commentary

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How can science help to guide the European Union's green recovery after COVID-19?

Summary

Following the enormous health and social costs imposed by the COVID-19 pandemic in Europe, increasing attention is turning to facilitating a green recovery, to promote economic activity while also tackling the global climate emergency. Policy development for a green recovery must be based on robust and transparent scientific evidence. In this Commentary EASAC, independent of commercial or political vested interests, draws upon its previous work on assessing energy, environmental and health priorities to advise on some of the key issues for rebuilding economies to deliver benefits fairly for planetary and human health.

Solutions are within reach. While our advice endorses some existing or planned European Union policies, we also urge fundamental green recovery transitions: in particular for a rapid reduction in generation and use of high-carbon energy; in giving greater recognition to the value of ecosystem services; and in taking account of health impacts in all sectoral policies, including those designed for the green recovery. The European Union should show global leadership by urging ambitious action by other countries and in international collaboration, in looking forward to COP26 of the United Nations Framework Convention on Climate Change and COP 15 of the Convention on Biological Diversity and tackling the Sustainable Development Goals. Moreover, the varying experience of countries in dealing with coronavirus infections has demonstrated that the effectiveness of communicating scientific understanding and engaging with the public influences trust in, and impact of, policy measures. EASAC calls for strengthening of this capacity for science-based decision-making at national, regional and global levels to drive the green recovery worldwide.

The COVID-19 pandemic has presented extraordinary global challenges affecting individuals, families, communities, health services and economies. Much now depends on successfully combining the desired medical outcomes with a gradual resumption of economic and social activity, and many academies have already advised on COVID-19 issues[1]. Societal disruption brought by the pandemic has forced some changes which were unimaginable in normal circumstances: suspension of industries, air travel and road traffic, which have revealed some

[1] For example, https://easac.eu/covid-19-response, www.sapea.info/coronavirus and https://www.interacademies.net/publication/iap-communique-covid-19.

positive environmental changes (in particular, clear skies and water, reduced emissions, reduced traffic accidents) alongside the great damage done to public health and the economy (European Parliamentary Research Service, 2020). Although no-one could credibly recommend such an abrupt transition in societal activities as an approach to tackling climate change (European Environment Agency, 2020), lessons may nevertheless be learnt from recent social and environmental impacts. As debate increasingly focuses on how to recover post-COVID-19, flagship policies such as the European Green Deal assume even greater importance — not only in accelerating progress towards a low-carbon economy and addressing the global climate emergency in a fair way, but also in increasing society's resilience to any future disruptions.

There is already political momentum[2] for tackling the ecological crisis and promoting a resilient economic recovery together. Many commentators are offering advice on the elements necessary for a green recovery but some of these comments are driven by vested interests. In this Commentary, EASAC (the European Academies' Science Advisory Council), independent of commercial or political bias, draws on its previous work from across its Energy, Environment and Biosciences

Key messages

- The concept of the 'green recovery' post-COVID-19 must build on the evidence that has already shown the dependence of economic benefits on human and planetary health. And, the green deal must maximise the potential for synergy between objectives — for instance, a recent analysis of fiscal recovery archetypes (Hepburn *et al.*, 2020) concludes that green projects create more jobs, deliver higher short-term returns on investment and lead to increased long-term cost savings in comparison with traditional fiscal stimuli.
- The COVID-19 extraordinary events threaten the existence of businesses and initiatives that would otherwise be vital, requiring urgent policy measures. Such measures should prioritise solutions and businesses that are value creating and sustainable in the long-term and avoid allocating resources to prolonging the life of industries responsible for high greenhouse gas (GHG) emissions and resource consumption. The primary principle should be to seek co-benefits to the economy, planetary and human health, and social equity.
- In some cases, EASAC advice endorses existing or planned EU policies. In other cases, we urge the EU to reconsider and update its current strategies. For example: (1) a more rapid reduction in carbon-based energy is needed; (2) the European Commission should be given a greater responsibility for health. Taken together, our points illustrate the wide spectrum of issues that need to be addressed in joined-up policy and we emphasise the imperative to take bold steps to effect the fundamental transitions towards a green recovery.
- Solutions based on science are already known and within reach to bring planetary and human health benefits from decarbonising the economy. The scientific community can also help by generating new knowledge to inform strategy, and academies are working to clarify research priorities[1]. There are also many other issues to address in the ongoing COVID-19 exit-recovery phases — now and for the longer-term. Moreover, green recovery may require different priorities in different Member States. National academies are well-placed to advise on particular national circumstances and EASAC is well-placed to take a broader European perspective while the InterAcademy Partnership global network of academies of science, medicine and engineering with its regional networks is well-placed to provide independent science-based advice on local-regional-global policy inter-relationships. Efficient green recovery requires international coordination. The EU should show leadership by urging ambitious action by other countries and in international programmes, based on such independent science advice, for example in looking forward to COP26 of the United Nations Framework Convention on Climate Change and COP15 of the United Nations Convention on Biological Diversity and in pursuit of the United Nations Sustainable Development Goals.
- The COVID-19 crisis and the daily need for policy-makers to translate the scientific advice received into policy has made the public acutely aware of the critical role of science. The effectiveness of communicating scientific understanding and engaging the public in turn influences trust in, and impact of, policy measures. At the same time, misinformation and perverse social media influences have been shown to have significant human consequences. Capacities for science-based decision-making should be strengthened at national (UNDESA, 2020), regional and global levels.

[2] For example, the European Parliament has called for coordinated action (P9_TA-PROV(2020)0054, 17 April), the European Commission President, Ursula von der Leyen, has emphasised that in re-starting the economy '*we should avoid falling back in old, polluting habits*' (Euractiv 28 April, www.euractiv.com). Member States are making detailed recommendations for green recovery policies (for example the Netherlands, Euractiv 22 April, www.euractiv.com) and this political momentum is being extended by the EU in leading global discussions: '*climate must not be excluded from the economic stimulus packages currently being put together*' (Chancellor Angela Merkel, Petersberg Climate dialogue XI, 28 April, www.bmu.de/en/event/petersberg-climate-dialogue-xi/).

programmes[3]. Our aim is to identify key issues that European Union (EU) and Member State policy-makers should consider in designing a European Green Deal-based equitable recovery, which will also deliver United Nations Sustainable Development Goals. Just as science has been central to efforts to manage the coronavirus pandemic, it must also be central to inform policy for the recovery phase, to provide the resources for sustainable technological and societal innovation, and to guide action. Evidence must be transparent, robust and relevant to the present circumstances and uncertainties.

Insights from EASAC's expertise

Decarbonisation together with economic recovery

Because of the COVID-19 crisis, global emissions of carbon dioxide fell by around 17% in April 2020 relative to 2019, as a result of the economic stagnation in industry and reduction in transport — the largest annual fall ever recorded since the 18th century. However, effects on annual emissions are likely to be just between 4% and 7% as lockdowns are eased (Le Quéré *et al.*, 2020). However, the reality is that even this reduction is insufficient to put us on track to meet the Paris Agreement target of 1.5°C — that would require a 7.6% reduction each year to be maintained for the next decade. This emphasises the scale of the climate challenge and our major energy-using systems have to be transformed completely away from reliance on combustion of carbon — whether in fossil fuels or carbon locked up in forests. This is therefore the time to pursue options to stimulate fundamental structural changes in production and consumption, urban planning, food systems, energy systems and transport — as explored by Diaz *et al.* (2019), IPBES (2019) and TWI2050.

Previous drivers of unsustainable development (e.g. reliance on gross domestic product as an indicator of progress, short-term thinking in financial and economic decision-making, and races to the bottom in global competition) require rethinking. Painful lessons from this shock to the system must be acted on to prevent return to business as usual in terms of consumption of high-carbon fuels. Accelerating the transition to a circular economy is necessary to be able to operate within planetary boundaries. This requires a move away from shallow and short-term indicators such as gross domestic product to those that properly account for environmental and social benefits and costs (EASAC, 2017a). System failures in the linear economy need to be addressed head on to encourage circular use in areas from plastics to critical metals (EASAC, 2017b; 2020a).

While hydro, wind, solar and nuclear power generation have continued during the COVID-19 pandemic, coal-fired power generation has been significantly reduced and there has been a dramatic fall in oil consumption for transport. Policies for restoring energy supply must build on this low-carbon base and avoid as far as possible returning to fossil fuels and other high-carbon sources (including over-reliance on biomass energy) (EASAC, 2017a; 2019a). Clean (low carbon) energy must thus be at the heart of a green recovery (see, for example, Hepburn *et al.*, 2020; IRENA, 2020). Moreover, the postponement of COP26 of the Framework Convention on Climate Change should be used to strengthen the EU's Nationally Determined Contribution to be consistent with achieving the Paris Agreement's aim of limiting warming to 1.5°C. Unfortunately, EASAC's review of technologies that can remove carbon dioxide from the atmosphere (EASAC, 2018a; 2019a) shows that we cannot rely on these to compensate for current failures to reduce emissions, while carbon capture and storage remains a largely ignored and abandoned policy tool across Europe.

Recognising the value of ecosystem services

The climate crisis proceeds in tandem with the biodiversity crisis, and the opportunity to act boldly should speed up our determination to reverse the decline in biodiversity and the ecosystem services it underpins. The human economy is embedded within Nature, so that economics urgently needs to integrate appropriate values into incentives and decision-making to recognise the limits Nature places on the economy (IPBES, 2019; Dasgupta *et al.*, 2020). Moreover, attention has focused recently on the increased risk of future pandemics and re-emergence of infectious diseases caused by climate change and the loss of biodiversity. The warming of the climate is forcing species to change habitats, and loss of biodiversity reduces resilience while the relentless push into forests and wild areas through rapid urbanisation and the hunt for timber, cropland and other natural resources increases risks of further cross-species transfer of diseases (Keesing *et al.*, 2010; EASAC, 2019c; Frutos *et al.*, 2020). Forests continue to decline globally despite the increased realisation of their critical role as a carbon sink and a means of achieving immediate mitigations of climate change (Griscom *et al.*, 2017; Inter Academy Partnership, 2019).

EASAC examined aspects of the role of ecosystem services in agriculture in its 2015 report on effects of neonicotinoid insecticides (EASAC, 2015). The COVID-19 crisis has reminded us of the vulnerability of dependence on global food systems. This should inform the current revisions of the Common Agriculture Policy to strengthen sustainability of local and regional food supplies while reducing agriculture's climate impact. The potential of

[3] EASAC reports are listed in the References and can all be accessed at www.easac.eu/publications/. Although all the publications were produced before the COVID-19 pandemic, much of the policy advice that they contain is even more important today.

agriculture to increase its carbon stock remains a priority — both as a contribution to climate change mitigation and for increasing the resilience and sustainability of soils (EASAC, 2018b). Several options remain available to strengthen the role of land management in increasing carbon stock and slowing climate change: protecting and restoring peatlands, increasing soil carbon levels, so-called 'blue' carbon in wetlands and shallow coastal areas. It is also necessary to create financial incentives to landowners to protect and enhance the carbon stocks in natural forest ecosystems, as a counterbalance to incentives to remove them for bioenergy. Protecting and restoring ecosystems is also likely to increase resilience against climate change-induced risks.

The ocean is also critical to the European climate, while its ecosystems sustain fisheries and marine life. Shifts in the Atlantic Meridional Overturning Current are continuing to cause concern (EASAC, 2018c) over extreme weather and regional climate shifts, and they emphasise the importance of mitigating climate change. Sustainable management of ocean ecosystems remains a challenge in balancing economic, environmental and social goals (EASAC, 2016).

Policies for economic recovery that will accelerate the energy transition

GHG emissions from energy must not rise as Europe emerges from the COVID crisis. Instead, economic recovery is an opportunity to accelerate the transition to a safer, fairer, more resilient and fully decarbonised energy economy.

The COVID-19 emergency has shown that simply ceasing activities responsible for GHG emissions is not an option owing to the extremely negative impacts on the economy, jobs and businesses. The transformational change needed must focus on delivering well-being through providing low-emission alternatives. Policies for recovery should address energy poverty because this can increase populist tendencies and create a reluctance to invest in new energy systems.

Energy investment priorities, including those for public and private lending, grants and subsidies, should be guided by the EU Taxonomy (European Commission, 2019), and focus on improving sector integration/coupling and the production of technologies, products, and infrastructure, which support sustainable and healthy lifestyles, without GHG emissions. They should also help to deliver the United Nations Sustainable Development Goals (United Nations, 2015). The European Green Deal/Green Recovery/Just Transition/Climate Pact should promote investments in the following:

- Low-carbon electricity generation, notably offshore wind, photovoltaics, and hydropower, which are already economically competitive, quick to build and produce very low GHG emissions over their full life cycle. These 'no regrets' options are crucial for the electrification of transport, buildings and industry, and offer high-quality jobs and opportunities for EU businesses to strengthen their leadership role in EU and international markets. Investments in low-carbon electricity generation should specifically exclude technologies that accelerate the rate of climate warming because they cannot deliver GHG emission reductions in less than 5–10 years, such as the burning of forest biomass (which also causes deforestation) (EASAC, 2019a).
- Electricity networks and systems, notably interconnectors (including multinational subsea grids), storage (including batteries, hydrogen and synthetic fuels), and the smart systems, needed to manage flexibility of the grid as the penetration of variable renewable electricity generation increases. As well as investments in installation and research and development (e.g. to further reduce costs and improve performance of batteries), money will be needed for expertise and software to implement future electricity market rules and codes as they evolve to accommodate growing degrees of coupling between electricity supply and electricity demands from transport, buildings and industry.
- Nearly zero-energy building renovations to transform existing buildings rapidly and with minimal disruption into high-quality living and working spaces, with improved access to daylight, fresh air and outside space. These should improve the well-being and health of their occupants as well as deliver nearly zero-energy performance (EASAC, 2020b). The EU's proposed 'renovation wave' should prioritise investments in deep renovations to produce nearly zero-energy buildings by supporting investment financing (lending) over long periods (e.g. 30 years) like mortgages. Support should be subject to conditions that ensure the avoidance of lock-ins to fossil-fuel-based technologies (such as gas boilers). Renovations should comply with new regulations that minimise embedded carbon emissions in building construction materials and processes, for example replacing concrete and steel by stone or industrialised timber that meets appropriate sustainability criteria (e.g. cross-laminated timber as a fire-resistant structural element). Prefabricated building components should be supported because of their high levels of quality control and potential for cost reduction. Business models that deliver a more circular economy should be prioritised, for example those that reuse components and recycle materials.
- District heating/cooling in urban areas should be implemented, with renewable energies (e.g. geothermal and solar), large-scale heat storage, waste heat and free cooling. Where possible, systems should offer grid flexibility services by storing excess renewable electricity as heat.

Energy legislation and priorities in all policy areas should reflect potential impacts on the climate, but policies for electricity, transport and buildings are particularly important:

- Digitalisation of electricity system controls and smart meters with time-dependent tariffs should be strengthened in line with regularly updated electricity market rules and grid codes to maintain the resilience of electricity transmission and distribution grids and the security of electricity supplies. This will also help with grid flexibility management (including congestion) while accommodating growing supplies of variable renewable generation (notably wind and photovoltaics) through the optimised use of interconnectors, self-consumption (prosumers), aggregators, electricity and heat storage (large scale in district heating systems and small scale in buildings and vehicles), demand response and flexible generation (EASAC, 2017d). Digitalisation will also help to deliver electricity with high reliability and affordable costs to all consumers in the transport, industry and buildings sectors.

- A holistic systems approach should be adopted for the electrification of transport, buildings and industry and promoted urgently to reduce GHG emissions, while increasing supplies of low-carbon electricity and reducing energy demands by improving energy efficiency (EASAC, 2019b). Battery electric vehicles and plug-in hybrid vehicles are 'no regrets options' during the energy transition, which will become increasingly valuable for climate change mitigation as power generation is decarbonised. Natural gas should be phased out during the energy transition and replaced with low-carbon electricity and heat pumps for heating and cooling in new and renovated nearly zero-energy buildings.

- Fossil fuel use in transport should be rapidly phased out with binding target dates, subsidised scrapping schemes to accelerate fleet renewal, and better focused road vehicle emission limits to discourage the production of oversized engines and passenger cars (such as sport utility vehicles). COVID-19 lockdowns have shown the air quality benefits of reducing the use of fossil fuels in urban areas, and preliminary analyses suggest that death rates from COVID-19 are higher in areas with high air pollution. Fossil fuel use for aviation should be reduced (e.g. by taxation) and replaced by low-carbon alternatives (e.g. advanced biofuels and synthetic fuels made using green electricity). Walking and cycling should be made safer, for example by building new cycle lanes and pedestrian zones, or by re-allocating existing road space to create wider pedestrian pavements and cycle lanes that would comply with the social distancing requirements that are expected to continue into the future to limit the spread of COVID-19 (Sustrans, 2020).

- Digitalisation should be used to curb passenger transport energy demand by facilitating working from home, virtual meetings and conferences. Experience during the COVID-19 crisis has demonstrated that the potential for using virtual meetings is higher than previously thought. In addition, better passenger transport information would improve energy efficiency by facilitating the use of mobility-as-a-service, guiding occupancy levels in public transport while the social distancing required to avoid COVID-19 remains in place, and increasing them thereafter. Digitalisation of freight scheduling and management, especially in urban areas, should also be promoted to curb energy demands for freight transport.

Protecting and improving human and planetary health

The European Green Deal, and associated activities to facilitate a green economic recovery after COVID-19, have the potential to achieve significant health improvements in the near term while reducing the growing health risks from climate change (Haines and Scheelbeck, 2020). However, capitalising on this potential, and ensuring health equity, requires careful design and evaluation of policy choices in all sectors, to ensure that climate change is not accelerated, to achieve synergies where possible, and to avoid unintended adverse consequences on health and social equality. Examples of unintended consequences include the fuel poverty in vulnerable groups that is exacerbated by putting taxes on fuels, and the urban air pollution that resulted from replacing petrol by diesel as a low-emission GHG transport fuel before the EURO 6 emission limits of nitrogen oxides (NO_x) and particulates were able significantly to reduce air pollution emissions from the active vehicle fleet.

Scientific evidence reviewed previously by EASAC (EASAC, 2019c) indicates that policies proposed to mitigate climate change can lead to localised improvements in the health of those populations undertaking the mitigation, in addition to the global health benefits that will flow from mitigation. In turn, a healthier population can be expected to increase productivity, supporting economic recovery. Thus, understanding the health impacts is central to the evaluation of mitigation options. Examples of the health co-benefits of mitigation were provided (EASAC, 2019c) from a range of sectoral analyses:

- Reduction of fossil fuel combustion to attain lower carbon dioxide emissions is accompanied

by reduced ambient air pollution. Improved air quality has manifold health benefits in reducing respiratory and cardiovascular diseases and in terms of improved cognitive function development. Better understanding of the multiple health benefits and their thresholds will help to inform more rigorous air quality standard-setting.

- Shifting towards sustainable transport strategies for people, if associated with increased physical exercise, can be expected to be associated with improvements in both physical and mental health.

- Energy-efficient housing can reduce health problems from both cold- and heat-exposure providing that adequate ventilation is introduced to control household air pollution. As has become obvious during the COVID-19-induced lockdown in many Member States, housing-related health issues also need to be considered as an integral part of urban planning, including the provision of sufficient green space to support citizens' physical and mental health.

- Agriculture contributes significantly to total GHG emissions, and environmental costs can be reduced by modifying food systems. If Western dietary intakes were shifted to more environmentally sustainable dietary patterns — including reduction of animal-based food — there would be human health benefits from a reduced all-cause mortality risk as well as the planetary health benefit from reduction in agriculture's contribution to total GHG emissions. The options must be considered as part of the forthcoming EU Farm to Fork strategy and in the reform of the Common Agricultural Policy, but it is important to explore causes and consequences in detail. For example, what are the environmental impacts of different livestock production systems? What are the environmental and health impacts of consuming different types of meat? What may be the negative effects on the most vulnerable groups in the population (if meat intake is controlled by increasing prices) who are already at risk of micronutrient deficiencies (EASAC, 2017e)?

This evidence and associated priorities defined for the research agenda to fill knowledge gaps are relevant to planning the post-COVID-19 recovery. But there are additional points to take into account to achieve coherent policy across the sectors to deal with emerging health challenges:

- Just as Europe must consider the options for the economic recovery programme, it must also plan for a health recovery programme (Horton, 2020). Even if recurrent waves of COVID-19 infections can be avoided, a longer-term health recovery strategy is needed to cope with the consequences of the pandemic. For example, addressing: the health impacts of delayed diagnosis and care for the many other clinical indications because health services priority was given to tackling COVID-19; sustained mental health impacts from societal disruption; the adverse health impacts transmitted through other sectors, such as rising food insecurity.

- Actions taken during the economic recovery phase must not do anything to worsen environmental damage that increases the likelihood for future pandemics, for example by increasing the risk of transmission of zoonoses or other pathogens as a consequence of land use change and biodiversity loss.

- The experience of COVID-19 must lead to a new emphasis on science to answer health-related questions more generally (InterAcademy Partnership, 2020). For example: in epidemiology, how to improve disease surveillance and monitoring; in social sciences, how to understand the determinants of individual and population behaviour, how to inform behavioural change, and how to take account of ethical considerations in monitoring behaviour; and for the scientific community broadly, how to counter misinformation and prejudice.

- Responses to the challenges for COVID-19 recovery and climate change also overlap in requiring the EU to take a leading role globally in tackling human and planetary health threats. Successful implementation of the European Green Deal will provide great help to the rest of the world both by demonstrating 'what works' for a green economy and in lessening the contribution to global damage historically contributed by Europe. To be fully effective, initiatives need to be coordinated worldwide whenever possible. However, the European Institutions cannot take a global role in health and, indeed, cannot be fully effective within the region, unless attention is given to increasing their science-based responsibility for health. Currently, there is a disconnect between health policy – often decided at a Member State level – and the other policies across the energy, agricultural and environmental domains that are often better harmonised at the EU level. Health impact assessment has to be considered in all policy development, particularly appertaining to energy, housing, urban design, transport, agriculture and biodiversity as well as in the cross-cutting initiatives such as for the bioeconomy and circular economy, for example to ensure that the design of the circular economy helps to reduce toxic exposure to chemicals (WHO Europe, 2018).

Acknowledgements

This Commentary was produced jointly by the Energy, Environment and Biosciences programmes. EASAC thanks our programme steering panels, chairs and directors.

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SUSTAINABLE DEVELOPMENT GOALS

Printed on 100% recycled paper by Schaefer Druck und Verlag GmbH, Teutschenthal, Germany

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