Green Economic Growth for the Democratic Republic of the Congo

How could post-covid green investment both bring short-term economic recovery and unlock long-term sustainable growth?

Oxford University Economic Recovery Project, SSEE and Vivid Economics

in partnership with the United Nations Economic Commission for Africa

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Executive Summary

Modelling suggests that the Democratic Republic of the Congo (DRC) could benefit significantly from investments in green initiatives as a part of a COVID-19 recovery and advancement program. Compared to traditional alternatives, green investment could bring more jobs and economic gains in the short term, unlock greater development opportunities in the medium to long term, and ensure better environmental and social outcomes.

In response to the pandemic so far, the DRC has spent USD11 per person, only 0.05% of that spent on average in advanced economies (USD20,800 per person) and 1.6% of that spent in emerging market and developing economies (USD680 per person). This huge disparity has been driven not by policy inaction, in fact DRC policy makers have been industrious, but by limitations on fiscal space and international support.

Foreign governments and international organisations must now generously partner with DRC to limit poverty in the wake of the crisis. By prioritising green assistance, partners can help the DRC implement one of its best options for economic recovery while also securing social and environmental benefits and moving to an accelerated path of long-term sustainable development. These investments could also help the nation strengthen its essential position in the global supply of key climate minerals and resources, including cobalt.

The DRC has suffered badly under the pandemic, which has brought significant job losses, debilitated some education programs, and forced 6.2 million new people into a position of acute food insecurity.[1] The country has thus far faced two waves of the virus, resulting in widespread business closures, school closures, and other disruptions that suppressed economic growth. Pre-pandemic, the nation already faced one of the highest poverty rates and lowest energy access rates in the world. These statistics have only worsened in the past year. Taxation revenue dropped by 46%, driven by volatility in commodity prices in an economy heavily reliant on metal and mineral exports.[2] Although small by value, the government has responded to the crisis with some new spending priorities, covering over 190 policies. Most spending has been oriented to saving lives and livelihoods and funded by international partners.

Green stimulus measures may be one of the DRC's strongest spending options in support of economic recovery in the coming years, boosting both short-term job creation and growth, and laying the foundation for future prosperity. Green measures could help bring about the poverty reductions that are desperately needed in the DRC through increased energy access and better health outcomes. Vivid Economics modelling quantifies the potential benefits of green initiatives over traditional alternatives for economic recovery and advancement in the DRC (Fig 1).

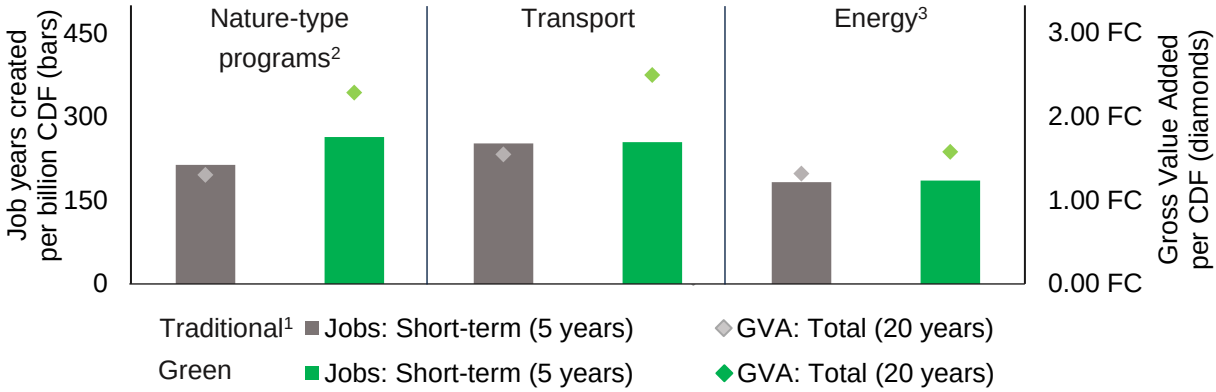

Figure 1. Job and Gross Value Added (GVA) impacts of green spending policies (average) compared to traditional spending measures in the Democratic Republic of the Congo. These are simple average figures; the full policy set is in Figure 4. Modelling output from Vivid Economics; see Technical Annex.

[1] Traditional investments include water treatment facilities, road construction, and coal energy generation. [2] Green nature includes agroforestry, irrigation systems, reforestation, a BRT, solar energy systems and hydroelectric power, among others (figure 4). [3] Modelling is based on current sector dynamics, rather than projected future dynamics. It is likely to overstate long-term GVA of traditional (fossil) investment and understate GVA of green energy. For fossil spending, stranded asset risk could reduce asset lifespans. For clean investment, cheaper energy is likely to unlock investment in electric transport, sustainable production, and other adjacent sectors.

This briefing suggests three green policy areas that could deliver particularly strong benefits to the DRC and pave the way towards sustainable development and a prosperous future:

Utility-scale Renewable Energy and Power Lines: The DRC is home to some of the most abundant resources for renewable energy generation on the planet, but a history of mismanaged commodity resources, political instability, and a long-standing security crisis, mainly in Eastern DRC, has meant that these resources remain largely untapped. Building on existing projects, expanding hydro and solar energy generation is an important step to increasing energy access across the country, reducing poverty, and unlocking economic opportunities. In conjunction, investment in transmission infrastructure, with the possibility of regional partnerships, will also be crucial for increasing energy access domestically and could make the DRC one of Africa's primary energy exporters.

Minigrids and Microgrids: While a lack of electricity access is a significant challenge across the entire nation, rural areas have particularly low electrification rates (0.4%).[3] Minigrids provide the option of energy systems that function independently, with communities taking control of their own energy supply. Providing renewable energy to rural communities through minigrids and microgrids is likely to increase agricultural productivity and improve health

outcomes, particularly where electric solutions can replace solid-fuel heating and cooking.

Natural Capital Investments: Nature-based interventions include restoration of habitats, agricultural interventions that sustainably boost productivity and protect livelihoods, and urban greening. Provided appropriate and consultative design, these can be implemented quickly, create low skill jobs, and can be one-off investments. They are not given to investment leakage outside of the country, ensuring that stimulus is focused on the domestic economy. These opportunities could act as climate adaptation safeguards, protecting against the impacts of climate change. In doing so, they can also increase the resilience of the economy.

Investments targeting job-creation and economic uplift, alongside continued urgent assistance in education and healthcare, could help to strengthen domestic security. Increased employment opportunities in the formal sector could reduce poverty and may provide an additional incentive for young people to seek opportunities in the formal labour market rather than engage in illegal resource-extractive enterprise or join militia groups. In turn, increased domestic security could unlock sizeable foreign direct investment (FDI) for sectors ranging from mining to agriculture to industry.

So far, in cooperation with international partners, Oxford's Global Recovery Observatory shows that DRC has devoted CDF1.9 trillion (USD928 million) to short-term rescue measures and CDF93 billion (USD47 million) to longer term recovery measures.[4] With the pandemic far from over in the DRC, spending will continue to be necessary to protect the communities worst affected and enable recovery. The Global Recovery Observatory, from the Oxford University Economic Recovery Project and the Green Fiscal Policy Network, tracks global fiscal spending in response to COVID-19 and can act as a resource for nations to compare recovery solutions globally.[4]

International partners will need to engage deeply with the DRC and provide the urgently needed resources to ensure that decades of development gains are not lost in the wake of the pandemic. Long-term partnerships will be crucial to the rebound and future sustainable growth of the DRC. Partners must productively engage community leaders, while prioritising transparency and accountability and acknowledging the harsh realities of existing constraints in the nation.

1. COVID-19 has intensified existing weaknesses and fragilities

1.1 Pre-pandemic Democratic Republic of the Congo

Despite its abundant natural resources, DRC remains one of the financially poorest nations in the world. A complex history ruptured by colonialism and conflict has culminated in a society where 72% of people live on less than USD1.90 per day, although poverty had been falling slightly before the pandemic.[5] With a human capital index score of just 0.37%,[5] and a dependency ratio of around 95%,[6] the country is in urgent need of more robust healthcare, education and nutrition, as well as stronger programs against worker exploitation. These developments are all essential enablers to a workforce able to meet the demands of future growth. In terms of natural capital, DRC is endowed with some of the largest and most biodiverse landscapes on the planet, though these resources have brought exploitative relationships with domestic and foreign private operators – landscapes are now under increasing threat due to illegal logging, slash and burn agriculture, and climate change.[7]

The DRC economy experienced relatively rapid growth before 2020. Yet, conflicts in the 1990s and earlier, which supported resource mismanagement at the time, continue to have an impact on the efficiencies of natural resource management today. The country operates a highly mineral-dependent economy, with metal and mineral exports making up 97% of total exports and ~22% of total GDP.[8] This renders DRC highly vulnerable to resource price volatility. The DRC Government has taken a stance against corruption and has aimed to address long-standing inefficiencies at the state-owned enterprise, La Générale des Carrières et des Mines (Gécamines), though this is a long process and progress to date remains unclear.[9]

Despite recent efforts to improve mining tax revenues, significant tax exemptions continue at ~USD4-5bn per year.[10,11] Additionally, low corporate tax collection across sectors represents a significant market inefficiency and lost opportunity. Historical and continuing high barriers to investment remains a barrier to domestic growth.[12] The country has historically relied heavily on support from international partners, though limited formal systems for managing foreign aid highlights the need for long-term partnerships rather than once-off investments. Transparent collaboration between domestic and international actors, driven by domestically determined priorities, will be key to the success of any economic plans to ensure long-term prosperity.

1.2 Impact of COVID-19 on the DRC economy and society

Due to a lack of healthcare infrastructure and challenges with data collection, it is difficult to fully know the depth of the pandemic's impact on DRC. However, with 0.1 physicians per 1,000 people (compared to the global average of 1.6) and PPP per capita health expenditure of just USD30.72 (PPP) (compared to the global average of USD1,467), the nation was unequipped to deal with the magnitude of the pandemic's potential health impacts.[13]

The first wave of the virus in early 2020 precipitated widespread mobility restrictions, which took a toll on businesses, lives, and livelihoods. Already dire poverty worsened appreciably, with estimates suggesting that 6.2 million new people (7% of the population) now face acute food insecurity.[14] School and business closures led to new pressures on workers and families, only exacerbated by an Ebola outbreak in April[15] and a second wave of the virus in late 2020.[16] Despite a pre-pandemic forecast of 5.4% growth, the economy took a significant hit in 2020, contracting by 2.2% according to the World Bank or 1.7% according to domestic estimates.[17] Businesses across all sectors were impacted, though a slowdown in mining was the biggest contributor, with supply chain pressures and lower commodity prices. Copper prices dropped

by 25% at the beginning of the pandemic, resulting in ~USD5bn in lost revenue.[18] Year on year, tax revenues, including customs and excise revenue, were down by 45.9% and revenue from oil producers down by 28.1%, with a full rebound not expected until 2024.[17] Inflation skyrocketed to 13.0% in 2020, apparently driven by factors including shifted demand, speculation, and a depreciation of the Congolese franc.[17] Internal estimates predict inflation of 15.1% in 2021, 8.2% in 2022, and 7.1% in 2023.[17]

International assistance has been crucial in the DRC's response to the pandemic. The nation has benefited significantly from concessional finance given by institutions such as the IMF and the AFDB among others and will rely heavily on vaccine assistance funded by international partners.[19, 20] With proper economic management, and continued international support, GDP may rebound by 3.1% or more in 2022, although many hurdles stand in the way of growth.[21]

1.3 Fiscal policy responses during the pandemic

Worldwide, the enormous economic challenges of COVID-19 have been met with unprecedented fiscal spending packages. Governments have mobilised both rescue-type spending, to address the immediate health and economic needs of nations, as well as recovery spending, to stimulate new jobs and economic growth. The Oxford University Economic Recovery Project has developed the Global Recovery Observatory (GRO), in partnership with the Green Fiscal Policy Network, to track over 3,500 fiscal spending policies announced in response to the pandemic by over 70 countries. These policies are assessed for economic, environmental and social impact. **The Observatory tracked CDF1.9 trillion (USD975 million) announced by the DRC government in 2020, of which CDF1.8 trillion (USD928 million) is rescue-type spending and CDF93 billion (USD47 million) is recovery-type spending.**[i]

Like many developing nations, the DRC's announced spending during this period has largely been funded by international partners. Opportunities to self-finance projects have been limited from the income statement by lower tax revenues, from the balance sheet by a low cash holding, and from debt by high and expensive financing constraints. Key responses have included healthcare spending through the National de Riposte Contre le Covid-19 and several new tax exemption and liquidity support measures for businesses. The government's largest spend to date has been the Programme multisectoriel d'urgence d'atténuation des impacts de la COVID-19 (PMUAIC-19).[22] This is a multifaceted spending package with three key aims – to reinforce the healthcare system for handling COVID-19, to support macro-economic stability and economic recovery and to reinforce social security, particularly for vulnerable populations. However, at the time of announcement in June 2020, only USD0.9bn of the USD2.6bn package seemed to be funded.[2222] Little to no spending policies in the package are explicitly green, and although there are several agricultural support policies included, their environmental characteristics remain unclear.

DRC has spent USD11 per person, compared to an average in advanced economies of USD20,800 per person and USD680 in emerging market and developing economies.[ii]

[i] This excludes an unconfirmed CDF8.6tn (USD4.4bn) agricultural efficiency spending program, the Plan National de Relance Agricole (PNRA)

[ii] This analysis includes data from the largest fifty economies in the world only.

International support provided to the people of DRC has not come close to addressing the additional economic and health challenges introduced by the pandemic.

1.4 Green stimulus to catalyse future prosperity

With the attention afforded by the African Union presidency, DRC has the opportunity to establish itself as a true global leader on climate and the environment. Spending green now could bring significant short-term recovery advantages, as well as long-term development opportunities, all while making progress against climate change and other environmental challenges. However, to date, and like most low-income nations, total recovery spending has been low and green recovery spending has been almost zero (Figure 2). Figure 3 shows significantly greater investment from advanced economies than emerging market and developing economies (EMDEs) on green initiatives across a broad range of sectors. This deviation is largely driven by higher financial and borrowing constraints in EMDEs.

It is essential that international partners, including foreign governments as well as multilaterals like the World Bank, IMF, AfDB, urgently direct significant concessional finance to provide support. In this, foreign partners should consider the comparatively high utility of grant programs. This is a matter of protecting current and future generations of Congolese citizens as well as making inroads on climate action.

Funding must flow through domestic structures with full collaborative partnership and transparency so that impacts are felt by the Congolese citizenry. Existing domestic structures may need to be bolstered so that they can appropriately disperse an increased volume of aid. Aid packages could orient to specific project-based funding, where intended economic and environmental impacts are clearly described and subsequently measured. As one mechanism to reduce concerns of funding misappropriation, long-term interest rates on borrowed capital could be publicly tied to desired outcomes, acting as a transparent incentive for policymakers to meet and exceed the predefined project outcomes. Outcomes could be set using a priori policy assessment frameworks, such as that of the Global Recovery Observatory.[23] Progress could be observed and publicised by impartial academics in a manner that also enables long-term learning on how to better set and implement projects. Long-term partnerships should be prioritised above short-term interventions to build domestic capacity and meaningfully accelerate the nation's development pathway.

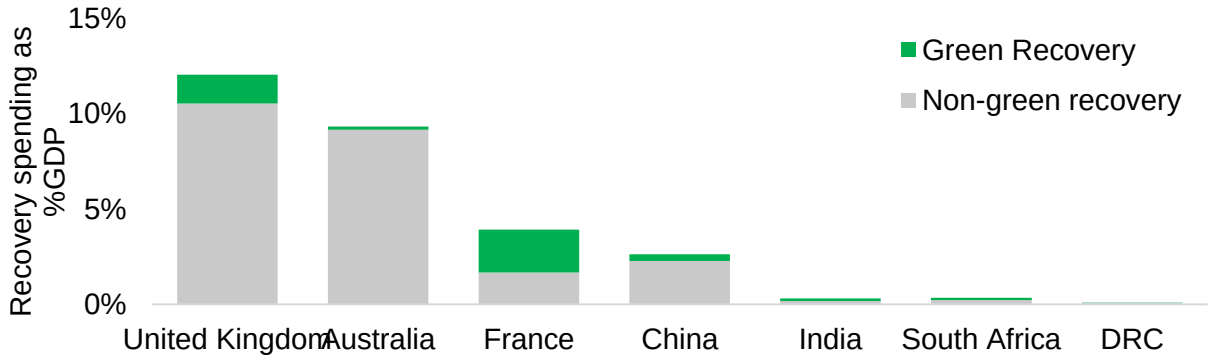

Figure 2. Composition of global recovery spending. Data excerpt from Global Recovery Observatory.

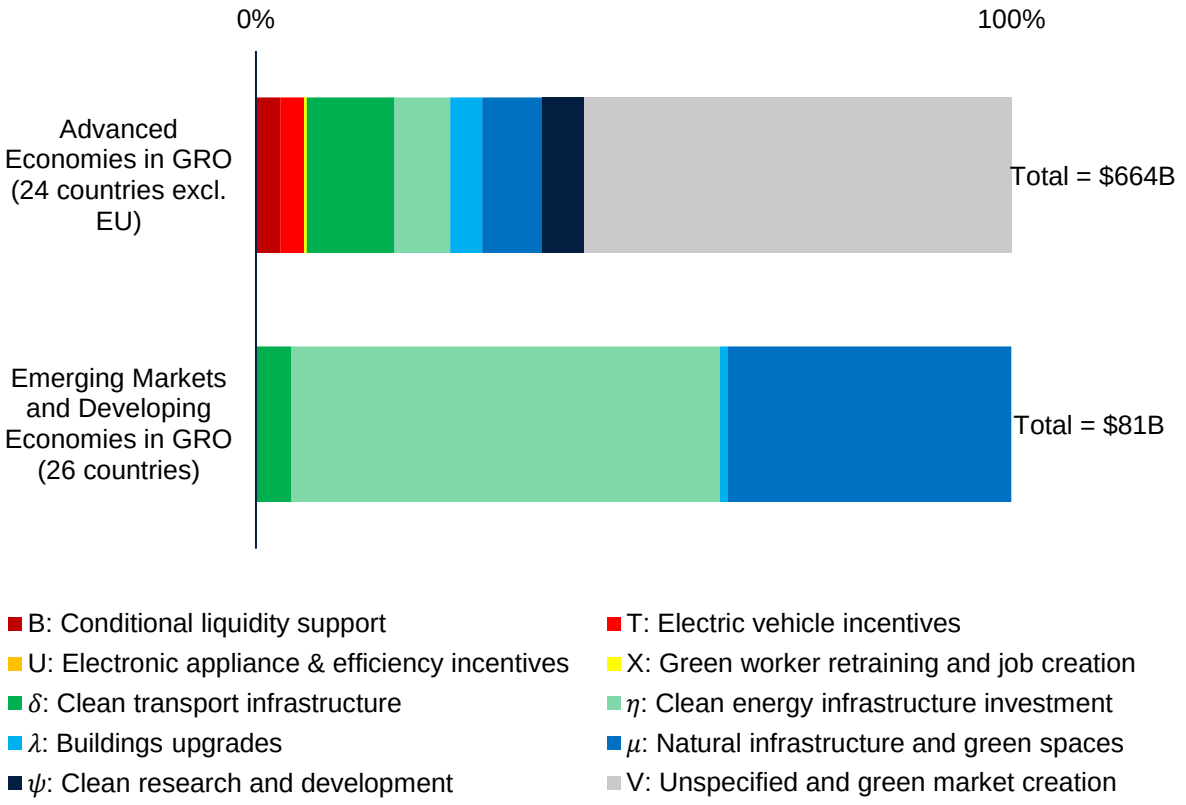

Figure 3. Distribution of green spending in 2020 as tracked by the Global Recovery Observatory.

2. Priority policy recommendations

With support from international partners, Vivid Economics modelling suggests that green investments could provide a strong economic recovery and advancement pathway for the DRC, leading to job creation, economic growth, and better environmental outcomes. Different green investment opportunities, along with their potential job creation impacts, both short- and long-term, are illustrated in figure 4. Gross value added (GVA) is also represented. The results of Vivid's input-output modelling show that job creation opportunities are plentiful in DRC if funding can be secured and that over the next 5 years, green policies are likely to deliver more jobs per dollar compared to traditional alternatives. These green investments also bring several social and environmental co-benefits that could deliver positive health outcomes, reduce DRC's climate impacts, and in some cases reduce the nation's vulnerability to the impacts of climate change.

Given the economic and social characteristics of DRC before the pandemic, the nation would benefit significantly from policies that improve health outcomes, reduce poverty, and increase quality of life. As discussed in the proceeding subsections, several of the modelled green policies have high prospects of achieving these outcomes.

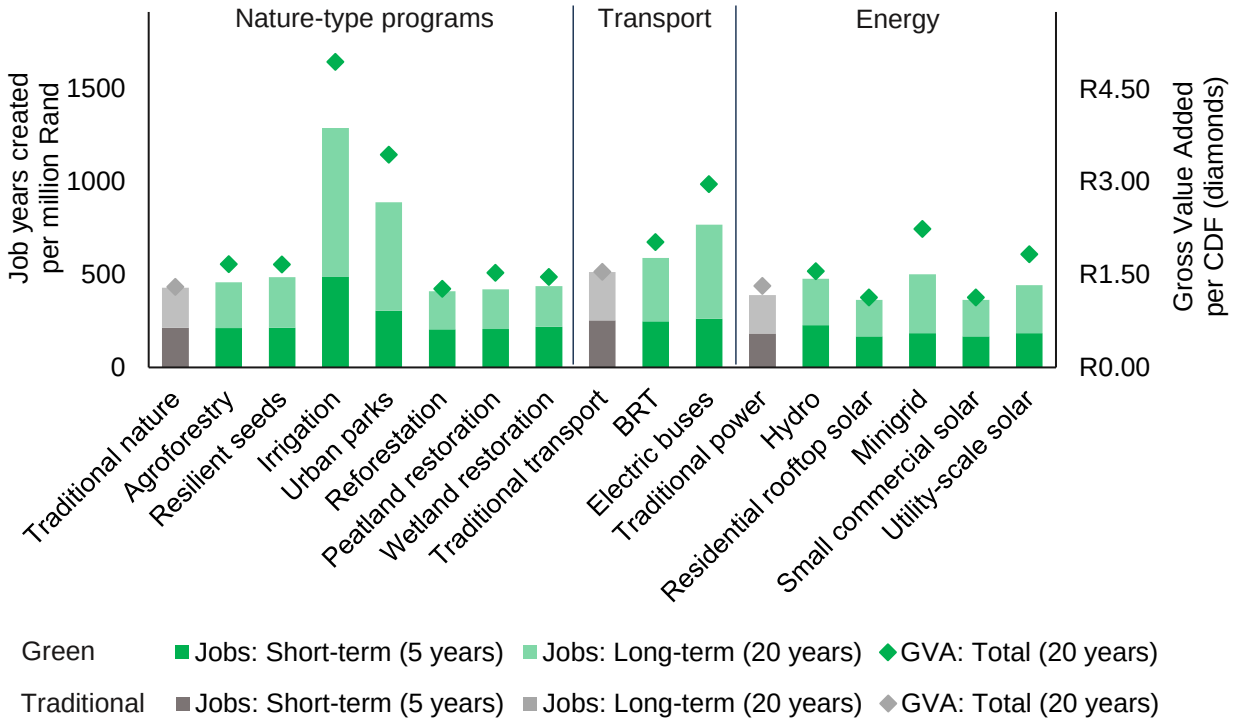

Figure 4. Job and Gross Value Added (GVA) impacts of green spending compared to traditional spending in the Democratic Republic of the Congo, all modelled policies. Modelling output from Vivid Economics; see Technical Annex.

Note: Modelling is based on current sector dynamics and is therefore likely to significantly overstate the long-term GVA of traditional (fossil) investment and understate the GVA of green energy. For fossil investment, stranded asset risk could significantly reduce the asset lifespan, and for clean investment, new cheap clean energy is likely to unlock new investment in adjacent areas like electric transport, artificial proteins, and sustainable material production. Finally, even if fossil assets were to serve a full working life, continued reliance on coal would support carbon emissions unacceptably.

Traditional investments are defined as follows: transport includes improvements to the road network, including laying new road and constructing accompanying road infrastructure, such as interchanges and bridges; nature includes water treatment facilities, including the construction and operation of waste-water treatment facilities; and energy includes ultra-supercritical coal energy generation without any carbon capture technology.

The modelling of Vivid Economics provided the basis for a wider analysis of green recovery and advancement opportunities for DRC, leading to three priority areas for investment. Spending in these areas could catalyse short-term job creation and economic growth for COVID-19 recovery, while enabling significant strides in sustainable development over the long-term. Additionally, these investments are likely to secure supplementary social and environmental benefits for the nation.

The three priority green investment opportunities are:

2.1 Utility-scale renewable energy and power line investment

Access to electricity is a core driver of poverty reduction. With one of the lowest rates of electrification in the world, at just 9%,[6] expansion of affordable utility-scale renewable energy production in DRC could lift millions of people out of the poverty trap, while unlocking significant new industrial economic opportunities for growth.

Renewable energy is the cheapest form of new generation on a capacity basis in many geographies.[24] DRC's high solar irradiation[25] and significant hydro resources[26] provide strong opportunities for investment. This has been recognised in recent large-scale privately-supported investments in Kinshasa Solar City[27] and elsewhere. The Grand Inga dam project, despite a somewhat turbulent financial history, has seen enthusiasm from countries in the region and from international investors. If carried out to completion, the project could provide 44,000MW of new green electricity, mostly earmarked for international transmission, bringing sizeable tax revenue. Complexities in the early stages of this project suggest that transparency in renewable energy investment is crucial for retaining investor confidence in DRC.[28]

Alongside new electricity generation through solar and hydro power, DRC also needs to significantly bolster its electricity transmission and distribution infrastructure to meet the needs of its population. Existing high voltage transmission infrastructure is badly aging and covers only a tiny portion of the country. Instability in the region has been a barrier to expanding transmission infrastructure, but through strategic partnerships with international actors, there is potential for upgrades and expansions, particularly in larger cities and mining areas. Additionally, involvement in transnational energy transmission projects provides an opportunity for Congolese renewable power to be instantaneously sold across Sub-Saharan Africa and could render the DRC one of Africa's major energy exporters. Expansions in transmission infrastructure would also lay a strong foundation for future clean economic opportunities including electric vehicle networks and electrification of processes in other sectors.

In the context of the COVID-19 pandemic, renewable energy investments offer some of the highest potential for an economic boost and to create jobs.[29] Similarly, significant investment in enabling transmission and distribution infrastructure is labour-intensive, involves use of local materials and could provide a step-change in economic productivity as soon as communities receive affordable power.

The Least Developed Countries (LDCs) Renewable Energy and Energy Efficiency Initiative for Sustainable Development (REEEI)[30] has demonstrated the benefits of renewable energy investment in the context of lower income nations. The program, developed by and for LDCs, supports nations as they strive to provide renewable energy access to their populations. The LDC REEEI framework highlights core principles for investment, implementation guidelines, and finance and governance considerations to maximise the benefits of renewables investment in LDC contexts.[30] Despite the wide range of benefits, there are several important limitations to utility-scale renewable investment to be considered. Corruption, low investor confidence, and the interference of militia groups in infrastructure projects have all been barriers to success in the past. However, the potential for high impact remains. International collaboration, both North-South and South-South, oriented to a long-term horizon can support

the development of appropriate technology solutions and implementation programs based on local priorities and skills.

For international partners, generous support of renewables could offer a way to simultaneously boost short- and long-term development, while securing positive climate outcomes in the DRC. This is an essential step along the development pathway and could help the nation establish a leading role in pushing peers to follow suit, particularly as DRC assumes the presidency of the African Union.

2.2 Minigrid and microgrid investment

While the entire DRC population faces significant challenges when it comes to energy access, the difficulties in rural areas are particularly large, as just 0.4% of the rural population has access to electricity.[12] Eventually, large scale increases in transmission infrastructure could service such communities, but that is likely several decades away. As suggested by LDC REEEI, in residential contexts, investment in distributed generation may provide an opportunity to leapfrog centralised transmission-distribution altogether.[30] Minigrids and microgrids may enable cheaper connection of rural and smaller urban centres to electricity and enable the wide-ranging benefits that electricity access brings. Investing in these solutions in the immediate term could simultaneously provide an economic boost as the nation recovers from COVID-19.

Minigrids are small-scale (10kW to 10MW) self-contained electricity networks that include a renewable energy generation source, storage facility (batteries), inverter and charge controller, and local distribution network.[31] Microgrids are even smaller in size, totalling generation capacity between 1-10kW.[31] In areas with smaller populations, large transmission solutions are often not economically viable and minigrids are a strong alternative.[32] Given the natural resources of the DRC, it is likely that solar and hydro will provide the best energy source for these grids. One 2017 study found that under the current transmission and distribution network, a minigrid rollout in DRC would be the most appropriate for reaching around 10 million people.[32]

The country has already seen some investment in minigrid solutions, as have its neighbours. Several of these projects have been funded by multilateral development banks,[33] others by global climate funds,[34] and still others by public investment.[35] Some projects were built with the long-term intention of connecting them to the main grid, but for DRC this may be a long way away and potentially unnecessary in a decentralised (distributed) energy future.

From an economic recovery perspective, mini-grids can inject investment to regional areas, create both short-term construction and long-term operation jobs, and open significant new opportunities for productivity gain. Skills programs will likely be necessary to ensure that the jobs benefits of these programs are felt by the communities that the projects serve. Financing such projects can be a challenge, but a multi-staged approach has shown promise under previous arrangements. This would involve development partners covering upfront costs and early-stage operations, with tariff's to be applied gradually over time as locals reap the rewards of the connection. De-risking measures for such projects have been suggested by the UNDP,[36] and there is also some promise in mini-grid pooling facilities.[37]

Minigrid investment provides a chance to secure a wide variety of social and environmental co-benefits alongside economic benefits. Renewable energy enabled electrification in rural areas, could reduce reliance on solid fuels (e.g., wood-fired) for cooking and heating. Ordinarily, the use of these fuels brings significant negative respiratory health consequences because of indoor air pollution.[38] Additionally, minigrids could provide energy to enable new healthcare facilities, particularly outside of urban centres. As discussed in section 2.1, access to electricity also plays a key role in poverty reduction, providing more and better opportunities for work and education.[39] This is particularly true in rural settings where electricity access can improve agricultural efficiency and productivity, reduce vulnerability to climatic variation (with better access to water pumps as well as lighting, cooling, and heating), and introduce new opportunities for enterprise (for instance, by enabling use of appliances, IT, power tools and other equipment).

To enhance the prospects of long-term success, national minigrid and microgrid programs should incorporate decentralised approaches to planning and implementation that prioritise community-driven leadership.[40] It is also vital that government and any other funders consider (i) security concerns particularly from militia groups in regional parts of the nation, (ii) the lack and inaccuracy of data needed to design appropriate systems in many parts of the country, and (iii) depending on the size of the total package investment, a need to invest in complementary training to address an undersupply of skilled workers and experienced contractors to manage implementation, operation, and maintenance of the minigrid or microgrid systems.

2.3 Natural capital investment

DRC is home to some of the most impressive and abundant natural resources on the African continent, with its forests and river systems being some of the most biodiverse in the world.[41] The history of natural resource exploitation in the country is a complex one, driven by colonial powers, unchecked foreign investment, and continued domestic conflict. Agriculture is a key driver of the economy, with almost two thirds of the total working population employed in the sector, though this fraction has been slowly declining in the last two decades.[42] Slash and burn agriculture has been a fixture in the DRC for decades, with communities often unaware of the long-term environmental and economic damage of the practice. This, in addition to illegal logging and other harmful practices, may have very short-term benefits for those who partake in them, but in the long term they reduce biodiversity, substantially limit crop yields, and increase the vulnerability of communities to climate impacts. The ultimate effect of this is reduced future earning potential from these natural assets that locals depend on today.[43]

Natural capital investment supported by international partners is likely to bring large benefits for DRC, on economic, environmental and social levels. Programs such as reforestation can create many jobs very quickly. Leakage of funds outside the domestic economy is usually minimal in such programs, as there is a focus on labour spending and little need for imports. They can bring air quality improvements, improve agricultural yields, and safeguard communities against the changing climate. Care must be taken to ensure that biodiversity is prioritised (monocultures should be avoided) and local community participation is integrated to every stage of the policy design and investment cycle.[44] Further, given the high accessibility of many natural capital programs, there is a risk that, unchecked, this work could lead to the exploitation of minors. Complete transparency and strong legal and other enforcement

mechanisms are therefore essential to the responsible implementation of such programs and the avoidance of repeating past harms.

Options for investment in DRC include:

- **Agroforestry:** introduction of trees into existing or potential pastureland to raise livestock or the creation of areas for foraging in a controlled forest environment. Agroforestry and habitat restoration can decrease the likelihood and severity of droughts by improving soil water retention, slowing water loss, and regulating water flow. Agroforestry efforts can also improve shading, decreasing livestock loss due to heat stress.
- **Resilient Seeds and Irrigation:** The World Bank estimates that in 2020, over 60% of the DRC's population was engaged in agriculture. As climate change intensifies, this sector is particularly vulnerable to the changing global weather patterns and climate shocks. Policies which build climate resilience into agriculture can both support jobs today and enable the DRC to better adapt to changing climatic conditions. Policies considered include investments in irrigation for agriculture, which better enable farmers to withstand droughts, and investment in drought-resistant seed programmes. Investments in resilience-focussed project could lead to high economic returns, with between CDF1.7-2 in revenue for every CDF1 spent. Furthermore, the economic impacts would increase farming revenues, enabling farmers to then reinvest into their practices, enhancing the impacts beyond those revealed through the modelling.
- **Urban parks:** Kinshasa is the second largest city in Africa and is projected to have a population of at least 20 million by 2030. Urban parks support recreation, health, and wellbeing, translating into a healthier population, improved human capital, and lower pressures on health services. Investing in the creation of parks today would help unlock urbanisation be a driver of agglomeration economies and productivity gains, rather than a source of congestion and pollution.
- **Restoring peatlands:** the process of restoring and conserving peatlands aims to cover bare peat areas with vegetation, blocking drains to raise the water table and re-introducing mosses and other plants into areas they have been lost.
- **Reforestation:** re-establishing natural forests, planting more native species, or increasing the density or extent of an existing forest. Well-managed, consultative, and participatory reforestation can enhance wildlife habitats, support biodiversity, protect water supplies, develop recreational opportunities, and work to address numerous issues associated with climate change, including through carbon sequestration.

2.4 Other guidance

The DRC and international partners may consider several supplementary actions to support green recovery and advancement efforts, while complementing the major recommendations detailed above.

2.4.1 Mineral extraction and the green transition

While the DRC may have one of the most valuable natural resource endowments in the world, domestic instability and an unconducive business environment means that many of these reserves do not attract foreign direct investment (FDI) and remain untouched. Those resources that are mined do not return appropriate taxation to the state. Beyond economic considerations, several environmental factors are also important in considering DRC mineral extraction.

The mining resources of the nation put it at the heart of the global green transition. The country contains approximately half of global cobalt reserves,[45] an element essential to battery production. Following the Sino-Congolese mining deal of 2007, Chinese companies have expanded their mining portfolios in the DRC, mainly in the copper-cobalt belt of ex-Katanga, making the DRC a particularly vital contributor to the e-mobility revolution. As the world moves to meet climate and sustainability goals, the expected growth in electric transport and rechargeable batteries will bring further increases in the demand for the minerals that make these technologies possible.[46]

Alongside cobalt, DRC endowments of copper, iron, manganese, silver, zinc, and lithium could all be useful inputs to enabling the global low-carbon transition.[47] Efficient processes for extraction of these minerals, alongside supportive government policy and stability in the political economy, will be essential to maximising returns to the DRC and minimising the cost of the global green transition. Increased stability and transparency could lead to greater FDI and, vitally, provide new opportunities to certify safe working conditions and safeguards against child labour and forced labour.

Additionally, mining is an inherently energy-intensive process, often leading to significant greenhouse gas (GHG) emissions, as well as other air and waterway pollution. By incentivising the decarbonisation of the mining sector, DRC could catalyse short-term investment in more sustainable practices, bringing positive economic impacts, particularly if domestic manufacturing can be prioritised over imports. In the long-term, a more sustainable mining industry in DRC could reduce GHG emissions while also signalling environmental leadership to the African continent and the world.

A targeted minerals sector carbon pricing mechanism could be one zero-cost mechanism for incentivising this shift. Mining companies could be taxed for emissions output or otherwise asked to engage in some form of carbon trading. However, to ensure a successful program government implementation and enforcement capacity will need to grow significantly. Additionally, investment in domestic manufacturing of relevant products will be needed to ensure that investments are not offshored. Laying the groundwork for such an action now could push financially secure mining companies to begin investing in more efficient extraction while allowing precariously positioned groups, like Gécamines, to plan for the future.

2.4.2 Dirty spending

The DRC has extremely scarce financial resources available to manage the immediate and long-term consequences of the pandemic. Directing any of these resources as incentives to or support for oil companies or other dirty industries without green conditions is deeply misguided. It is dangerous to direct resources to assets that are at significant risk of being stranded by trends in global energy use that are already underway. This dependency could lead to even further reduced tax revenue and increased debt burdens, which could have negative effects on the already precarious economy. The perpetuation of dirty industries puts in jeopardy the natural capital of the nation, causing pollution issues that can result in serious health consequences for individuals. It may also reduce energy security in the long-run and could render later climate mitigation actions much more difficult.

2.4.3 Labour, human capital, and green skills

Before the pandemic, conflict in DRC, among other factors, led to a large population of young people without access to education or work training.[48] This left the country with a number of skills shortages and many young people struggling to find employment. School and businesses

closures during the pandemic have accentuated this problem, leading to a substantially reduced national balance of human capital. To substantially invest in many of the policies detailed above, without relying on an external labour force, the nation will likely need to invest in green skills development in the labour market. International partners may engage collaboratively with the DRC to aid in green skills and retraining programmes, though given the size of the DRC population, significant investment in education infrastructure will be necessary to fully capture economic benefits.

2.4.4 Governance, enforceable regulation, and security

, DRC continues to face challenges in providing oversight to policy implementation, enforcing regulation, and in some cases, containing corruption. The implementation of many of the aforementioned programs will be difficult without also bolstering systems of governance. It's imperative that transparency is prioritised and built into all proposals, both for the benefit of foreign partners and for domestic communities. A lack of existing regulation and continuing state capture could be countered with new transparency mechanisms and results-tied aid programs, as described in section 1.4. The limitations imposed by poor security and rule of law, particularly outside of major cities, must be acknowledged in any DRC policy development process. It is vital that the safety of workers and security of assets are prioritised at all stages.

2.4.5 Long-term partnership and capacity building

To bring a structural shift to the economy of the DRC, global partners must be willing to engage for the long-term. They must work collaboratively with domestic leaders and communities to ensure that spending is directed to initiatives that are truly designed by and for the people of DRC, not simply to those which seem the most aligned with preconceived development principals. The injustices of the colonial era precipitated decades of violence and poverty. Unfortunately, many of these injustices continue today, perpetuating the nation's place among the poorest and most dangerous in the world. Hence, restoring state authority in the DRC remains an important prerequisite. International partners must generously partner to bring a productive future to a nation which is Africa's largest country by area, largest by value of natural resource endowment, and third largest by population.

3. Conclusion

For the DRC, green investments could secure the economic, environmental and social benefits necessary for a strong recovery and new sustainable development pathway.

These investments are expected to result in 130% more jobs and 280% greater economic output when compared to traditional investments in the same sectors. The nation has expansive natural resources that, with careful investment and strong governance, could contribute to the prosperity of the Congolese people. Furthermore, investment in economic uplift could help to improve domestic security in the long-term by creating new employment and economic opportunities and drawing young people away from illegal enterprises and militia groups. In turn, this could strengthen the business environment and induce new FDI.

With investments in utility scale solar and hydro, mini-grids, and nature-based solutions, the DRC has a chance to simultaneously address its immediate economic concerns while safeguarding the natural environment and securing several social co-benefits. Expanding electricity access to the entire population by 2030 is a lofty goal that the pandemic has made

even more challenging, but reaching this goal is imperative to ensure that poverty rates drop across the country and that quality-of-life increases.

So far, the nation has seen only $11 per person in COVID-related spending, compared to USD20,800 per person in advanced economies and USD680 per person in emerging market and developing economies. The spending constraints on the DRC government during this time of crisis continue to be extreme.

International partners can help the DRC make a rapid recovery from the pandemic, avoid significant additional loss of human lives, and align the nation's growth trajectory to an accelerated sustainable development pathway. This may manifest in generous long-term partnerships paired with immediate grant and concessional finance support. Inaction could make reaching the sustainable development goals an impossibility for the DRC and would have detrimental impacts on vulnerable communities. Transparency, open forums of collaboration with local leaders, and strong governance programs will all be useful in avoiding the worst long-term impacts of COVID-19.

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ABOUT THE OXFORD UNIVERSITY ECONOMIC RECOVERY PROJECT

OUERP is the world's hub for developing and communicating long-term economic perspectives on recessionary fiscal spending. The project develops leading original research, as well as core advisory services to governments and multilaterals, businesses, and non-profit institutions. Core initiatives include tracking of global COVID-19 government recovery spending, assessment of spending effectiveness, and development of core perspectives on how to incorporate long-term economic, social, and environmental objectives into immediate stimulus action.

The project is generously supported by the Children's Investment Fund Foundation, ClimateWorks Foundation, Green Fiscal Policy Network (United Nations Environment Program, International Monetary Fund, and GIZ), and University of Oxford Social Sciences Division.

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Vivid has an extensive track record in analysing the economic, environmental, and social impacts of policies and public investments, including COVID-19 rescue and recovery packages:

- Our Green Recovery Roadmap work, including modelling the impacts of announced and alternate recovery measures on the economy and environment of ten countries worldwide, is funded by the ClimateWorks Foundation. We are also working with the Children's Investment Fund Foundation, to model further recovery policies.
- Our flagship 'Greenness of Stimulus Index' (funded by the MAVA foundation) assesses the effectiveness of COVID-19 stimulus efforts in ensuring an economic recovery that takes advantage of sustainable growth opportunities and is resilient to climate and biodiversity.
- We are experts in assessing the economic, environmental and social benefits of government interventions to be included in national strategies, working with Nigeria, Indonesia, Belize, Lebanon, Colombia, Jamaica and others to prioritise policies and investments for inclusion in their intervention plans.
- We are working with SystemIQ to develop an assessment of the economic and climate mitigation and adaptation impacts of global stimulus packages and assess the benefits of a greater emphasis on investment in nature-based solutions

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Technical Annex from Vivid Economics

Authors: Julia Bird, Jonathan Aron, Malvina Bondy, Paul Roe, and Dan Aylward-Mills.

The objective of the modelling is to estimate the economic and environmental impacts of different stimulus policies. As Figure A.*1* shows, there are four steps in the analysis:

- **Coordinate background policy analysis**
    - The existing COVID-19 spending policies were mapped using Vivid Economics tracking and Oxford's Global Recovery Observatory. Policies included rescue-type spending such as household and job support programmes, as well as non-targeted business support. To consider recovery-type investment policies, a set of reference investments across core sectors was established.
    - Vivid Economics designed a series of indicative green recovery policies to form a potential green recovery package. This package is tailored to the national context, while drawing on international best practice for designing green stimulus policies.
- **Prepare model inputs.** Each intervention is translated into a 'shock' for use in the I3M model. As a Leontief multiplier input-output (I/O) model, model shocks are changes in sectoral final demand.
- **Conduct economic modelling.** The shocks are input to the model to estimate the direct and indirect economic impacts of the different stimulus scenarios. The direct economic impacts are those within the sector where demand has changed. For example, an increase in demand for solar power will directly increase jobs in the renewable energy sector, and indirectly bring upstream supply chain impacts.
- **Conduct emissions modelling.** The economic modelling outputs predicted the emissions impact of each shock. Using emissions factors, Vivid Economics calculates the total change in CO2 emissions to demonstrate the mitigation benefits of a green recovery.

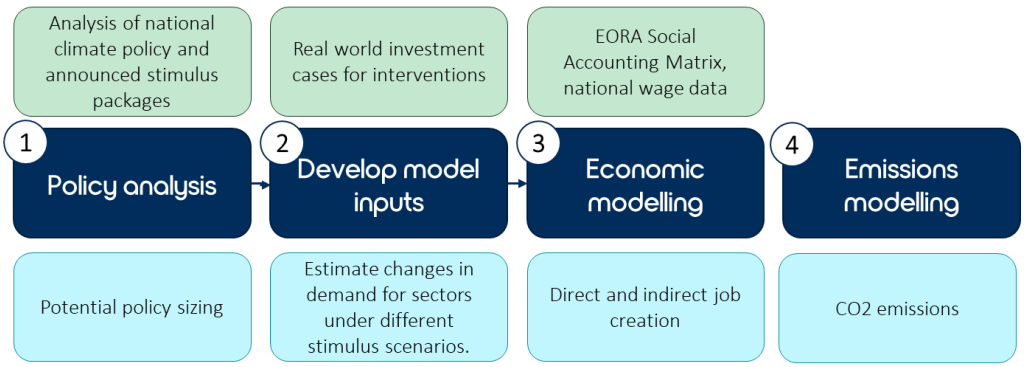

Figure A.1. Overview of modelling approach. Dark blue boxes summarise the steps in the analysis, green boxes indicate inputs at each stage, and light blue boxes indicate outputs.

A.1.1 Economic modelling: How does the model estimate direct and indirect economic impacts?

The analysis leverages Vivid Economics' Intervention & Investment Impact Model (I3M) to estimate the direct and indirect economic impacts of different stimulus packages. The analysis feeds the investment and operational phase spending profiles into the I3M input-output model to obtain estimates of changes to sectors' gross value added and labour costs.

Vivid's I3M model has been applied to assess the impacts of investment in green solutions, as compared to 'reference stimulus' packages deployed by countries in response to the COVID-19 pandemic. The I3M model uses an input-output framework to estimate the short- and long-term impacts of investments and other interventions. To define the inputs to the I3M model, the interventions (both green solutions and reference) are characterised in terms of changes to the final demand for the output of specific sectors within the Eora26 classification scheme.[3] The I3M modelling framework estimates a 'per unit' impact of each intervention, which is then multiplied by the total amount of investment allocated to the intervention. This technical note details the methodology for modelling both the investment green solutions and the reference stimulus.

Input-output tables

I3M is an input-output modelling framework which can be calibrated to work with any input-output data source. This work was drawn from the Eora multi-region input-output table (MRIO). The MRIO is a square matrix that represents the intermediate transactions between all sectors in all countries. In addition, the final demand of households, government purchases, and other agents within each country for the output of all sectors is represented in the Final Demand block. Correspondingly, the primary inputs to sectoral production (labour, capital etc.) are represented in the Primary Inputs block. A simplified version of the table is represented in Figure A.2.

Impact modelling

I3M works by modelling the impacts of investments and other interventions as shocks to final demand in specific sectors. The flowchart in **Error! Reference source not found.**shows how the MRIO is used to calculate the matrix of Leontief multipliers. Multiplying a shock vector (a change in final demand for every sector) by the Leontief matrix produces the increase in sectoral output needed to satisfy the increase in final demand. Relationships between sectoral output and variables such as GVA, employment, and GHG emissions, determined from the Satellite accounts of the Eora database, are used to calculate the impacts of the shock. The shock vector itself determines the 'direct' impacts, while the additional impacts on sectoral output are used to calculate the 'indirect' impacts.

[3] https://worldmrio.com/eora26/. The modelling for the USA uses the IMPLAN data platform https://implan.com/

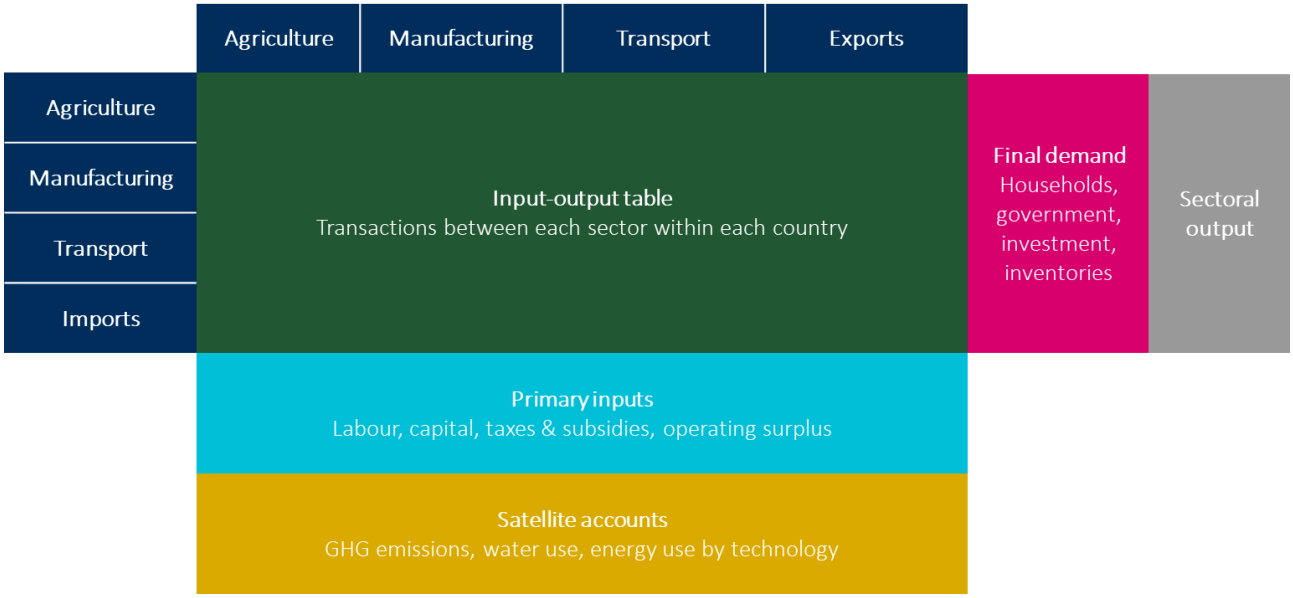

Figure A.2. Simplified representation of the Eora MRIO.

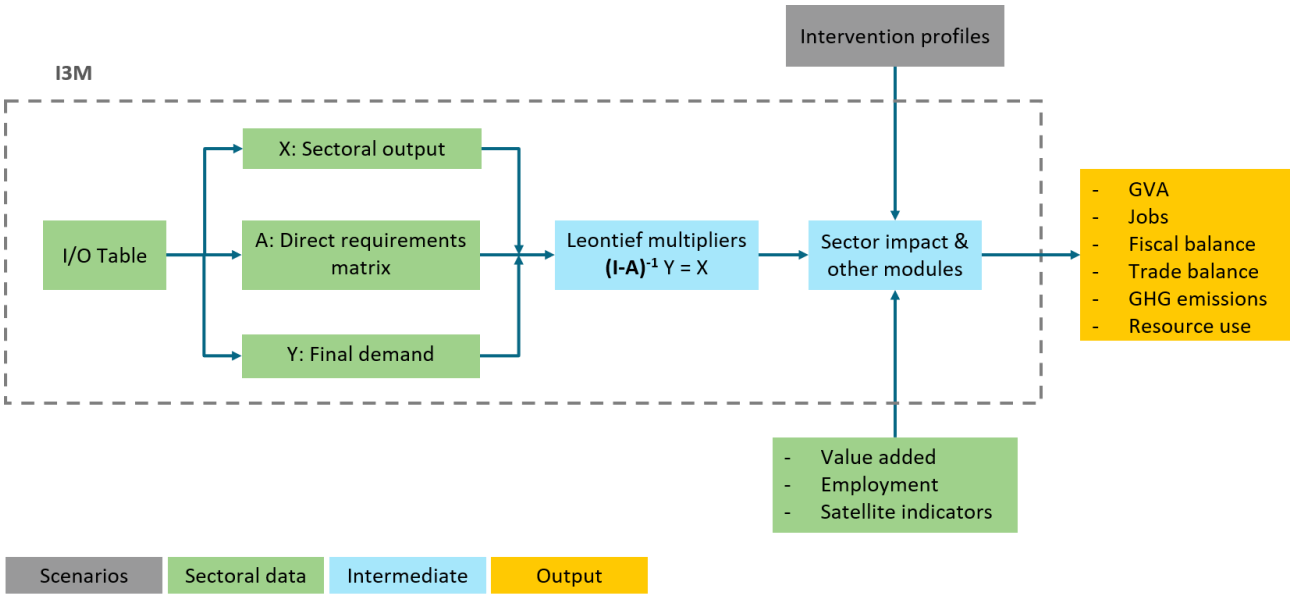

Figure A.3. Representation of the I3M system.

Since the I3M system is fundamentally linear, the per-USD benefits can be calculated before knowing the final allocation. This means that the steps were taken in the following order:

1. Determine the capital expenditure (CAPEX) and operational expenditure (OPEX) spending profiles associated with each stimulus policy.

2. Estimate the per-USD impacts on GDP within the country.

3. Determine the allocation of investment in green solutions for each intervention.

4. Multiply the allocation by the per-USD impacts for each intervention within the country.

Job Impacts

Labour is a key input to production. The economic shock, as modelled by I3M, leads to increased demand for inputs both from the impacted sector and from indirectly affected sectors. The increase in labour demand that results from this is expressed in monetary terms.

To translate the monetary value of increased labour demand into job years, the total labour spending increase, per year, is divided by the average existing wage in the economy.

'Short-term' vs. 'long-term'

The 'short-term' impacts of interventions are defined as those that result from the CAPEX associated with the intervention. The 'long-term' impacts result from the operation phase of the intervention, i.e., the OPEX. In this case, the long-term impacts are calculated on an annual basis.

Assumptions

There are four key assumptions in I3M:

- **Constant returns to scale as production is increased.** In other words, the empirical technology observed in the I/O table is assumed to be the same at any level of production.

- **Slack capacity.** There is enough underused capacity in the economy to scale up production without requiring additional investment. This is considered reasonably valid in the context of an economic downturn.

- **Fixed prices.** The model does not allow for price adjustments. This assumption is critical, as the model does not consider substitution effects between inputs, but rather assumes they will always be used in the same proportions. In the short run, this is a reasonable assumption, but in the longer run, prices will reflect the increase in demand through an upward movement.

- **No induced impacts.** The model excludes the mechanism by which increased household wealth prompts greater consumer spending.

A.1.2. Develop model inputs: How do stimulus packages become model inputs?

The analysis draws on real-world investment cases to translate the interventions into model inputs. Model inputs are the changes in expected demand for different sectors over time, which are captured in spending profiles for the 'investment' and 'operational' phases. The investment phase consists of capital expenditure, which are the costs of manufacturing, constructing, or installing the technologies, such as installing a wind farm or building a power plant. Recovery stimulus is assumed to directly translate to CAPEX rather than OPEX. The 'operational' phase consists of OPEX, including on inputs (such as fuel) and maintenance.

There are three key points to note about this phase of the work:

- The model is agnostic to the source of the expenditure and does not account for any multiplying effect government investment can have. The modelling compares the economic and environmental impacts of like-for-like investment. For instance:
    - The model analyses the expected cost of expanding solar generation, which could be borne by state-owned enterprises or private sector firms.
    - The model analyses the costs of implementing energy efficiency improvements in the building sector. This type of intervention is often part-funded by government through subsidies.
- Each of these interventions is treated in the same way: the total cost of the investment is modelled without regard to the source of the expenditure.
- The spending profiles are developed from real world investment cases from both national and international sources.