRANSPORT:** Unit sales, total cost of ownership, installed base of vehicles, product adoption
5. **CLIMATE-SMART WASTE AND WATER:** Cubic meters (m^3) of wastewater treated
6. **CLIMATE-SMART AGRICULTURE:** Productivity metrics, sub-sectoral growth rates
7. **CARBON CAPTURE UTILIZATION AND STORAGE:** Regional industrial emissions, technology penetration
8. **AIRLINES AND SHIPPING:** Capex spend, average GHG and carbon costs

EMPLOYMENT: NEW JOB CREATION POTENTIAL LINKED TO MARKET SIZE INVESTMENT

$ INVESTMENTS IN THE SECTOR FOR YEAR 20XX *(BASED ON MARKET POTENTIAL)* × JOB CREATION POTENTIAL IN THE SECTOR *(DIRECT JOBS PER $ INVESTED)* = NEW DIRECT JOBS CREATED BY YEAR IN THE SECTOR

SHARE OF EXPENDITURES ALLOCATED TO EMPLOYEE COMPENSATION *(Source: Input-Output (I-O) matrices from OECD)* ÷ THE AVERAGE ANNUAL WAGE OF THE SECTOR *(Source: ILO)*

$ CUMULATIVE INVESTMENTS OVER THE PERIOD 2020 TO 2030 × JOB CREATION POTENTIAL IN THE SECTOR *(DIRECT JOBS PER $ INVESTED)* = CUMULATIVE NEW DIRECT JOBS CREATED BETWEEN 2020 AND 2030 IN THE SECTOR

$ INDIRECT INVESTMENTS IN OTHER SECTORS AS A RESULT OF THE INVESTMENTS IN THE SECTOR × JOB CREATION POTENTIAL *(DIRECT JOBS PER $ INVESTED)* ÷ NEW DIRECT JOBS CREATED BY YEAR IN THE SECTOR = INDIRECT JOB CREATION MULTIPLIERS

Guidehouse Insights estimated the employment impacts of green technology deployment by developing a spreadsheet-based input-output (I-O) model based on recognized literature sources (see other examples of studies using the same approach by *IEA* and *CAT*). This model derives estimates of new job creation potential linked to market size investment in green build across selected sectors between 2020 and 2030 as defined by Guidehouse Insights. The model covers eight green sectors and six regions and focuses on the supply side only. The model does not estimate the net employment effects across the overall green and non-green economy and does not estimate potential for retained jobs over the years and potential lost jobs in other sectors of the economy. As we focus on the supply side only, more job opportunities might be created on the demand side.

1. NEW DIRECT JOBS CREATED BY YEAR are calculated in each sector based on the level of investment (market size) estimated for each sector in that year multiplied by the job creation potential of the sector (direct jobs/$ invested). The job creation potential is defined using (1) the share of expenditures allocated to employee compensation (= the share of the investment that is going in salary) and (2) the average annual wage for the sector (=the average salary for 1 FTE).

For example, let us assume that for $1 million invested in the transport equipment sector in Brazil, $250k are going into compensation (salaries). Assuming the average annual salary in transport equipment sector is $7,451 per year, we can estimate that 33 jobs are created for every $1 million invested in that sector.

The share of expenditures allocated to employee compensation (salaries) is calculated based on the representative country Input-Output matrices from the OECD (can be downloaded *HERE*) and average annual wage for each sector is based on the mean nominal monthly earning from the ILO (can be downloaded *HERE*)

2. CUMULATIVE NEW DIRECT JOBS CREATED BETWEEN 2020 AND 2030 are calculated for each sector based on the cumulative investment (market size) estimated for each sector over the period multiplied by the job creation potential of the sector (direct jobs/$ invested) as explained above.

3. INDIRECT JOB CREATION MULTIPLIERS are calculated for each sector using the symmetric input-output table to determine the indirect expenditure (or investment) as result of expenditures in a certain sector. This indirect expenditure describes the amount of the initial expenditure that is reinvested in another sector. Based on this indirect expenditure, indirect jobs created are calculated using the same approach as the direct jobs created based on direct expenditure.

For example, for every $1 million spent in the machinery and equipment sector, over $200,000 is indirectly spent on the basic metals and fabricated metal products sectors. Based on the jobs/$ invested factor (as explained above) we know that the million spent in the machinery and equipment sector will result in one indirect employment effect of 1.9 FTE in the basic metals and fabricated metal products sector. On that basis we can calculate a ratio of the number of indirect jobs created for each direct job created in a specific sector.

Benchmarking: There are various studies estimating potential job creation, with the majority using one or a combination of CGE modeling, I-O modeling, or employment multipliers. Guidehouse Insights used the I-O approach as it presents the advantage of being applicable to sectors where there are limited existing points of reference and using investments figures in isolation of other macroeconomic factors. Other recognized studies using the I-O approach include GARRETT-PELTIER, H (2017), IEA (2020), and WB (2013).

GHG EMISSIONS

CURRENT GHG EMISSIONS REDUCTION POTENTIAL

HISTORICAL EMISSIONS BY COUNTRY BY SECTOR

TECHNICAL POTENTIAL (%) FOR EACH SECTOR TO REDUCE GHG EMISSIONS

Assumed % share of savings in GHG that could be achieved if investments in clean energy technologies are made

=

CURRENT GHG EMISSIONS REDUCTION POTENTIAL *(IN $MtCO_2e$)* IN EACH SECTOR

FUTURE GHG EMISSIONS REDUCTION POTENTIAL

SHARE OF GREEN BUILD (%) EXPECTED THAT WILL BE ADOPTED IN EACH SECTOR

Only a fraction of the technical potential will be realized as a result of a conservative share in the build.

INCREASE IN THE SHARE OF GREEN BUILD BETWEEN 2020 AND 2030, BY SECTOR

Assumed a compounded annual growth rate (CAGR) based on Guidehouse Insights' understanding of the growth in the share of green investments for each sector in the region.

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FUTURE GHG EMISSIONS REDUCTION POTENTIAL *(IN $MtCO_2e$)* IN EACH SECTOR

FUTURE GHG EMISSIONS REDUCTION POTENTIAL *(IN $MtCO_2e$)* IN EACH SECTOR WITH AN INCREASED SHARE OF GREEN BUILD

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CURRENT GHG EMISSIONS REDUCTION POTENTIAL *(IN $MtCO_2e$)* IN EACH SECTOR

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SAVINGS IN GHG REDUCTION *(IN $MtCO_2e$)* IN EACH SECTOR

GHG INDICATORS

Guidehouse Insight's GHG estimation is based on the state of development of the industry in each of the analyzed markets, and the maximum technical potential of the sector to reduce GHG emissions compared to historical emissions data from the World Resources Institute (WRI).

1. INPUT

Historical emissions by country by sector from the World Resources Institute. Data were available until 2014, when these estimations were done. (source link - *HERE*). This is assumed to be the current emissions from the sector for a high-level estimation.

2. INPUT

Technical potential (%) of each sector to reduce GHG estimations based on Guidehouse Insights' understanding of the ideal or theoretical potential of GHG that can be reduced from each sector. The technical potential is an assumed percentage share of saving in GHG that could be achieved if investments in clean energy technologies are made. This is used to derive the historical/current technical potential (in $MtCO_2e$) to reduce GHG by applying historical emissions X technical potential (%) reductions.

3. INPUT

Share of green build (%) expected in each sector in each emerging region are assumptions based on Guidehouse Insights' understanding of the share of green investments that will be adopted in each sector. This assumes that only a fraction of the technical potential is realized in each of these sectors as a result of a conservative share in green build. This is used to derive the current technical potential in $MtCO_2e$ of reducing GHG by applying an assumed x% share of green build for each sector in each region.

4. INPUT

Increase in the share of green build between 2020 and 2030, by sector in each region. Applied a compounded annual growth rate (CAGR) based on Guidehouse Insights' understanding of the growth in the share of green investments for each sector in the region. This is used to estimate the future technical potential of GHG emissions with an increased share of green build (in $MtCO_2e$) that can reduce GHG.

5. OUTPUT

Savings in GHG reduction (in absolute terms $MtCO_2e$). This is the future potential of GHG reduction minus current potential of GHG reduction as explained above. The GHG Emission Reduction Potential percentage in the final databook represents total savings in GHG reduction (in $MtCO_2e$) divided by the current GHG emissions by sector.

Benchmarking: THE 2018 IEA ENERGY EFFICIENCY reports that six economies are likely to generate roughly 14 $GtCo_2$. It estimates an additional GHG savings of 3.4 $GtCo_2$ (billion tons) per annum achieved between the NPS and EWS scenarios in 2040. Guidehouse Insights estimates that investment in green build will result in a reduction of 3.9 billion tons of CO_2e in GHG emission until 2030 across the 21 emerging countries. Based on historical emission we can say about 75 percent of these are in East and South Asia (which primarily includes India and China). Therefore, we can broadly assume about 90 percent of 3.9 billion tons of CO_2 represents the six major economies (equals to 3.5 billion tons of CO_2e). Based on our high-level estimation, the GHG savings potential is roughly in a similar ballpark range as compared to IEA estimates. Also, the IEA estimates reflect total energy use and additional savings while the scope of our assessment reflects a selected list of sectors and subsectors.

NOTES

Estimated projections are general guidelines given the many uncertainties associated with the adoptions of green build in each region, policy frameworks and other factors likely to change significantly over the next decade. Estimates of technical potential to reduce GHG with increased share of green build are based on Guidehouse Insights' interpretation of the geopolitical picture in relation to climate change and energy security issues, as well as commitments to renewables

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