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**THE RECOVERY FROM THE COVID-19
PANDEMIC AS AN OPPORTUNITY FOR A
SUSTAINABLE AND RESILIENT WORLD**

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THE RECOVERY FROM THE COVID-19 PANDEMIC AS AN OPPORTUNITY FOR A SUSTAINABLE AND RESILIENT WORLD

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ABSTRACT

The COVID-19 pandemic caused a global health crisis with severe social and economic effects, formulating a converging situation with the climate change, the biodiversity collapse, the subsequent war in Ukraine and the macroeconomic recession. This combination of challenges forms an unprecedented opportunity for addressing them systemically, achieving multiple co-benefits under the broader sustainability context: Alleviating poverty and hunger, inequality, and building resilient societies, based on inclusiveness and strong finance, is the topic of this paper. We explain the concept of this “green” recovery, the pathways to achieve it, the key areas-sectors for transformation, and outline the funding opportunities and necessary changes for its globally sustainable implementation. This paper reflects the work of global experts on the field, joined after the Lancet Commissioned Report on the Recovery from COVID-19, with a strong focus on science-based policy, global cooperation, and international finance.

Keywords: Sustainability; Resilience; Green Recovery; Finance; Global Cooperation; COVID-19.

INTRODUCTION

United Nations (UN) member states unanimously adopted the 17 Sustainable Development Goals (SDGs) in September 2015 at the UN Sustainable Development Summit. The following December, Parties to the UNFCCC met in Paris and reached a historic commitment to fight climate change and strengthen action for a sustainable low-carbon future.¹ The SDGs and the Paris Agreement need substantial adjustments involving governments, civil society, scientists, and corporations. By 2020, several countries had already enacted ambitious plans to achieve internationally agreed targets, such as the European Green Deal (EGD) introduced by the European Union (EU) in December 2019.² In February 2020, the COVID-19 pandemic hit, causing a global health crisis and socioeconomic catastrophe whose full implications are yet to be known. Health experts encouraged outbreak response strategies such as "flattening the curve" to decrease the rate of new infections and reduce pressure on health systems, but these strategies unavoidably sped up the macroeconomic recession and threatened supply networks. While some small environmental wins resulted from lockdown policies, such as reduced emissions and improved air quality, these were short-lived and an order of magnitude smaller than the negative consequences of the pandemic for health and the economy. COVID-19 led to increased poverty and hunger, poor educational outcomes, widened inequality, and directly and indirectly affected global health, with disadvantaged groups disproportionately bearing the burden. Subsequently, the armed conflict in Ukraine, and the inflation are acting as additional pressures to the pre-existing socio-economic, climate, biodiversity and environmental issues. This combination of systemic changes makes the achievement of SDGs even more challenging.

In response, many countries have passed legislation to increase spending, recover from the pandemic, and be more resilient for future challenges. Many have also dedicated Official Development Assistance (ODA) to help lower-income countries recover, and international financial organizations such as the International Monetary Fund (IMF) and the World Bank have also implemented programs to support the recovery. For example, in mid-2020, EU leaders agreed to spend €1.8 trillion on COVID-19 recovery, which includes the expanded 2021-2027 EU budget and the "Next Generation EU" recovery facility. These programs represent an immense opportunity for the world to "build back better" from COVID-19 and to accelerate the transition to an environmentally friendly, inclusive, and equitable global economy (green – sustainable recovery). However, experiences have been uneven, and the results have generally had limited impact. A "return-to-normal" is considered environmentally unsustainable and economically mediocre compared to a "green recovery" approach that would be in line with the sustainability agenda and make societies more resilient for the future.³

At this point, given the complex global challenges we face, there is the opportunity to invest in green infrastructure, technology, and innovation, as a way of speeding inclusive and equitable recovery from the induced recession, achieving the SDGs, and improving the ability to respond to and bounce back from future global crises. This green recovery and the broader sustainability agenda are complementary and supportive of each other, with multiple co-benefits. This paper explores these post-pandemic opportunities for the transition towards a green global economy. The aim is also to understand what would and would not be considered part of a green recovery, explore the pathways for this transition, and explore the key sectors – changes to help "building back better." It also attempts to pull together some lessons learned from the pandemic thus far and make recommendations so that the world can better respond to future crises and use them to create a world of vibrant green economies, equal opportunities, and sustainable development.

GREEN RECOVERY

The importance of the Green Recovery lies in the degree to which COVID-19 is overlaid on other systemic changes. To a large extent, COVID-19 and climate change are convergent crises that share some critical upstream determinants, including the biodiversity crisis and the increasing risk of spillover of zoonotic diseases.⁴ The armed conflict in Ukraine followed almost a year after the COVID-19 breakdown, and this combination of ‘systemic changes’ revealed complex global economic interdependencies and exposed societal structural gaps that perpetuate social, economic, production, environmental, health, and supply chain problems, as well as inequalities. These inequalities are particularly pronounced in developing and emerging economies, where the pandemic is overlaid by pre-existing factors such as the climate crisis and economic and political uncertainties that disproportionately threaten the livelihoods of the most vulnerable groups.^{5,6,7,8}

Green recovery efforts need to recognize how these systemic challenges intersect and avoid deepening these problems and inequalities; to do so would derail efforts to achieve the Sustainable Development Goals (SDGs). The effort to address the shared determinants of COVID-19 and the broader overlaid sustainability issues is an opportunity to obtain co-benefits and increase the cost-effectiveness of the investments. As suggested by Hepburn et al.,⁹ there is evidence that investments in clean physical infrastructure, building efficiency retrofits, education and training, natural capital, and clean R&D have high potential concerning the economic multiplier and climate impact metrics.^{9,10}

Part of the economic multiplier effect can be via health co-benefits, as shown in a study reporting that the costs of change mitigation strategies in line with the Paris Agreement can yield substantial health co-benefits where economic cost savings can by themselves offset the costs of mitigation.¹¹ An analysis of the health co-benefits of Nationally Determined Contributions for the year 2040 for Brazil, China, Germany, India, Indonesia, Nigeria, South Africa, the UK, and the USA, found that the health co-benefits of achieving the goals of the Paris Agreement and the SDGs include an annual reduction of 1.18 million air pollution-related deaths, 5.86 million diet-related deaths, and 1.15 million deaths due to physical inactivity across the nine countries.¹² The recent literature has proven the significant health benefits of such sustainable policies, about air pollution,¹¹ climate,¹³ mental health and violence,¹⁴ dietary habits,¹⁵ and of course the end of any armed conflict which is against any sustainability principle.^{16,17}

A relevant gap in the current evidence is related to the social distribution of co-benefits and to what extent these co-benefits, if materialized, will reduce existing inequalities.¹⁷ Another relevant gap relates to gender equity in climate recovery policies.^{19,20,21} Both social and gender equity are crucial for the recovery, which needs to embrace a "just transition" that recognizes the vulnerability of developing regions. The broader sustainability transition should prioritize inclusive innovation and growth to create secure, decent green jobs that will help communities become resilient and thriving.^{22,23} In any case, the recovery must ensure the wellbeing of communities and consumers.^{24,25,26}

PATHWAYS TO ACHIEVE THE GREEN RECOVERY

The progress to meet the SDGs has been slow, and their political impact has also been limited, except for a few cases.²⁷ COVID-19, the armed conflict in Ukraine, and inflation is added pressures on the pre-existing climate, biodiversity, and environmental issues, so this combination of systemic changes makes the achievement of the SDGs even more challenging. However, the current policy agenda includes opportunities to sustainably recover. This section gives an overview of these pathways to achieve a green recovery.

Sustainable Development Goals (SDGs)

The 2030 Agenda for Sustainable Development, agreed upon by all UN members in 2015, contains 17 Sustainable Development Goals (SDGs) and 169 objectives (Table 1). The Agenda is a pledge to eradicate poverty and achieve sustainable development on a global scale by 2030, considering three pillars of sustainable development – economic, social, and environmental. The SDGs are international in scope and universal in application, considering the different national specificities, abilities, stages of development, and specific difficulties. Thus, all countries share responsibility for achieving the SDGs, and each has a critical role to play locally, nationally, and globally, under the principle of "leaving no one behind".¹

Table 1: A brief presentation of the 17 sustainable development goals

Goal 1 - No Poverty	End poverty in all its forms everywhere
Goal 2 - Zero Hunger	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3 - Good Health & Well Being	Ensure healthy lives and promote well-being for all at all ages
Goal 4 - Quality Education	Ensure inclusive and fair quality education and promote lifelong learning opportunities for all
Goal 5 - Gender Equality	Achieve gender equality and empower all women and girls
Goal 6 - Clean Water & Sanitation	Ensure availability and sustainable management of water and sanitation for all
Goal 7 - Affordable & Clean Energy	Ensure access to affordable, reliable, sustainable, and modern energy for all
Goal 8 - Decent Work & Economic Growth	Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all
Goal 9 - Industry, Innovation & Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
Goal 10 - Reduced Inequalities	Reduce inequality within and among countries
Goal 11 - Sustainable Cities & Communities	Make cities and human settlements inclusive, safe, resilient, and sustainable
Goal 12 - Responsible Consumption & Production	Ensure sustainable consumption and production patterns
Goal 13 - Climate Action	Take urgent action to combat climate change and its impacts
Goal 14 - Life Below Water	Conserve and sustainably use the oceans, seas, and marine resources for sustainable development
Goal 15 - Life on Land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16 - Peace Justice & Strong Institutions	Promote peaceful and inclusive societies for sustainable development, supply access to justice for all, and build effective, accountable, and inclusive institutions at all levels
Goal 17 - Partnerships for the Goals	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

The SDGs, like the Paris Climate Agreement, call for profound changes in every country, requiring coordinated efforts by governments, civil society, research, and business. However, stakeholders lack a broad consensus on how to operationalize the 17 SDGs. Therefore, Sachs et al. (2019)²⁸ suggested six “Transformations” that integrate the SDGs in public policy interventions, namely: (1) education, gender, and inequality; (2) health, well-being and demography; (3) energy decarbonization and sustainable industry; (4) sustainable food, land, water and oceans; (5) sustainable cities and communities; and (6) digital revolution for sustainable development. These Transformations must be systems-based to address the most critical synergies and trade-offs between essential interventions. For example, when promoting system-wide decarbonization, Transformation 3 encompasses all primary energy usage and Transformation four, integrates agriculture, food, and biodiversity, as the first two are the primary causes of biodiversity loss.

The European Green Deal (EGD)

The European Green Deal (EGD) is a collection of policy measures introduced by the European Commission to achieve climate neutrality in the European Union (EU) by 2050. The plan's creation is prompted by environmental concerns such as climate change, biodiversity loss, ozone depletion, water pollution, urban stress, waste production, etc. It has goals extending to many different sectors, including construction, biodiversity, energy, transport, and food. Moreover, it covers a broad range of policy areas such as clean energy, sustainable industry, buildings and renovation, farm to fork, ending pollution, sustainable mobility, biodiversity, and sustainable finance.² Following the launch of the EGD in 2019, the European Commission introduced a significant number of policies and strategies to support its implementation and the achievement of its ambitious goals. These documents cover a wide range of sectors of the economy, articulating the substantial impacts that achieving these goals will have on the way financial markets work, on society, and on the everyday life of European citizens.

The EGD is becoming a part of EU economic policy, which will "place people and planet at the centre of EU economic policy," as they have also chosen to incorporate the SDGs into the European Semester¹. Additionally, EU leaders responded to the enormous health, environmental, and economic challenges faced by the pandemic with a powerful "Next Generation EU" package of policies and funds to aid economic recovery while pursuing Europe's green and digital transformation.²⁹ The EU has a great chance to transform and become a model for the rest of the world if it has the funds and the will to make Europe a digital, sustainable, and more resilient continent. The NextGeneration (NGEU) Recovery Package is a recovery plan of €750 billion agreed upon among EU member states, on top of the EU's long-term budget of €1.074 trillion for the 2021-2027 multiannual financial framework. This sums to €1.8 trillion, an unprecedented amount to support member states in recovering from the negative consequences of the COVID-19 crisis and the EU's long-term priorities across various policy areas.

The link between the SDGs and the EGD

The EGD and the 17 SDGs share common aims, meaning that the implementation of EGD policies would simultaneously support actions that will contribute to achieving various SDGs. Sachs, J., Koundouri, P., et al. 2021,³⁰ presented a method to link the aims of the EGD Policy Areas with those of the 17 SDGs, which is based on a text-mining exercise to match specific parts of the EGD document to all relevant SDGs. The findings show the strong relation between SDGs and EGD policy areas, and the vibrant connection between the two frameworks.

In the 2nd Annual Report of the SDSN's Senior Working Group on the European Green Deal, a cross-mapping of 22 European Green Deal Policies to the 17 SDGs was performed, with text mining through both *human* and *machine learning* approaches.³¹

The main conclusion from the *human* approach is that overall, the policies resulting from the European Green Deal affect all SDGs, some to a greater extent and others to a lesser extent. But, the most significant impact is found on

¹ [The European Semester](#) serves as a framework for the integrated monitoring and coordination of economic and employment policies across the European Union. Since its inception in 2011, it has become a well-established forum for discussing the fiscal, economic, and employment policy challenges confronting EU countries on a yearly basis.

SDG 13 (climate Action), SDG 9 (industry, innovation, and infrastructure), SDG 7 (affordable and clean energy), SDG 12 (responsible consumption and production), and SDG 8 (decent work and economic growth).

The results of machine learning method confirmed the results of human approach and revealed more connections between EGD policies and the SDGs, not identifiable from the human eye. More specifically, the ML method suggest that most of the EDG policies are connected to SDG 17 (partnership for the goals), SDG 12 (responsible consumption and production), and SDG 16 (peace, justice, and strong institutions. Following, a strong connection is seen with SDG 13 (climate action), SDG 7 (affordable and clean energy), and SDG 9 (industry, innovation, and infrastructure). Also, an interesting result concerning the “New Industrial Strategy” and the “Updating the 2020 Industrial Strategy” documents, came up. Although, a stronger connection between these documents to SDG 7 (affordable and clean energy) would be expected, considering the topic of the documents and the theme of the SDG, machine learning model reveals a stronger relationship with SDG 8 (decent work & economic growth) and SDG 12 (responsible consumption and production) instead. Furthermore, the EU's Blue Economy for Sustainable Future policy seems more relevant to SDG 8, SDG 12, SDG 17, and SDG 7, rather than SDG 14 (life below water), as intuitively expected.

Recovery and Resilience Facility

The concept of building more resilient and inclusive human-environmental systems and societies is another policy-supported pathway in line with the aims of green recovery, and a lesson that governments can learn from the pandemic. The climate and biodiversity crises must be incorporated into COVID-19 recovery plans, as it is becoming increasingly clear that the world has passed the limits of our planet.³² Any such plans must align with what the United Nations General Assembly has called "The Future we want", which embraces Agenda 2030 and the 17 SDGs, as well as the Paris Agreement of 2015. The EGD has laid forth a detailed vision for the "Future Europe Wants", namely a green and digital, job-based, inclusive recovery from the pandemic.³⁰ As mentioned in the previous section, the EU's NGEU is an effort to help and speed up the transition to sustainability in the EU. The Recovery and Resilience Facility (RRF), the cornerstone of the NGEU, accounting for €672.5 billion or 90% of the NGEU budget, will offer loans and grants to assist reforms and investments, and requires member states to submit Recovery and Resilience Plans (RRPs), consistent with EU priorities, namely: (1) Enhancing economic and social resilience through increasing growth potential, job creation, and economic and social stability; (2) Addressing the issues derived from the European Semester's country-specific recommendations; (3) Promoting a green transition by allocating at least 37% of resources to climate action and environmental sustainability; and (4) Promotion of the digital revolution by devoting at least 20% of resources to the EU's digital transformation.³³

Systemic, innovative and integrative policies

The above indicative pathways show that they are based on common principles, reflecting a broader sustainability model, and that they are complementary and/or closely related. In general, the recovery policies should be implemented based on a systems approach to address several objectives simultaneously and promote policy instruments and technical solutions that can be applied across sectors. Decarbonization and human-environmental sustainability are at the core of the international agendas, as are economic development (including alleviating poverty) and social inclusion that leaves no one behind. Public investments, phased-out fossil-fuel subsidies, market processes, regulatory frameworks, and land-use restrictions are policy instruments, while technology solutions cover many present and emerging technologies, from smart power grids to synthetic fuels.

A systems approach, or efforts toward any one or more objectives, connects one or more of the policies mentioned above with the necessary instruments or technical solutions.³⁴ While a single action can have negative consequences for another, a series of coordinated efforts can have a multiplier effect and accomplish more than one goal at once.³⁰

KEY SECTORS FOR TRANSFORMATION

The COVID-19 pandemic, followed by the armed conflict in Ukraine and inflation, have highlighted key economic vulnerabilities and widespread consequences. A key lesson from this should be that rather than simply reacting to crises and adapting to the new situation, economies and communities should become more resilient to better cope with future challenges. Science, technology, sustainable policies, and strong finance systems have the potential to play a significant role in that, reducing the impacts of multiple interconnected potential hazards posed by climate change, biodiversity loss, pandemics, wars and recession. These efforts should make economies "greener", more digital, more resilient, and more capable of achieving the SDGs and addressing the overarching challenges. A radical reform of key sectors is necessary. As mentioned in the earlier sections, this transition to sustainable and resilient societies is systemic and holistic, so all sectors are part of it. In this section, some indicative sectors are further discussed.

Sustainable trade

International trade has contributed to adverse environmental and social impacts,³⁵ such as carbon dioxide emissions, water use, land use, modern slavery, income inequality, and much more. These impacts are also known as spillovers and are driven mainly by consumer demand in the developed world. It has been found that for both raw materials, and emissions, among other environmental impacts – costs, the developed world ‘outsources’ the developing countries, while the distribution of the associated production or trade benefits is uneven.³⁶ The Green recovery must ensure that any strategy implemented for transitioning economies out of COVID-19 does not inadvertently lead to outsourcing and inequality phenomena. This has been shown to occur widely worldwide.^{37,38}

Energy Sector

Before the COVID-19 pandemic, the global energy system was already transitioning to clean energy, also targeting the reduced GHG emissions through the extensive deployment of a wide range of clean energy technologies.^{39,40} Therefore, the existing status quo presents a massive opportunity for the renewable energy sector.

The global electricity and transport sectors rely heavily on fossil fuels, such as coal and crude oil, respectively. Increasing demand for fossil fuels has resulted in a significant rise in global emissions during the past two decades. With this increase in emissions and concerns about resource depletion, research into renewable energy is growing worldwide.⁴¹ Specifically, renewable energy is being recognized as a critical part of the COVID-19 economic recovery, which can create more “green” jobs and strengthen resilience, while also accelerating the transition to a low-carbon energy future with reduced GHG emissions – an urgent task for meeting the goals of the Paris Agreement.^{42,43,10} According to IRENA, under the Planned Energy Scenario (PES),² the workforce occupied in the energy sector could escalate to almost 140m workers globally, from 106 million, while a shift to greener jobs would have multiple co-benefits (e.g., generating employment and economic stimulus, reducing GHG emissions and air pollution, providing a sustainable, energy-secure future, etc.).⁴⁴ Aste N, Bocciolone MF et al.⁴⁵ found six central decarbonization pillars for managing the energy system's complexity: zero-carbon electricity, intelligent power grids, electrification of end uses, materials efficiency and circular economy, green synthetic fuels, and sustainable land use. Except for green fuels, which require a longer time horizon and significant investments to reach the market, these pillars provide policymakers with a set of transformation pathways that can be at once pursued. For example, smart grids can enable fast penetration of low-cost renewable electricity. Also, specific circular economy options are cost-effective and require business awareness and training and targeted incentives, and sustainable land use can help both climate change mitigation and adaptation.

Countries’ investments in clean energies such as hydropower, wind, solar, bioenergy or other more specific solutions - e.g., regenerative systems,⁴² or using algae as a feedstock for biofuel production,⁴⁶ should aim to achieve energy autonomy. Such investments should be accompanied by respective focus on energy storage infrastructure to perfect

² The Planned Energy Scenario (PES) is the primary reference case, providing a perspective on energy system developments based on governments’ current energy plans and other planned targets and policies, including Nationally Determined Contributions (NDCs) under the Paris Agreement.

the usage,⁴⁷ while diversified energy portfolios should be looked for. Recent research has proved that relying on a single (renewable) energy source can have negative effects on other ecosystem components, or not being as dependable for multiple sectors, compared to having diversified multi-purpose energy portfolios.⁴⁸

The Agriculture and Food Sector

The agri-food sector is a cross-disciplinary example combining agriculture, livestock and food production, economy, climate, water, energy, ecosystems health, land use, forests and biodiversity, policy, social equity, and many more.³⁴ The recent armed conflict in Ukraine sharpened a broader underlying economic-food-energy crisis. Covering increasing human needs with limited and deteriorating resources, minimizing waste and environmental footprint, and being in line with the broader sustainability agenda mentioned is a complex and challenging problem. However, this sector has perhaps the most significant potential for achieving an impactful transformation, given its direct and extensive interface with all the other associated fields. Agri-food sector has the biophysical potential to offset and sequester about 20% of total annual emissions through improved soil management techniques. Reforestation can add to that figure, subject to avoiding negative impacts from changing the earth's albedo.

Agri-food performs very poorly in delivering the requisite quantity and quality of food and nutrition to humankind. According to the FAO, over 811 million people are undernourished, of which more than half (418 million) live in Asia, more than a third (282 million) in Africa, and over 60 million in Latin America and the Caribbean. Hunger worsened during the COVID-19 pandemic, because of disrupted supply chains, and was the worst in Africa, where 21% of the population is undernourished, more than double that of any other region.⁴⁹ To meet the needs of the current global population and expected increases, the world needs to produce at least 50% more food by 2050 to adequately feed 9 billion people, assuming delivery systems function effectively. However, over the next 50 years, climate change could reduce food crop yields by 16% worldwide, and 28% in Africa. Agriculture is also a significant part of the climate problem; it generates up to 25% of total GHG emissions, including emissions through land-use change; without action this could rise to 70%. The pollution of ecosystems with emissions, fertilizers, and pesticides, is also a considerable burden that needs to be mitigated.

There is the opportunity to transform the broader agri-food sector through the green recovery pathways, and the need for scientifically supported solutions is now a necessity. Food-Energy-Water-Ecosystem-Climate sectors should be managed as an interconnected system and not as competitive users.^{50,34} The clean energy, renewable portfolios, circular economy, net-zero emissions pathways are complementary and all support the sustainable transition of the agri-food sector. New technologies, regenerative agricultural systems, and precision agriculture, and reduction of food waste, among other solutions pointed out by the literature, have a great potential to achieve the green recovery of the agri-food sector.⁵² Biotechnology for example, can help farmers grow more nutritious plants, more resistant to droughts, flooding, and salinity, and with higher yields. Such solutions can increase productivity, are environmentally friendly, economically and time efficient, and are particularly important to produce wealth that would be equitably shared.⁵³

To recover from the COVID-19 recession and the increased challenges facing the agri-food sector after the war in Ukraine, significant efforts should be deployed to accelerate its sustainability transition. This should come from fair policies supplying considerable support for smallholder farmers in developing countries. In the industrialized countries, incentives should aid in the deployment of circularity, precision agriculture and climate-smart agriculture, and major campaigns to reduce food waste are all parts of what a green recovery should entail.

Cities and Urbanization

Urbanization is the gradual shift in residence of the human population from rural to urban areas, combined with the expected growth of the world's population. From 1950 to 2018, the world's urban population has grown from 751 million to 4.2 billion people; In 2018 55% of the world's population lived in urban areas, and this is expected to increase to 68% by 2050.⁵⁴ In other words, an added 2.5 billion people will move into urban areas by 2050, with close to 90% of this increase taking place in Asia and Africa. By 2030 it is expected that there will be 43 megacities, mostly in developed regions, with more than 10 million inhabitants. Currently, one in eight people lives in 33 megacities

worldwide, whereas close to half of the world's urban dwellers reside in smaller settlements with fewer than 500,000 inhabitants.

95% of all cases of COVID-19 occurred in cities, and according to UN-Habitat, compact, well-planned programs to improve access to public spaces and affordable housing improved public health, the economy, and the pandemic experience.⁵⁵ Therefore, this calls for investment in areas that are overcrowded, cut off from other parts of the city, and at-risk due to environmental and health hazards. In fact, as with earlier public health crises, the key determinants of risk for urban residents are inequality, inadequate housing, and lack of access to clean water, sanitation, and waste management.⁵⁵ Leveraging recovery packages to invest in these areas and improve these indicators will support fast recovery from COVID-19, improve health outcomes in the long term, and build resilience to future crises.

As urbanization grows, the recovery from COVID-19 – which is synonymous with sustainable development, depends increasingly on the successful management of this growth, especially in low and middle-income countries where the pace of urbanization is projected to be the fastest. Urbanization is an embedded issue in a broader research field, that of cities. Sustainable cities should incorporate technological, engineering, economic, social, ethical, environmental, political, and cultural aspects in a more human-centric way. Sustainable cities are an opportunity to act as systems of controllable strengthening of the SDGs' objectives, including equitable transition to green jobs, meeting the infrastructure needs, land use and green areas, housing, transportation, energy systems, social justice, services such as digitalization of economies and industries, and of course essential service needs such as education and health care, for the growing populations. Cities, as units have a great potential as green recovery tipping points, because their nature as complex interconnected systems, can support integrated policies that build on existing economic, social, and environmental ties and improve the lives of both urban and rural dwellers. To ensure that the benefits of urbanization are fully shared, policies to manage sustainable urban growth need to provide equitable access to infrastructure and social services, focusing on the urban poor and other vulnerable groups for housing, education, health care, and decent work, and gradually achieving more SDGs.⁵⁶

The Health Sector

The health-related industrial sector includes pharmaceutical production, medical equipment manufacturing, and the production of chemicals for public health campaigns; it also consumes energy, requires transportation, produces chemical waste, and involves other activities responsible for GHG emissions. According to the health sector's annual climate footprint report, it is equivalent to 514 coal power plants and corresponds to 1-5% of global net emissions, with unequal contribution among countries.³⁵ One crucial area that can influence the practices of the health sector is procurement. For example, health products are one of the UN's largest procurement categories, which increased by 25.5% to US \$5.5 billion from 2019 to 2020.⁵⁷

Promoting a more sustainable health sector is vital to lower emissions, mitigate the climate crisis, reduce impacts from chemical pollution, and reach more equitable access to medicine and healthcare globally. Once again, COVID-19 and the climate crisis appear as converging situations requiring policies to integrate recovery with sustainability. The health sector is explicitly named in the UNFCCC's Race to Zero campaign to promote a "zero-carbon recovery that prevents future threats, creates decent jobs and unlocks inclusive, sustainable growth".⁵⁸ Another initiative, Health Care Without Harm, counts 1,350 members in 72 countries, representing the interests of over 43,000 hospitals and health centers that are working on estimating and reducing their emissions from energy, transport, waste, and gases, benchmarking their footprints, and promoting suitable solutions.⁵⁹ Several initiatives, including Sustainable UN System (SUN), Greening Procurement in the Health Sector, and Greening the Blue, have achieved significant progress.

The COVID-19 pandemic has proven the inability of today's society to cope with a major global shock effectively. The pandemic has produced an enormous cost of human lives and has profoundly altered social and economic functioning, with significant impacts on the health, environment, and governance systems in most countries. COVID-19 recovery packages are an unprecedented opportunity to invest in strengthening health systems but should not do so at a cost to the global climate and environmental degradation. By learning from the experiences of so many hospitals and health facilities in reducing their environmental footprint, we can use recovery packages to green the health sector

and make it resilient. Resilience, understood as the set of capacities of natural and social approaches to prevent, react, and recover from global shocks, requires enhanced governance, funding, human and material resources, and the ability to adopt flexible and innovative approaches to service provision.⁶⁰ Modern epidemics have shown the importance of considering structural, political-economic conditions together with contextual and ill-defined processes that result from complexity and uncertainty. To address this complexity, it is necessary to consider some key strategies.⁶¹ The first is how scientific evidence is managed and incorporated into political decisions, within a larger context of pre-established power relations and great uncertainty. Second, economies' behavior and the restrictions imposed by conventional models of economic growth should be understood. Third, we must understand new political relations that change citizen-state's traditional ties and that, as in the case of COVID-19, range from aspects such as solidarity and response to political authority, to the questioning of democracy. The example of Trinidad and Tobago, that has been ranked among the best on four of the six WHO criteria for rolling back COVID-19 "lockdown" measures,⁶² shows that, although developing countries face many health system challenges; political will, evidence-informed decision-making, respect for science, and timely, coordinated, collaborative actions can strengthen the resilience and response of the health system during a health emergency.

Sustainable mining

Most sectors must evolve from a fuels-based to minerals-based energy production, storage, and distribution system, in order to achieve net-zero emissions. Central to this emerging minerals-based energy system are critical minerals such as copper, nickel, cobalt, lithium, and rare earth minerals. Overall minerals demand is expected to grow 400% by 2040 to meet the 2016 Paris Agreement and from 500% up to 600% to meet net-zero globally by 2050, with exceptionally high growth for minerals related to electric vehicles, wind turbines, and solar panels.^{39,40,63} By 2040, the demand for lithium is forecast to grow up to 42 times 2020 levels; followed by graphite, cobalt, and nickel (around 20-25 times); and rare earths (7 times),⁴⁰ while the expansion of electricity networks is expected to double copper demand by 2040. Many minerals come from a small number of producers, and the production of many energy transition minerals is more geographically concentrated than for oil or natural gas.⁴⁰ For example, the world's top three producers of lithium, cobalt, and rare earth elements control well over three-quarters of global production. This high level of concentration, compounded by complex supply chains, increases the risks of physical disruption, trade restrictions, or other developments in major producing countries.

The transition to the net-zero model must be done in an equitable way, accompanied with efficient demand management including circular approaches, and alternative supplies, including deep seabed mining (DSM) and terrestrial mining (TM).⁶⁴ Satisfying rising demand is depended on the responsiveness of primary supply given current ability (i.e., the price elasticity of supply), and long-term shifts due to investment and technological progress. Growing demand in the face of relatively unresponsive (inelastic) supply can result in a long-term trend of rising minerals prices, which invariably leads to a super-cycle, higher energy costs and a slower transition to green energy. Over a more extended period, increasing fees and expenses could induce quicker green technological change, dampening price increases and helping the green energy transition. Significant investments and more price-responsive supplies are necessary to avoid minerals shortages, increased costs, and thus a slower green energy transition.⁶⁵ The relevant transition plans should pay particular attention to the associated environmental justice and human costs issues, as well as protecting local populations' human rights and ecological health, and addressing the disparity in the distribution of economic benefits derived from mining.^{66,67,68} Sustainable minerals sourcing goals are in line and complementary overall with the SDGs and the Paris Agreement.

Research and Development

The above key sectors suggest a number of opportunities for complementary greener policies, with co-benefits for all sectors, in line with the mitigation of the climate change crisis. The risks of exceeding the 1.5-2.0 °C target, and the complex economic-environmental challenges occurred after COVID-19, wars, and the recession, are so significant that all technologies that could contribute to alleviating them, need to be evaluated.

One example is Geoengineering, which is currently unknown whether it would work, how well it would work, or the potential risks. However, given the severity of the situation, it should be included for consideration in green recovery packages. A Nature Editorial ⁶⁹ entitled “Give research into solar geoengineering a chance” argued there is no substitute for aggressive cuts in GHG emissions. Such research includes the removal of CO₂ from the atmosphere through Direct Air Capture (DAC), large-scale green walls, exploring the oceans’ potential to function as carbon sinks, or other solutions related to targeted rainfall, large-scale reforestation, or sun-blocking. In March 2021, the US National Academies of Sciences, Engineering, and Medicine recommended that the US government set up a coordinated federal research program to investigate solar geoengineering. The proposal is based on a major study undertaken by the National Academies and presented in a report entitled “Reflecting Sunlight” which recommends establishing a research program costing the US \$100-200 million over the first five years, to assess the potential benefits and risks of solar geoengineering, as well as the ethics and public perception of such technologies.⁷⁰

Another example of an agricultural system that meets urgent food production needs while also producing food and energy with zero-waste is “regenerative agricultural systems”.⁷¹ The potential of seaweed aquaculture should be also examined. Recent studies in Nature Sustainability shows that seaweed aquaculture’s expansion can produce food, animal feeds, and fuel, while significantly reducing agricultural land and carbon emissions.⁷² Several other promising fields could be further supported; for example, sunlight-based technologies can offer reliable disinfection for providing drinking water solutions, along with solar desalination, which can be critical for rural populations and developing countries.^{73,74,75}

Place-Based, Inclusive Policy, and Finance

Policy and Finance are important overarching factors that should support all key sectors for the necessary transformation. While the complex climate, economy, pandemic, conflict, and biodiversity challenges are global, the response needs to build on regional and local actors. Recovery packages are a clear opportunity to green our economies, as many national and supranational recovery plans have sustainability at their core.¹⁰ However, only 17% of the total recovery spending has been distributed to environmentally positive measures.⁷⁶

As mentioned, cities, and regions can play a vital role in the transition to net-zero GHG emissions.⁷⁷ Rural regions should be part of the transition, as they cover around 80% of the territory in OECD countries, hold the biodiversity and ecosystem services we need to sustain our lives, and are increasingly under threat.⁷⁶ Greening the policies and budgets of subnational governments is needed on both the expenditure and revenue sides. Recovery plans need to be inclusive and place-based. Local governments are estimated to oversee and be able to cut up to one-third of GHG emissions, with the remaining two-thirds dependent on national and state governments or coordination across different levels of government.⁷⁷ Climate challenges and opportunities vary greatly across places and supporting the most affected areas and the most vulnerable communities early is key to ensuring a just transition. GHG emissions per capita vary more strongly across regions within countries than across countries.⁷⁸ This implies that moving to net-zero emissions will be challenging because of the affected employment supporting the current high-emission activities (e.g., coal mining). The green transition will bring employment opportunities; however, they may not arise where losses occur, and require the acquisition of new skills. Climate change poses unique challenges for adaptation, which requires locally tailored approaches as its physical impacts and costs will differ significantly across regions.

Public action and investment alone are not enough to achieve the Paris Agreement’s targets; involvement of the private sector is crucial. In OECD countries, small- and medium-sized enterprises (SMEs) account for 99% of all businesses, 60% of total employment, and 50-60% of national business sector value added.⁷⁸ Many SMEs are already leading on green technologies, and they should be central to the green transition. The private sector can also play a key role in closing the necessary funding gap to implement the transition to a circular economy. A recent OECD survey, looking at over 50 cities and regions worldwide, shows that nearly three-quarters of them (73%) do not have enough funding to do so.⁷⁶ These pressures are likely to worsen, as the pandemic and then the recession stress local government finances.

Along with a granular approach, multilevel governance, and finance mechanisms to coordinate policies; a clear evidence-base and recommendations to find, prioritize, and implement climate action measures and policy priorities and check progress and scale-up ambition are needed. One example of a successful initiative to achieve place-based climate action is the OECD Centre for Entrepreneurship, SMEs, Regions, and Cities.⁷⁹ Through its unique perspective, recommendations, and data at the subnational and firm level, it supports evidence-based decision making for policymakers, local governments, SMEs, and the social economy, to drive the net-zero transition and build systemic resilience.

Following the 2008 financial crisis, governments mainstreamed large amounts of money to the most polluting businesses and the wealthiest people. Learning from this mistake, following the COVID-19 pandemic we must invest in what strengthens our society and economy in the face of a crisis. We must lay the groundwork for a green, circular economy based on the SDGs, as a framework, allowing for more time for their achievement, perhaps until 2050. As mentioned, all sectors of our societies are part of the sustainability transition and green recovery, and the more systemic this effort is, the higher and faster increases in social, economic, health, and environmental resilience will be achieved.

FINANCING THE GREEN AND SUSTAINABLE RECOVERY

Sustainable, Long-Term Finance and Fiscal Policy in the Recovery from COVID-19

The COVID-19 pandemic has completely altered the landscape of international economies and has rolled back or even halted progress on the 2030 Agenda. Many parts of the world focused their COVID-19 recovery on short-term needs, mainly suppressing the pandemic, providing direct support to workers and firms, and implementing tax deferrals, to the detriment of urgent, longer-term structural needs related to the climate crisis and Agenda 2030. The short-term response, mainly through economic injections, has failed to account for mid-term and long-term effects and objectives. There is an urgent need for a more unified, forward-looking plan that puts the idea of sustainable recovery at the center.

Solutions rely on developing strategies with very long-term lending and investment horizons. Supplying access to relatively short-term market finance alone is not the answer; as seen in some countries, this will exacerbate the risk of debt distress. Relying on private finance to fill all the gaps is also an incomplete solution, as it is suitable in some but not all SDG contexts. Moreover, capital markets should be re-oriented towards investing in sustainable development-aligned priorities by encouraging the removal of short-term incentives along the investment chain. The current business model, which prioritizes short term financial returns for shareholders, is not conducive to supporting businesses' contributions to the SDGs.⁸⁰ Regulation and innovation will only converge when investment is stable.⁸¹

There is no shortage of money; the challenge is to direct it efficiently towards narrowing the innovation gap. The Next Generation EU Recovery Package can and should help redirect growth towards innovation, long-termism, and resilience; it should require member states to prioritize challenge-oriented areas, including green, digital, and healthcare investment. The SDGs should be used to guide conditions placed on available funds. Financial markets were flooded with liquidity in 2008 due to unconditional bailouts. It is possible to link COVID-19 relief conditionalities to sustainable outcomes, and there are differences between 'emergency' liquidity lending (which can be challenging to attach restrictions to) and longer-term lending directed towards recovery.⁸² Conditions can be applied to the latter to ensure that bailouts are organized in ways that save sectors while also investing in employees and preparing them for new technology. Conditionalities should not be perceived as creating hurdles to doing business. Companies that pivot quickly will be the most competitive, innovative, and long-lasting.

In sum, it is necessary to develop and implement long-term fiscal policies, support the SDGs and finance innovation.

The urgent need to fund the SDGs: A multi-stakeholder funding effort

This section talks about the global funding gap for the SDGs, which was brought to light after the pandemic. Another element that was made clear was the interconnectedness of the SDGs, meaning that failure to address anyone hinders progress on others. This also creates systemic risk for the world should the plans be missed, creating a potentially vicious circle of environmental degradation, political upheavals, economic disruption, conflict, and human security risk, making the need to meet the SDGs an urgent one for the world.

The overall volume of financing the SDGs is insufficient and its allocation is imperfect. The SDG funding gap (estimated from US \$8.4 trillion to US \$10.1 trillion,⁸³ is widened by continued underspending, increasing costs of meeting the goals, the setbacks suffered from the COVID-19 pandemic and the war in Ukraine. While climate-related goals account for about 22% of the SDG funding requirement, they receive about 44% of the current funding. This is expected, given that a strong business case has been set up for renewables and green investing. However, the total financing need still exceeds current commitments, and climate targets are unlikely to be met (even with sufficient funding) if other SDGs relating to uplifting the developing world economically and socially are not sufficiently addressed. Most of the current spending appears to be allocated to advanced economies, targeted to reduce carbon emissions, leaving developing countries with more outstanding shortfalls in investment to address other SDGs, and a general shortfall in funding for the human, economic, and social SDGs (which account for about 40% of the total funding need, but only 32% of current funding).

Funding the US \$84-101 trillion shortfall through 2030 is a challenge beyond governments' capacity and ability and requires private sector capital deployed at scale. Multi-stakeholder cooperation, including cross-governmental, individuals, and private corporations' coordination is needed. On the positive side, the largest global financial institutions are rapidly scaling their commitments in this regard (including the 'race to the top' example of large businesses to achieve SDG and climate commitments.⁸³ Developed and developing governments have a clear mandate to cooperate and drive capital towards sustainability and development and can partner with the private sector finance industry, for example by filling gaps where it is not practical for private financial institutions to supply funding alone. Individuals own \$255 trillion of liquid assets and represent 80% of the world's consumption, and when acting collectively, they can mobilize systemic change and redirect the global flow of funds.

Unlocking this multi-stakeholder collective action will likely require technology platforms, mainly social media platforms, which have built deep relationships with over half the world's population, implying an essential role for 'Big Tech' too. Efficient collaboration between these parties will require a shared blueprint of goals, deliverables, roles, and actions for the world to own. This would need to include new rules of engagement, new principles of competition and collaboration, new resource management regulations, and new fiscal and monetary policy directions, while encompassing a diverse range of national strategies, power blocs, and international coalitions. Such global blueprints have traditionally been the remit of the UN, which has met its member states to build consensus on the most significant issues facing the world and promote united action. Given the projected future flows of global capital, the UN will need to include the four major power blocs (initially the US, EU, and China, and given its scale and rise, India) at an early point and will quickly need to expand beyond national governments to become a true global compact. However, existing political and economic structures are not on track to develop this blueprint for financing, despite its urgent priority.

Taking a lesson from the business case for climate change, simplicity is essential, and these themes need to make the SDGs more accessible. The SDGs can be divided into four critical financial investment platform categories: people, planet, prosperity, physical and virtual infrastructure, and an enabling one that cuts across all of them: peace and partnerships. The macro investment themes, from the work of the 2021 Capital as a Force for Good: Capitalism for a Sustainable Future report,⁸³ which conducted an extensive analysis of and engagement with 100 leading financial institutions, DFIs, tech companies, and fintech businesses, indicating the scale of challenge and ambition required, whose funding will determine the shape of this global transition provide examples (Table 2):

Table 2: Funding actions per SDG category ⁸³

<p>I. Platform. A better and more sustainable future platform for the world, including laying the foundations for the future. Key focus areas include:</p> <ul style="list-style-type: none"> ● Closing the SDG Funding Gap, by investing US \$116-142 trillion, an added US \$84-101 trillion, over the next decade, with major financial institutions partnering with other stakeholders to adopt the SDGs, particularly the most neglected. ● Mobilizing the Individual, shaping the flows of \$49 trillion of annual household spending globally³ as the individual becomes a responsible consumer and investor (reflecting the growing awareness of the power of the individual as a collective and potential force for good). ● Stakeholder Aligned and Resilient Companies, influencing the priorities of the 99% of global companies not yet fully aligned to the SDGs,⁸⁷ reflecting the resilience that comes with businesses that are relevant to the values of sustainability in the world and ready to tap the US \$12 trillion in business opportunities associated with the SDGs.⁸⁸ ● Radical Energy Breakthroughs, enabling a step-change in human civilization with energy sources that are a breakthrough in functionality while being clean, affordable, reliable, and abundant (funding the future energy for a new society).
<p>II. People. Addressing basic human needs. Key focus areas include:</p>

³ According to IMF data, individual consumptions is the consumption by households and non-profit institutions serving households (NPISH).

<ul style="list-style-type: none"> ● Food and Water Security, increasing global food production by 70% to meet rising demand by 2050, supplying safe, nutritious, and varied food for 9.7 billion people (turning low productivity arable land into industrial-scale yield while keeping farmer ownership). ● Resilient Healthcare and Social Security Systems, caring for the 3.9 billion people who lack access to critical healthcare services, recognizing universal health care and social security as a fundamental human right. ● Mass Education and Skill Development, including better awareness and mental resilience, using digital platforms to break the boundaries of location and local restrictions (moving beyond education to a more inclusive, aware, and resilient population).
<p>III. Prosperity. Creating shared prosperity. Key focus areas include:</p> <ul style="list-style-type: none"> ● Mass Financial Inclusion, supplying financial access and services to the 67% of the world's population that is still un- or underbanked,⁸⁹ including moving beyond basic bank accounts to meaningful inclusion in the financial system, such as access to credit.
<p>IV. Planet. Saving the planet. Key focus areas include:</p> <ul style="list-style-type: none"> ● Mass Scaling of Existing Green Energy Solutions, replacing 83% of global energy still generated by fossil fuels,⁹⁰ going beyond net zero, being a replacement of the current infrastructure to net negative. ● Regeneration of the Environment and Ecosystems, renewing 20-40% of global land area estimated to be degraded or degrading to varying extents and degrees,⁹¹ and cleaning cities and industries (enhancing the SDGs by also restoring urban and industrial environments for what has been destroyed, at scale).
<p>V. Physical and Virtual Infrastructure. Enabling human activity.</p> <ul style="list-style-type: none"> ● Reimagined Urban Life, creating sustainable living for the 2.5 billion new urban inhabitants expected by 2050,⁹¹ in the face of migration within and across boundaries (beyond 2030, reflecting the rise in urbanization). ● Global Digital Participation and Inclusion for the over three billion people without internet access;⁹² this is a universal project which goes beyond the agreed SDG access goals to move forward together.

Realizing these themes holds the promise of a stable transition to sustainability, and universals (universal connectivity, universal inclusion, universal education, and universal healthcare access – ending hunger, illiteracy, diseases, and countless unnecessary deaths). Such a world would also be abundant in food, water, energy, and life's essentials, ending absolute poverty and creating economic opportunities for all. And such a world would be one of balance, with regenerated ecosystems and manufactured and natural environments operating in harmony, promoting biodiversity, and thriving communities.

PLANNING FOR FUTURE PANDEMICS

The pandemic has revealed many cracks in the world's existing political, economic, and governance systems, including public health, international cooperation, monetary flexibility, and government effectiveness. These cracks are the results of a series of deeper, underlying issues facing the world today, including inequitable and disparate public healthcare systems within and between countries; unaddressed market and regulatory issues; the loss of political cohesion; and demographic challenges facing industrialized countries with large elderly populations.⁹³ A lesson from the past two years is that confronting the pandemic requires mass mobilization of healthcare resources and financial tools, and community and individual action within and across countries of the kind that has usually been seen only during periods of war or significant economic dislocation.⁹³

Lack of cross-sectoral resilience and preparedness to deal with a pandemic on the scale of COVID-19, was found, especially in India, the USA, and EU, while China was an exception.⁸³ Threats to a successful implementation of sound policy existed from the lack of adequate, reliable public information and a 'populist' approach. The prevalence of unreliable news on social media made clear and efficient communication a challenge in countries where trust in mainstream media is low and social networks are a significant source of information for the population, particularly given the alleged existence of targeted disinformation campaigns underway and the populist stances of confident political leaders. The same study by **Force for Good**⁸³ underlines the importance of the inadequate global coordination, collaboration, and cohesion, particularly given the US administration's political positions on the pandemic, its 'America First' stance, and lack of global leadership.

At this point, given the complex global challenges we face, there is the opportunity to invest in green infrastructure as a way of speeding recovery from the induced recession, achieving the SDGs, and improving our ability to respond to and bounce back from future global crises.

Most countries' public health infrastructure is not organized around responding to a large scale, a quick-moving disaster like a pandemic, in a similar way with what emergency management agencies do to deal with hurricanes, wildfires, or prevent widespread waterborne diseases when water utilities fail. Credibly communicating with the public, moving people to safer locations, and getting others to shelter-in-place, assessing the damage, coordinating medical and rescue teams, restoring communications, supplying large quantities of essential goods and temporary housing, keeping track of those impacted and what they need, and injecting money into the local economy are standard tasks of disaster management. Such emergency units could be cross trained to do contact tracing and distribute personal protective equipment, set up mass vaccination centers. With adequate preparation, the disaster management system needed to respond to climate change extremes could have provided the capability to implement short, strict lockdowns and undertake early mass testing, options that were not available for COVID-19.

Other aspects of green infrastructure investment can make an economy more resilient to a pandemic, such as a heavy-duty smart grid for electricity and communications. Electricity generated from renewable sources is less susceptible to domestic production and trade shocks, while vehicles run on it are not subject to the yo-yo effect of oil prices. Increased capacity to monitor weather should also be considered, as temperature and other weather variables play a central and underappreciated role in determining the path of pandemics, including the 1918 Influenza pandemic, COVID-19, and the annual wave of influenza.^{84,85,86} Environmental and health monitoring systems need to be coordinated.

More generally, globalization has increased the threat of further pandemics, the speed at which they move, and the amount of harm they can do. However, it also raises the possibility of earlier detection, coordinated containment efforts, and larger markets for effective drugs and vaccines. Like climate change, pandemics are negative global externalities. We have tried to make clear here that synergies between solutions to both persistent threats can be exploited to enhance resilience and lower overall implementation costs. The pandemic has highlighted the potential to execute rapid transformation. The various responses to the pandemic illustrate the ability to implement changes not seen since the world wars. These include changes to taken-for-granted freedoms (large-scale lockdowns and billions of people voluntarily staying at home), the nature of work (mass online relocation of jobs previously performed in

offices and stores), the nature of retail sales (digital economies supported by physical delivery and with dramatically less in-person contact with customers), industrial models (the rapid creation of new healthcare and industrial capacity to address shortfalls), and government intervention in capitalistic market economies (the willingness and ability to shoulder costs and economic burdens, printing money at unprecedented scale). There have been unintended consequences, such as a significant improvement in air quality across cities as an industry, a halt in transportation ground, and a precipitous drop in energy consumption. Therefore, a green recovery that makes countries more resilient would address several risks and capacities, including population and demographic risk, healthcare and social protection, economic strength, policy capacity for economic stimulus, and global coordination, collaboration, and cohesion.⁹³ In the light of the experience of the pandemic, the agenda to ‘build back better’ would use the acceleration of a global shift to a ‘Sustainable Information’ age by accelerating the transition to a digital world, including remote working, online education, digital finance, and exponentially higher digital participation. While many governments have showed they can provide stimulus in crises, a far greater pool of private capital can make a difference. With a shift in focus to ensuring sustainable economic growth, there needs to be a clear recognition that investing widely available money in enhancing resilience to both climate change and pandemics is likely to have high returns.⁸³

Recovery funds to restart the economy after pandemics are related with subsidies to various sectors to keep the economy spinning, increase employment, and avoid a severe recession. Naturally, targeting these funds to the right technologies and sectors would be very beneficial for a green transition, and the contrary (which all too often happens) is excessive funding of airlines, car companies, and fossil fuel companies that will not only delay the green transition but increase the risk of stranded assets and new crises in the future.

However, a green transition cannot only consist of subsidies and cash transfers. On the contrary, economists keep repeating that the most fundamental policy instrument for a green transition is universal pricing of climate forcers (carbon dioxide, methane, nitrous oxides, etc.). There is a vivid debate about this, as lobbyists for the fossil industry and energy-intensive sectors, low-income individuals, and countries (among many others) concerned with distributional effects object to such pricing. Many policy analysts have concluded that carbon pricing is a dead end and that other policies should be tried.⁹⁴ A quick and somewhat nuanced conclusion is that emission prices are needed and possible, but that sufficiently high prices will not always be possible in every sector and country, and that other instruments (such as subsidies for infrastructure and R&D) are needed, both as complements to emissions pricing and to prepare the way for such pricing.

Much attention is needed to address the fairness and perceived fairness issues, and the (game theory) dynamics of creating agreements between sovereign states. It is vital and instructive to see what the EU is proposing in its Fit for 55 strategies, including proposals such as revised policies for: shipping, aviation, road transport, buildings; land use, and forestry; renewable energy and energy efficiency directives; alternative fuels; energy and emission taxes and standards. It may be easier to price all global emissions because the main barriers to acceptability and fairness should disappear if the policies were truly applied to all emissions. There stays, of course, the issue of how to get anyone to take the first step – and that, in a sense, is what the EU wants to do, starting from the suggestions in the ‘Fit-for-55’ package.

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