

# The Potential role of Green Finance in realizing Sustainable recovery from COVID-19 and achievement of Sustainable Development Goals

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**Abstract:** Since the genesis of the industrial revolution, finance has proven to be a powerful fuel for human progress. Accordingly, the purpose and existence of a global financial system alludes to allotting global savings to their most appropriate and productive use. This has corroborated various international efforts that reflect on the impacts of climate change and foster the ambition to adopt socially and environmentally responsible investment instruments. Green finance, a relatively nascent finance initiative has been hailed for its potential in attaining the needs of environmentalism and capitalism in tandem. This paper reviewed the potential of green financing as an initiative that could lead to a sustainable recovery from corona virus disease-19 (COVID-19), and hence achievement of the United Nations' Sustainable Development Goals (SDGs). The study unveiled that COVID-19 is both related to the SDGs and part of the research to attain the same. Though the world has been confronted by COVID-19's asymmetric economic, fiscal, social and health impacts, green financing could hasten recovery from socio-economic disruptions of COVID-19 if concerted policy actions and the various proposed global recovery packages that prioritizes green policy choices are implemented. Green financing is compatible with both the climate goals and the low emissions transition agenda. Thus, its promotion of environmental protection, speeding up structural environment towards a low-carbon transition, increasing the society's resilience to shocks and reducing future risks could lead to the achievement of at least 50% of the aspirational SDGs.

**Keywords:** COVID-19; Green growth; Sustainable Development Goals; Green Recovery Stimulus Packages

## I. INTRODUCTION

The novel Corona Virus Disease-19 (COVID-19) is one of the planetary crises alongside climate change and biodiversity crises that have proven potential to devastate natural systems that humanity and global economies subsist (UNEP 2020c; Norton 2020). COVID-19 which originated from China advanced into a global health emergency and has since December 2019 spread, infected and killed several millions of people worldwide (Yi et al. 2020; Fenz and Kharas 2020). Due to its highly contagious nature, various containment measures for COVID-19 has been enforced globally (Girum et al. 2020). Measures such as lockdowns and curfews (restricted human and vehicular movements) has exerted both negative and positive impacts on various sectors (Mostafa et al. 2021; Dantas et al. 2020; Anil and Alagha 2021). The pandemic has exerted mostly negative

impacts that impede the attainment of at least 90% (144) of SDGs' targets (Nerini et al. 2020). The remaining targets are planet-related, with the potential to benefit from the pandemic only if appropriate actions are taken (Rose-Redwood et al. 2020; UN 2020). For example, environmental resurgence has been reported in the short term and may have the potential to be continued but will depend on what environmental actions are taken (UN 2020; Rose-Redwood et al. 2020; Bates et al. 2020; Corlett et al. 2020; Mostafa et al. 2021). There are many views which depict that COVID-19 could play out as a turning point in re-orienting the pre-pandemic global growth path into a sustainable one (Hörisch 2021; Barber and Mostajo-Radji 2020). It is further argued that the pandemic could offer opportunities to avert the climate change crisis (Fuentes et al. 2020; Klenert et al. 2020; Botzen et al. 2021; Gardiner 2020). Taken wholly, low air pollution, cleaner water, effective waste management and enhanced biodiversity protection could minimize global vulnerability to future pandemics, build resilience and accord an opportunity to boost economic activity, generate income, create jobs and reduce inequalities (Hodges and Jackson 2020; UNEP 2020b; Pearson et al. 2020; Bennett 2020).

The aspirational 2030 sustainable development goals (SDGs) first prescribed in 2015 by the United Nations is an integrated set of 169 quinquennial targets that is an interwoven guide to governments, international agencies and other institutions in the quest to achieve sustainable development (United Nations 2017; Fuentes et al. 2020). There has always been concerns about the sustainability of rapid economic development in the face of climate change, because they need to be executed without depleting the available resources for the current and future generations (Hák et al. 2016; Zhouying 2002; Horton and Horton 2019; Jean-Louis et al. 2016). Among the popular aspects of green growth advocated by the SDGs is green finance (Fleming 2020; Sachs et al. 2019; Kazlauskienė and Draksaite 2020; Guild 2020). In the context of COVID-19, green recovery is a win-win once-in-a-lifetime opportunity that is achievable if countries establish course of actions for a green and inclusive recovery, hasten the transition to low-carbon emission economies, track progress through pertinent, comparable and timely data, and leverage finance to invest in the same (OECD 2020a; Calice et al. 2020; Cojoianu et al. 2021). Green finance (GF) is designed to earmark and

plummet the level of financial flows (or instruments) such as bonds and equity investments (e.g. banking, micro-credit, insurance and investments) from the public, private and not-for-profit sectors to sustainable development priorities (Sachs et al. 2019; Jung Wan 2020; Guild 2020). As an answer on how to afford exponential economic growth in a sustainable way, the green finance strategy emerged to ably manage environmental and social risks as well as uplift avenues that spur both a decent rate of return and environmental benefits, and deliver greater accountability (Ocampo et al. 2012; Guild 2020). GF is a concept at its infancy and therefore its precise definitions are evolving along with the conceptualization of the best practices for managing the sector (Guild 2020; Smith et al. 2014). On the whole, GF is defined as financial investments directed to sustainable development projects and initiatives, environmental products as well as policies that foster the institution and progression of a more sustainable economy with other environmental targets (Green Finance LAC 2021). GF extends both public and private investments that confer environmental returns through new policies, financial institutions and instruments including green banks, green bonds, carbon market instruments, innovative financial technologies, labeling and guarantees for Public-Private Partnerships (PPPs). Investment in the green economy needs to take place on a larger scale over the next decades in order to achieve the SDGs and the global objectives of the Paris Agreement.

Green financing could be promoted through changes in national regulatory frameworks, harmonizing public financial incentives, increase in green financing from different sectors, alignment of public sector financing decision-making with the environmental dimension of the SDGs, increases in investment in clean and green technologies, financing for sustainable natural resource-based green economies, climate smart blue economy and increased utilization of green bonds (Ordóñez et al. 2015; Smith et al. 2014). For example, carbon pricing policies to reduce carbon emissions (taxing of energy use) for sustainable development should be embraced, despite the reported failure by the world's most advanced economies (Teusch and Theodoropoulos 2021). Such reforms if well designed and executed by developing and emerging economies could buttress their capacity to attend to various pressing challenges of ecological, economic and social nature, including climate change. Carbon pricing, along with energy tax and subsidy reform falls at the nexus of various SDGs including SDG 12 (responsible production and consumption), SDG 13 (climate action), favours SDG 3 (good health and well-being), SDG 7 (affordable and clean energy) which with the appropriate design can culminate into reduced inequalities (SDG 10) and more sustainable cities and communities i.e. SDG 11 (Teusch and Theodoropoulos 2021). To meet the ambitious goals of the 2030 Agenda (SDGs) and the Paris Agreement, a paradigm shift is urgently required with scaling up of green finance and investments (Mendiluce 2020; Gardiner et al. 2015). Large-scale private sector engagement and investment in developing countries will be needed to

drive their transition to low-carbon and climate-resilient economies. Development finance plays a critical role in catalysing, leveraging and guiding such investments. However, ensuring the approaches adopted are effective and deliver results necessitate taking decisions informed by a clear understanding of what works and those that do not (Fritsche et al. 2020; Oliphant 2020).

This study therefore analyses the concept of green finance with a bias on its potential role in realization of the SDGs and sustainable recovery from the COVID-19-induced disruptions. The paper is organized into three sections, section 1 critically reviews and highlights the potential of green finance in achieving sustainable recovery from COVID-19 and/or the SDGs. Section 2, explores the available research and reports examining how the world could transition into a green economy as well as the nexus between green financing, COVID-19 and the SDGs. Section 3 offers conclusions and recommendations, giving insights of how green financing could expedite green growth, sustainable recovery from COVID-19 and the achievement of SDGs.

## II. METHODOLOGY

This study is a non-systematic review which examined peer-reviewed articles and reports on the role of green finance in realizing sustainable recovery from COVID-19 and achievement of SDGs. The review was conducted between December 2020 and February 2021. The reviewed reports were retrieved from multidisciplinary databases: Science Direct, PubMed, Scopus, Google Scholar and Web of Science Core Collection. A more general search was further performed on the Google search engine to retrieve reports from international organizations, regional, national and subnational agencies. The documents were obtained and screened using their titles, abstracts and keywords for the key terms "green finance", "green financing", "green bonds", "green banks", "carbon market instruments", "green central banking" and "community-based green funds". These keywords were combined with "COVID-19", "Coronavirus Disease-2019", "coronavirus disease pandemic", "COVID-19 recovery", "Sustainable development goals", "SDGs" or "Sustainable Development". Only reports published in or translated to English and dated until February 2021 were considered. However, there were no geographical restrictions. From the retrieved reports, information on the emerging global green finance perspectives, COVID-19 recovery packages and the SDGs were extracted and analyzed.

## III. LITERATURE

*Transitioning into a Green Economy (A push for Carbon Neutrality)*

The overarching need to delve into a green economy is in line with other transitions in human socio-economic history (Söderholm 2020; The Asian Development Bank 2020). The green economy concept has gained currency to a greater extent solely because it offers response to multiple

crises that the world has been facing in recent years namely: climate change, food insecurity and economic crises (Ocampo et al. 2012; Söderholm 2020). The concept definitely differs from preceding waves of change as it was at least in part intentional, and in that it sagaciously gave attention to the welfare of those that might otherwise get entangled in the exponential and unplanned structural change (Ocampo et al. 2012; Söderholm 2020). From the United Nations Environment Programme (UNEP) perspective, green economies have the potential to improve human wellbeing and reduce inequality, environmental risks and ecological scarcities (Ocampo et al. 2012).

#### *COVID-19 and Green Financing*

The impacts of COVID-19 have been a double sword on a developmental perspective. In regards to green financing, it cannot be dismissed that green bonds as well as sustainability and social bonds have been on an upward trajectory in the recent past (Oliphant 2020; Jung Wan 2020; The Asian Development Bank 2020). Though the pandemic sparked a surge of volatility across global financial markets and green bond issuance subsided drastically in its wake, COVID-19 has on the other hand expedited issuance of sustainability and social bonds because the private markets tapped have teamed up to assist in the response to, and recovery from COVID-19. The Institute of International Finance has reported recent monthly volumes of more than \$7 billion in social bond issuances, compared to a monthly average of \$1.2 billion in 2018/2019, and with the prospect of a further surge in the future (Oliphant 2020). The foregoing indicates that green financing has the potential to leverage sustainable recovery from COVID-19, and thus the realization of some SDGs. The next subsection therefore digests this aspect, giving examples from selected countries or continental organizations across the globe.

#### *Green financing (green stimulus packages) and Sustainable Recovery from COVID-19*

There are at least five profound lessons that can be excerpted from the ferocious pandemic (COVID-19) and translated into a better, resilient and sustainable tomorrow. These include; (1) the need to conserve the pristine environment, (2) global crises necessitate (global) collaboration i.e. the bipolar nature of the world will lead to more worst future outcomes, (3) scientific policy advice is never value-free, (4) focus on building low-carbon economies, and (5) build robust health care and economic systems with strong surveillance (Klenert et al. 2020; Botzen et al. 2021; Timmis and Brüssow 2020; Wu and McGoogan 2020; Fuentes et al. 2020). The most paramount of these is the need to address with close enthusiasm the threat of the decadal climate change (achieve net-zero carbon emissions).

Climate change is an issue necessitating joint global actions, and has hoisted awareness of the imperativeness of integrating sustainable principles in capital markets (Jakubik and Uguz 2020; The Asian Development Bank 2020). With

environmental conservation being prioritized, investors have exercised an increasing need to adopt and institute environmental, social and governance (ESG) criteria in their financial services (Jakubik and Uguz 2020). This is clearly evident in sensitive sectors that contribute to the global greenhouse gas pool (energy and transport), which exemplifies that a one-time allocation of huge finances to achieve zero carbon emissions is impractical. Thus, the focal potential of the green bond market in supporting green projects with huge up-front costs that only recover over the long-term will be inevitable to explore (Sartzetakis 2019). Further, COVID-19 has now emphasized the need to adopt a more blended ESG approach in which the previously dominant “E” is now in accompaniment of a stronger accent on the “S” (Oliphant 2020).

COVID-19 is a multifaceted crisis, which indicate that its comparison with past crises (such as the 2008-2009 financial crisis) other than climate change is impractical (OECD 2020b). Given its zoonotic nature, it points to the fact that the recovery packages from the contagion should focus on green growth. Most governments (Figure 1) in Europe, Asia, Africa and elsewhere have reached consensus geared towards implementation of comprehensive green recovery plans to bolster both economic and social systems in order to build back better from the pandemic (UNEP 2020a; Fritsche et al. 2020; The Asian Development Bank 2020; Falak Medina 2020). The European Union for example, now aims at a circular and sustainable bioeconomy as the nucleus instrument for the Green Deal in the post-pandemic Europe which braces the interdependence of the environment, economy and society (Fritsche et al. 2020).

#### *The European Union Green Deal*

Most nations have recognized the possible benefits of a green COVID-19 recovery. European countries, aiming at making Europe the first carbon-neutral continent, have unanimously adopted measures that support transition to greener economies as part of their COVID-19 recovery packages (Mendiluce 2020; Fritsche et al. 2020; The Asian Development Bank 2020; Harsono 2020; Sriring 2020; Lamy 2020). Indeed, the leader of the green recovery is the European Union (EU) that have sidelined an estimated €750 billion COVID-19 recovery package with the Green Deal at its core (Mendiluce 2020). This deal—described as the Europe’s man on the moon moment—first came into existence in response to a November 2019 declaration of a climate emergency by the European parliament (Figure 2). It is a blueprint for recovery that targets the transformation of various aspects of the members’ economies which has been supported fully by its 27 member countries (European Commission 2019; Geneva Environment Network 2020).

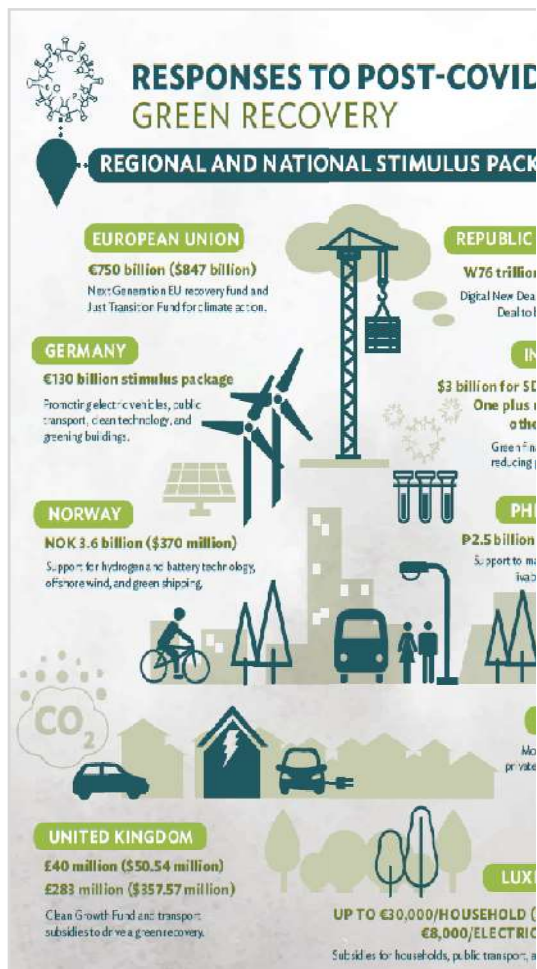


Figure 1: COVID-19 Recovery stimulus packages reported in some countries (Adopted from The Asian Development Bank, 2020).

With the disruptive waves of COVID-19, the EU created a Just Transition Mechanism (JTM) to ensure that the Green Deal through a regulatory and legislative framework indicate and execute its clear overarching targets of achieving net zero carbon emissions by 2050 and a 50%–55% reduction in emissions by 2030 vis-à-vis the 1990 records.

These are poised to be financed by incentives that foster private sector investment to achieve goals such as conserving biodiversity, reducing wastes and sustainable utilization of the available resources (The Asian Development Bank 2020). The JTM is set to mobilize about €100 billion between 2021 and 2027 to finance and technically support businesses, organizations, individuals or regions that have been severely impacted by the climate neutral economy movement. Other initiatives under the JTM are; (1) the Leveraged public sector loan facility and (2) Recovery Fund for Europe -Next Generation EU which all aim at providing an enabling atmosphere for distributing grants (to a tune of €390 billion) and loans up to €360 billion to fund post-COVID-19 recovery in members states (The Asian Development Bank 2020).



Figure 2: Summary of the major targets of the European Green Deal. Source: Napolitano (2020).

In its entirety, the European Green deal also possess a crucial external dimension i.e. incorporates international cooperation, diplomacy as well as trade relations and agreements as tools to promote the approach (Geneva Environment Network 2020).

#### Republic of Korea's New Green Deal

On December 15<sup>th</sup> 2020, Korea finalized its low-emission development strategy with revision of its nationally determined contributions (Geneva Environment Network 2020). These reaffirmed Korean commitments to attain net-zero emissions by 2050 and lays the targets to reduce greenhouse gas emissions by 24.4% by 2030 (as compared to 2017 levels). In the crucible of the pandemic, a green stimulus package named “the Republic of Korea's New Green Deal” (Figure 3) arose from a convergence of support for piloting nascent pathways in the country (Geneva Environment Network 2020). The deal has a mirror objective of attaining net zero emissions by 2050 as envisioned by the EU. The initiative sets out to put an end to coal financing, and invest largely in the renewable energy sector, embrace carbon tax, phase out both domestic and overseas coal financing by public institutions and institute a Regional Energy Transition Centre to support workers' transition to green jobs (Farand 2020). The total package sum is estimated at US\$ 134.5 billion (Geneva Environment Network 2020), majorly targeting decarbonization (Green New Deal) and digitalization (Digital New Deal). This attest to the fact that technology is synergistic with green ambitions.

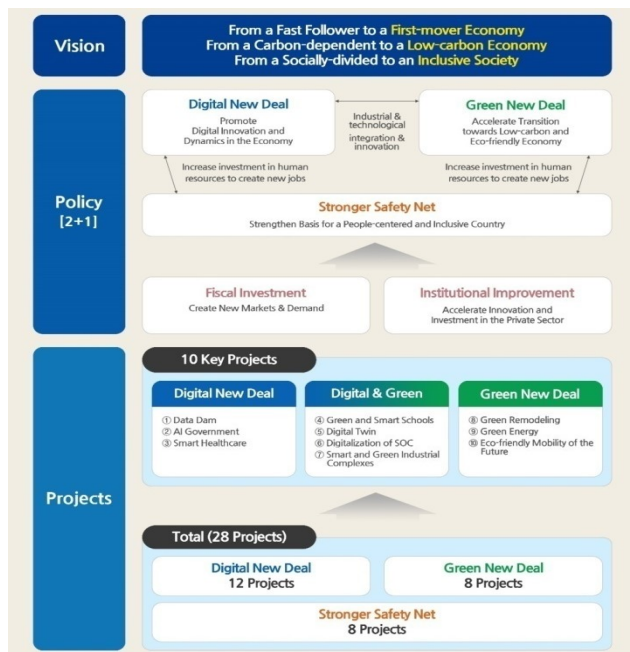


Figure 3: Synopsis of the Korea New Deal (Source: National Strategy for A Great Transformation, 2020).

#### *New Zealand, Indonesia and Thailand packages*

A similar COVID-19 recovery package to that of Korea has been reported in New Zealand. The country's 2020 budgetary allocation directed US \$1.1 billion to create at least 11,000 environment-oriented jobs, with an introduced US \$200 million finance for jobs promoting nature-based tourism, wetland restoration, vegetation regeneration and biodiversity conservation (Government of New Zealand 2020).

Indonesia has also launched green recovery actions. The National Economic Recovery Program was initiated on 11<sup>th</sup> May 2020. It is aimed at availing the latest stimulus policies for the economy projected at US \$43 billion, and includes industrial tax breaks (up to US\$8.3 billion), capital injections to buttress state-owned enterprises and banking liquidity support to ameliorate the economic impacts of COVID-19 (Medina 2020). The nation had been working on green bonds and *sukuk* (Islamic) bonds issuance prior to the pandemic and instituting SDGs platform under the government financing institution PT Sarana Multi Infrastructure. These programs stand out to be further leveraged for green recovery plans. Amongst several other initiatives, the government's biodiesel program which manufactured 30% palm-based biodiesel received subsidies amounting to US\$183 million (Medina 2020).

The Asian Development Bank similarly invested in the Indonesian renewable energy resource as a strategy for a sustainable economic recovery plans in the post-pandemic era. This encompasses the geothermal power projects that targets job creation and financing the emergence of a green economy. Indonesia reportedly have the largest but underexplored global geothermal reserves with less than 9% of the total 23.9 GW of geothermal potential exploited as of 2020 (Harsono 2020).

In Thailand, investment infrastructure development was adopted as the basis of growth in the next five years with a plan for ninety-two PPP projects worth US \$33.39 billion from 2020 to 2027 (Sriing 2020). The ninety-two-project plan is inclusive of about 18 high-priority infrastructure projects worth 472 billion baht. Thailand has also embarked on the issuance of sovereign sustainability bonds to fund green infrastructure projects as witnessed in August 2020 (Sriing 2020).

#### *- African COVID-19 Green Recovery Packages*

At a continental level, African countries have launched the African Green Stimulus Programme (UNEP 2021). This pragmatic and innovative African-led initiative aims at reinforcing the continent's recovery response (informed by an ambitious vision for its future) in a sustainable manner to the devastating socio-economic and environmental impacts of COVID-19. The package centres around the achievement of African Union Agenda 2063 aspirations, the accompanying SDGs and the Paris Agreement targets in the post COVID-19 Africa whilst transforming and catalysing Africa's sustainable development towards a low-carbon development trajectory by 2030. As Köhlin et al. (2021) put it, carbon pricing could raise substantial revenues to support this initiative since COVID-19 led to reductions in both global and the continent's oil prices. This implies that African policymakers have fiscal space to implement reforms without increasing prices compared to pre-pandemic levels. However, it is surprising to note that South Africa, an African country, scored poorly in Vivid's Greenness of Stimulation Index report as it deferred carbon tax payments, scaled back renewable energy support and bailed out polluting energy companies (Ruhweza 2021). This index pointed that globally, COVID-19 stimulus commitments are seemingly entrenching unsustainable economic pathways, which exacerbates the futuristic risk of having stranded assets, accelerated climate change and continued depletion of natural capital (Rowling 2020). A green recovery blue point advanced as recommendations in the print, "Africa in the context of COVID-19" laid out the following as key in attaining a green and just COVID-19 recovery (WWF International 2020):

1. Increasing investments in nature-based solutions (including biodiversity conservation) to safeguard the continent's natural capital, biodiversity, nature-based tourism and build resilience to climate change impacts and avail clean water and sanitation.
2. Re-orientation and focus on driving self-sufficiency, sustainability and enhanced productivity through agricultural diversification and adoption of climate-smart and climate resilient technologies such as micro-irrigation and natural measures such as agroforestry.
3. Redirecting fossil fuel subsidies and investment funds to kick start mega renewable energy projects with minimal pristine environmental footprints.
4. Restraining and overcoming the pressing need to roll back existing environmental legislation further away

from the best practices in exchange to attain swift economic recovery, and

5. Empowering the local communities with land and water-use rights and ensuring that no existing protections are revoked.

A notable example in the African green financing context is Nigeria, the continent's largest producer of oil. The country's federal government approved US \$5.9 billion (about 23 trillion Naira) for the Nigerian Economic Sustainability Plan in July 2020. The plan, estimated to be about 1% of Nigeria's Gross Domestic Product aims at stimulating and diversifying its economy as well retaining and creating jobs, and extending further protection to the poor (Nyong et al. 2021). The green recovery plans in this are investments in clean energy, agriculture and infrastructure. The most citable of the green budget is the US \$619 million investment to be made in the Solar Homes Systems Project, to enable access to solar power by about five million households (25 million Nigerians) who currently have no access to electricity from the national grid (Nyong et al. 2021).

*The Debt-for-Climate Swaps: A Possible Green Recovery for Developing Countries*

Debt-for-climate (D4C) swaps have been cited as a promising green recovery path, particularly for developing countries (Widge 2021; Calice et al. 2020; Ruhweza 2021). Various exhort actions in the unprecedented and fiscally constrained COVID-19 times has imaged that debt relief with promotion of green recovery could provide the fiscal space to developing nations to concentrate on their three grave crises: the climate and environmental crisis, the debt crisis, and the health and social crisis. In countries such as Argentina where green debt relief has been obtained, forest conservation and other nature resurging activities have taken hold. This indicates that such green approaches should be scaled up as the pandemic stretches budgets of various countries (Piccolotti and Miller 2020).

Further, spike in corporate insolvencies could be addressed through the same, in an effort to offer space to address corporate debt challenges while increasing resilience to both climate change and risks from biodiversity and nature loss (Calice et al. 2020). Various challenges are tied to this structure, as noted in earlier experiments. For example, it is unpredictable whether a host country with its current economic status and governance could deliver the expected outcomes if accorded such reliefs. However, one option would be for a government to invest in corporate debt restructuring funds that can purchase non-performing loans of viable firms from banks. Thereafter, the fund and the firms exchange the loans with discounts from the purchase value of the debt with a new loan to finance a permanent reduction in carbon emissions in the firm's operations or supply chains aligned with the country's Nationally Determined Contributions (Calice et al. 2020). The D4C swaps is under close investigation by the European Climate Foundation,

Climate Policy Initiative and Oxford Sustainable Finance Programme at the University of Oxford with the intention to initiate a program that supports a greener, more just, sustainable, and resilient recovery (Calice et al. 2020).

*Aviation recovery packages*

Other recovery packages redirected and centred their focus on aviation, use of conditional recapitalization and bailouts to airline companies to afford emissions reduction and short haul flights. For instance, the government of the United Kingdom announced a Jet-Zero strategy with a view to reducing emissions as part of their net zero carbon emission target within a generation and has set up a Jet-Zero Council (The Asian Development Bank 2020). This is intended to be features of recovery strategies in ensuring "brown to green" trajectories are embraced.

#### IV. LIMITATIONS

This study only examined reports on green financing that are available in electronic form and in open literature. Further, only articles and reports that were published in or translated to English were considered.

#### V. CONCLUSIONS AND RECOMMENDATIONS

*Conclusions and Future Perspectives*

Both the investment and policy decisions upheld today in response to COVID-19 will be decisive of either future risks will be eradicated (minimized) or otherwise amplified. The exit strategy from COVID-19 impacts therefore may not be linear because it is both related to, and part of the quest to achieve sustainable development (SDGs) i.e. recovery from the pandemic and repairing the planet are apparently two sides of the same coin. Therefore, progress to achieve the SDGs will be shaped by interactions of diverse global systems, COVID-19 and the concerted efforts that nations will put to end COVID-19, re-ignite the economic engine and revert to accelerated sustainable development pathways.

To achieve SDGs, up scaling the financing of investments that provide environmental benefits, through new financial instruments and new policies notably green bonds, green banks, carbon market instruments, fiscal policy, green central banking, fintech, community-based green funds that are otherwise known as "green finance" will become inevitable for sustainable recovery from COVID-19. Because stimulus measures will be inadequate, governments ought to implement the identified measures to the dot by prepending appropriate policy interventions to them so as to realize reasonable decarbonization of every economic aspect of their systems.

Green financing has the potential to expediate developments that are the foci of the SDGs subthemes— people, planet, prosperity and peace. Whereas governments are at the forefront to set the seal that green recovery from COVID-19 is possible, companies and institutions have the potential to exhibit real leadership by partnering with governments to ensure that green stimulus measures translate into sustainable economies and livelihoods. This will ensure that the various

stimulus packages offer an excellent avenue to build a secure and sustainable energy future amidst the flurry of immediate priorities.

## REFERENCES

- [1] Anil, I., and O. Alagha. 2021. 'The impact of COVID-19 lockdown on the air quality of Eastern Province, Saudi Arabia', *Air Qual Atmos Health*, 14: 117–28
- [2] Barber, K., and M.A. Mostajo-Radji. 2020. 'Youth Networks' Advances Toward the Sustainable Development Goals During the COVID-19 Pandemic', *Frontiers in Sociology*, 5: 589539.
- [3] Bates, A.E., R.B. Primack, P. Moraga, and C.M. Duarte. 2020. 'COVID-19 pandemic and associated lockdown as a "Global Human Confinement Experiment" to investigate biodiversity conservation', *Biological Conservation*, 248: 108665.
- [4] Bennett, J. 2020. 'Reorienting the post-coronavirus economy for ecological sustainability', *Journal of Australian Political Economy*, 85: 212–18.
- [5] Botzen, W., S. Duijndam, and P. van Beukering. 2021. 'Lessons for climate policy from behavioral biases towards COVID-19 and climate change risks', *World development*, 137: 105214.
- [6] Calice, Pietro, Andrés F. Martínez, and Fiona Stewart. 2020. 'Corporate debt restructuring in times of COVID-19: The case for Debt-for-Climate swaps'. <https://blogs.worldbank.org/psd/corporate-debt-restructuring-times-covid-19-case-debt-climate-swaps>.
- [7] Cojoianu, T., H. Andreas, and I. S.Fabiola. 2021. 'How can green finance foster a sustainable recovery after Covid-19?'. <https://www.economicsobservatory.com/how-can-green-finance-foster-a-sustainable-recovery-after-covid-19>.
- [8] Corlett, R.T., R.B. Primack, V. Devictor, B. Maas, V.R. Goswami, A.E. Bates, R.J. Pakeman. 2020. 'Impacts of the coronavirus pandemic on biodiversity conservation', *Biol. Conserv.*, 246: 108571.
- [9] Dantas, G., B. Siciliano, B.B. França, C.M. da Silva, and G. Arbilla. 2020. 'The impact of COVID-19 partial lockdown on the air quality of the city of Rio de Janeiro, Brazil', *Sci. Total Environ.*, 729 139085.
- [10] European Commission. 2019. 'Communication from the European Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. The European Green Deal. Brussels. 11 December 2019'.
- [11] Falak M.A. 2020. 'ASEAN Briefing. Malaysia Issues Stimulus Package to Combat COVID-19 Impact'. <https://www.aseanbriefing.com/news/malaysia-issues-stimulus-package-combat-covid-19-impact/#:~:text=In%20February%202020%2C%20the%20Malaysian,of%20the%20COVID%2D19%20outbreak>.
- [12] Farand, C. 2020. 'South Korea to Implement Green New Deal after Ruling Party Election Win. Climate Home News. 16 April'.
- [13] Fenz, K. and H. Kharas. 2020. 'A mortality perspective on COVID-19: Time, location, and age'. <https://www.brookings.edu/blog/future-development/2020/03/23/a-mortality-perspective-on-covid-19-time-location-and-age/>.
- [14] Fleming, S. 2020. 'What is green finance and why is it important?'. <https://www.weforum.org/agenda/2020/11/what-is-green-finance/>.
- [15] Fritsche, U., G. Brunori, D. Chiramonti, C.M. Galanakis, S. Hellweg, R. Matthews, and C. Panoutsou. 2020. 'Future transitions for the Bioeconomy towards Sustainable Development and a Climate-Neutral Economy. *Knowledge Synthesis Final Report*. Publications Office of the European Union, Luxembourg, <https://core.ac.uk/download/pdf/343468055.pdf>.
- [16] Fuentes, R., M. Galeotti, A. Lanza, and B. Manzano. 2020. 'COVID-19 and Climate Change: A Tale of Two Global Problems', *Sustainability*, 12: 8560.
- [17] Gardiner, A., M. Bardout, F. Grossi, and S. Dixon-Declève. 2015. 'Public-Private Partnerships for Climate Finance', *TemaNord* pp. 577.
- [18] Gardiner, B. 2020. 'Coronavirus Holds Key Lessons on How to Fight Climate Change', *Yale School of the Environment*.
- [19] Geneva Environment Network. 2020. 'Korean Green New Deal and How It Can Support a Green Recovery. In: Building Forward Better: Prospects for Green Recovery Efforts. <https://www.genevaenvironmentnetwork.org/events/building-forward-better-prospects-for-green-recovery-efforts/>'.
- [20] Girum, T., K. Lentiro, M. Geremew, and S. Shewamare. 2020. 'Global strategies and effectiveness for COVID-19 prevention through contact tracing, screening, quarantine, and isolation: a systematic review', *Tropical Medicina and Health*, 48: 91.
- [21] Government of New Zealand. 2020. 'Department of Conservation. \$1.1 Billion Investment to Create 11,000 Environment Jobs in Our Regions'.
- [22] Green Finance LAC. 2021. 'Green Finance. <https://www.greenfinancelac.org/our-initiatives/green-finance/>'.
- [23] Guild, James. 2020. 'The political and institutional constraints on green finance in Indonesia', *Journal of Sustainable Finance & Investment*, 10: 157-70.
- [24] Hák, T., S. Janoušková, and B. Moldan. 2016. 'Sustainable development goals: A need for relevant indicators', *Ecological Indicators*, 60: 565-73.
- [25] Harsono, Norman. 2020. 'ADB pledges to double funds for Indonesia, pushes for green recovery. <https://www.thejakartapost.com/news/2020/08/21/adb-pledges-to-double-funds-for-indonesia-pushes-for-green-recovery.html>'.
- [26] Hodges, K., and J. Jackson. 2020. 'Pandemics and the global environment', *Science Advances*: 1–2.
- [27] Hörisch, J. 2021. 'The relation of COVID-19 to the UN sustainable development goals: implications for sustainability accounting, management and policy research', *Sustainability Accounting, Management and Policy Journal*: 12 pages.
- [28] Horton, P., and B. P. Horton. 2019. 'Re-defining Sustainability: Living in Harmony with Life on Earth', *One Earth*, 1: 86–94.
- [29] Jakubik, P., and S. Uguz. 2020. 'Impact of green bond policies on insurers: evidence from the European equity market'. *Journal of Economics and Finance*. <https://doi.org/10.1007/s12197-020-09534-4>.
- [30] Jean-Louis, M., M. Virginie, and D.S. Simberloff. 2016. 'The need to respect nature and its limits challenges society and conservation science', *Proceedings of the National Academy of Sciences of the United States of America*, 113: 6105–12.
- [31] Jung Wan, L.E.E. 2020. 'Green Finance and Sustainable Development Goals: The Case of China', *Journal of Asian Finance, Economics and Business*, 7: 577 – 86.
- [32] Kazlauskienė, V., and A. Draksaite. 2020. 'Green Investment Financing Instruments. In: CSR and Socially Responsible Investing Strategies in Transitioning and Emerging Economies, 25 pages'.
- [33] Klenert, D., F. Funke, L. Mattauch, and B. O'Callaghan. 2020. 'Five Lessons from COVID-19 for Advancing Climate Change Mitigation', *Environmental and Resource Economics*, 76: 751–78.
- [34] Köhlin, Gunnar, Ira Dorband, Jan Christoph Steckel, and Thomas Sterner. 2021. 'Recipe for a green recovery: Carbon taxes. <https://www.brookings.edu/blog/africa-focus/2021/03/01/recipe-for-a-green-recovery-carbon-taxes/>'.
- [35] Lamy, P. 2020. 'Greener After: A Green Recovery Stimulus for a Post-COVID-19 Europe. Jacques Delors Institute Policy Paper 200514. <https://institutdelors.eu/publications/greener-after/>'.
- [36] Medina, A.F. 2020. 'Indonesia Launches National Economic Recovery Program. <https://www.aseanbriefing.com/news/indonesia-launches-national-economic-recoveryprogram/#:~:text=Indonesia%20launched%20the%20National%20Economic,stimulus%20policies%20for%20the%20economy.&text=With%20the%20launch%20of%20the,anticipated%205.07%20percent%20of%20GDP>'.

- [37] Mendiluce, M. 2020. 'OPINION: Not just emissions: why a green recovery from Covid-19 means more jobs'. <https://news.trust.org/item/20201123151006-kl5wd>.
- [38] Mostafa, M.K., G. Gamal, and A. Wafiq. 2021. 'The impact of COVID 19 on air pollution levels and other environmental indicators - A case study of Egypt', *Journal of Environmental Management*, 277: 111496.
- [39] Napolitano, A. 2020. 'Will the pandemic mark the end of Europe's green dream?'. <https://blog.up2europe.eu/green-deal/will-the-pandemic-mark-the-end-of-europes-green-dream/>.
- [40] National Strategy for A Great Transformation. 2020. 'Korean New Deal'. [https://english.moef.go.kr/popup/20200826\\_policyFocus/popup.html](https://english.moef.go.kr/popup/20200826_policyFocus/popup.html).
- [41] Nerini, F.F., M. Henrysson, A. Swain, and R.B. Swain. 2020. 'Sustainable Development in the Wake of COVID-19', *Research Square*, 1–15.
- [42] Norton, A. 2020. 'Coronavirus and climate change are two crises that need humanity to unite', *International Institute for Environment and Development*. <https://www.iied.org/coronavirus-climate-change-are-two-crises-need-humanity-unite>.
- [43] Nyong, A., M. Bapna, J. Jaeger, and E. Clarke. 2021. 'Nigeria Moves Toward a Sustainable COVID-19 Recovery'. <https://www.wri.org/blog/2021/01/nigeria-moves-toward-sustainable-covid-19-recovery>.
- [44] Ocampo, J. A., A. Cosbey, and M. Khor. 2012. 'The Transition to a Green Economy: Benefits, Challenges and Risks from a Sustainable Development Perspective. Second Preparatory Committee Meeting for United Nations Conference on Sustainable Development'. <https://plagiarism.repec.org/trica-papuc/trica-papuc2.pdf>.
- [45] OECD. 2020a. 'Focus on green recovery'. <http://www.oecd.org/coronavirus/en/themes/green-recovery/>.
- [46] ———. 2020b. 'The territorial impact of COVID-19: Managing the crisis across levels of government. OECD Policy Responses to Coronavirus (COVID-19)'. <http://www.oecd.org/coronavirus/policy-responses/the-territorial-impact-of-covid-19-managing-the-crisis-across-levels-of-government-d3e314e1/>.
- [47] Oliphant, Mark 2020. 'COVID-19 & green finance: What next?'. Available: <https://www.environmental-finance.com/content/market-insight/covid-19-and-green-finance-what-next.html>.
- [48] Ordonez, C. D., D. Uzsoki, and S. T. Dorji. 2015. 'Green Bonds in Public-Private Partnerships. *The International Institute for Sustainable Development*. <https://www.iisd.org/system/files/publications/green-bonds-public-private-partnerships.pdf?q=sites/default/files/publications/green-bonds-public-private-partnerships.pdf>.
- [49] Pearson, R.M., M. Sievers, E.C. McClure, M.P. Turschwell, and R.M. Connolly. 2020. 'COVID-19 recovery can benefit biodiversity', *Science*, 368: 838–39.
- [50] Picolotti, R., and A. Miller. 2020. 'Debt-For-Climate Swaps Can Help Developing Countries Make A Green Recovery'. <https://www.iisd.org/sustainable-recovery/debt-for-climate-swaps-can-help-developing-countries-make-a-green-recovery/>.
- [51] Rose-Redwood, R., R. Kitchin, E. Apostolopoulou, L. Rickards, T. Blackman, J. Crampton I.M. Buckley. 2020. 'Geographies of the COVID-19 pandemic', *Dialogues Hum. Geogr.*, 10: 97–106.
- [52] Rowling, M. 2020. 'Few major economies investing in nature-friendly COVID-19 recovery, index finds'. <https://news.trust.org/item/20201217092751-wk5b9/>.
- [53] Ruhweza, A. 2021. 'Africa's path to a green and just recovery'. [https://wwf.panda.org/discover/our\\_focus/climate\\_and\\_energy\\_practice/?1311466/Africa-green-just-recovery](https://wwf.panda.org/discover/our_focus/climate_and_energy_practice/?1311466/Africa-green-just-recovery).
- [54] Sachs, J. D., W. T. Woo, N. Yoshino, and F. Taghizadeh-Hesary. 2019. 'Importance of Green Finance for Achieving Sustainable Development Goals and Energy Security. In: Sachs J., Woo W., Yoshino N., Taghizadeh-Hesary F. (eds) Handbook of Green Finance. Sustainable Development. Springer, Singapore, pp. 3–12'.
- [55] Sartzetakis, E. 2019. 'Green Bonds as an Instrument to Finance Low Carbon Transition, Bank of Greece Working Paper, March 2019'.
- [56] Smith, N., A. Halton, and J. Strachan. 2014. 'Transitioning to a Green Economy. Political Economy of Approaches in Small States. Commonwealth Secretariat, London'.
- [57] Söderholm, P. 2020. 'The green economy transition: the challenges of technological change for sustainability', *Sustainable Earth*, 3: 6.
- [58] Sriring, O. 2020. 'Thailand Plans \$33 Billion Public-Private Investment Projects'. <https://www.reuters.com/article/us-thailand-economy-investment-idUSKCN21X1PF>.
- [59] Teusch, J., and K.Theodoropoulos. 2021. 'Why should developing countries implement carbon pricing when even advanced economies fall woefully short?'. <https://oecd-development-matters.org/2021/02/17/why-should-developing-countries-implement-carbon-pricing-when-even-advanced-economies-fall-woefully-short/>.
- [60] The Asian Development Bank. 2020. 'Green Finance Strategies for Post-COVID-19 Economic Recovery in Southeast Asia: Greening Recoveries for Planet and People'. <https://dx.doi.org/10.22617/TCS200267-2>.
- [61] Timmis, K., and H. Brüssow. 2020. 'The COVID-19 pandemic: some lessons learned about crisis preparedness and management, and the need for international benchmarking to reduce deficits', *Environmental Microbiology*, 22: 1986–96.
- [62] UN. 2020. 'Sustainable Development Outlook 2020: Achieving SDGs in the wake of COVID-19: Scenarios for policymakers. Department of Economic and Social Affairs Economic Analysis. <https://www.un.org/development/desa/dpuc/publication/sustainable-development-outlook-2020-achieving-sdgs-in-the-wake-of-covid-19-scenarios-for-policymakers/>.
- [63] UNEP. 2020a. 'African Ministers of the Environment commit to support a green COVID-19 recovery plan'. <https://www.unep.org/news-and-stories/press-release/african-ministers-environment-commit-support-green-covid-19-recovery>.
- [64] ———. 2020b. 'COVID-19: Four Sustainable Development Goals that help future-proof global recovery. Retrieved from <https://www.unenvironment.org/news-and-stories/story/covid-19-four-sustainable-development-goals-help-future-proof-global>.
- [65] ———. 2020c. 'Investing in sustainability: Greening finance. Available: <https://www.unep.org/news-and-stories/speech/investing-sustainability-greening-finance>.
- [66] ———. 2021. 'African Green Stimulus Programme. <https://wedocs.unep.org/bitstream/handle/20.500.11822/34409/AGSP.pdf?sequence=3>'
- [67] United Nations. 2017. 'Resolution adopted by the General Assembly on 6 July 2017, Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development (A/RES/71/313). Retrieved from [https://upload.wikimedia.org/wikipedia/commons/9/9d/A\\_RES\\_71\\_313\\_E.pdf](https://upload.wikimedia.org/wikipedia/commons/9/9d/A_RES_71_313_E.pdf).
- [68] Widge, V. 2021. 'Opinion: Debt-for-climate swaps — are they really a good idea, and what are the challenges?'. <https://www.devex.com/news/opinion-debt-for-climate-swaps-are-they-really-a-good-idea-and-what-are-the-challenges-98842>.
- [69] Wu, Z., and J.M. McGoogan. 2020. 'Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention', *JAMA*, 323: 1239–42.
- [70] WWF International. 2020. 'Africa in the context of COVID-19'. [https://wwfafrica.awsassets.panda.org/downloads/africa\\_covid\\_hr.pdf?uNewsID=32622](https://wwfafrica.awsassets.panda.org/downloads/africa_covid_hr.pdf?uNewsID=32622).
- [71] Yi, Y., P. Lagniton, S. Ye, E. Li, and R. H. Xu. 2020. 'COVID-19: what has been learned and to be learned about the novel coronavirus disease', *International Journal of Biological Sciences*, 16: 1753–66.
- [72] Zhouying, J. . 2002. 'Driving Force for Sustainable Development: Principles of Harmony and Balance', *AI & Society*, 16 21 –48.