



COVID-19 and EU Climate Targets: Can We Now Go Further?

Tensay Hadush Meles^{1,2} · Lisa Ryan^{1,2} · Joe Wheatley^{1,2}

Accepted: 11 July 2020 / Published online: 4 August 2020
© Springer Nature B.V. 2020

Abstract

This paper examines the implications of the COVID-19 crisis on the 2030 EU CO₂ emissions target, considering a range of economic growth scenarios. With lower economic activity resulting from the COVID-19 crisis, we find that existing climate policy measures could overshoot the current 40% EU target in 2030. If policymakers consequently relax climate policy measures to maintain the 2030 target, the opportunity will be missed to align EU climate policy with longer-term Paris emissions mitigation goals. Our analysis highlights that although existing climate policy measures will likely reduce emissions more than 40% by 2030 in the wake of the pandemic, they will not be enough to meet the Paris agreement. More stringent measures, such as those proposed under the Green New Deal, will still be needed and may be less costly than previously estimated.

Keywords Climate change policy · Greenhouse gas emissions · Economic recovery · COVID-19 economic effects · Energy demand

JEL Classification Q5 · Q54 · Q58 · E6 · Q43

1 Introduction

The COVID-19 outbreak has been more than a global health crisis and humanitarian emergency. In an attempt to contain the spread of the novel coronavirus, governments around the world have taken unilateral measures that range from temporary closure of educational institutions and international travel restrictions to a complete lockdown. As a result, streets

We are grateful for the helpful comments from members of UCD Energy Institute and the EMPower research team.

✉ Tensay Hadush Meles
tensay.meles@ucd.ie

Lisa Ryan
lisa.ryan@ucd.ie

Joe Wheatley
joe.wheatley@ucd.ie

¹ School of Economics, University College Dublin, Belfield, Dublin, Ireland

² Energy Institute, University College Dublin, Belfield, Dublin, Ireland

are free of vehicles, flights are grounded, factories are closed and economic activities have slowed down. These measures have had a dramatic effect on the global economy and on the wider environment.

The International Energy Agency (IEA), in its review of the first quarter in 2020, estimates an average of 25% decline in energy demand in countries in full lockdown and an average of 18% decrease in countries in partial lockdown (IEA 2020). Global energy demand is forecast to fall by 6% for the year, equivalent to the annual combined energy demand of the UK, Italy, France and Germany. Similarly, early results from NASA Earth Observatory show that the concentration of nitrous dioxide in the air in China and the fine particulate matter in New Delhi have dropped as a result of country-wide lockdowns.¹ A study by Saadat et al. (2020) also indicates that the lockdown of COVID-19 improved air and water quality across the globe, albeit leading to the generation of a huge amount of medical waste in the environment. With our dependence on fossil fuel-sourced energy, global CO₂ emissions are projected to fall in 2020 by 2.6Gt, a fall of nearly 8% relative to 2019 (IEA 2020). Emissions in future years will depend on the speed of economic recovery as well as on climate policy.

In this paper, we probe the impact of the COVID-19 crisis on European climate policy. The EU has a binding target of at least 40 percent reduction in greenhouse gas emissions by 2030, compared with 1990 levels (European Commission 2014). A further tightening of this target to 50–55% was already under negotiation before the crisis as part of the European Green Deal (European Commission 2019). The more stringent target is necessary to achieve the promise made under international climate agreements to limit global warming to well below 2 °C and pursue efforts to limit it to 1.5 °C (IPCC 2018). Pre COVID-19, this new target was considered very challenging, especially for countries like Ireland with a poor track record on earlier targets.

Previous crises have varied in the extent of their impact on energy demand and the associated CO₂ emissions. The oil crisis in 1973, for example, led to a reduction in the global reliance on oil and slowed down the global growth of CO₂ emissions for several years. The impact of the 2008 financial crisis on global CO₂ emissions on the other hand was more short-lived; emissions quickly rebounded in 2010 (Peters et al. 2012; Jiang and Guan 2017).

Here, we re-examine EU policy targets in light of the uncertain economic outlook and the possibility of significantly lower emissions due to the COVID-19 crisis. We develop a model of the CO₂ emissions associated with different economic growth scenarios, ranging from rapid to muted recovery and a baseline scenario (before the COVID-19 crisis). In terms of climate policy, we consider two options: ‘maintain (continue) with current climate policy measures’ and ‘modify climate policies to just achieve the 40% target in 2030’. We then try to relate the results to the more ambitious targets that are proposed under the draft *European Green Deal* before the COVID-19 crisis.

In the remainder of the paper, we first discuss the scenarios of economic recovery from the crisis and the estimation of their impact on CO₂ emissions. Next, in light of these, we reexamine EU climate policy targets. We also assess whether more ambitious emissions mitigation targets might now be feasible; and if so, whether we should now change our approach to 2030 climate targets. Finally, we provide a conclusion.

¹ See, <https://earthobservatory.nasa.gov/images/146596/airborne-particle-levels-plummet-in-northern-india> and <https://earthobservatory.nasa.gov/images/146362/airborne-nitrogen-dioxide-plummet-over-china>.

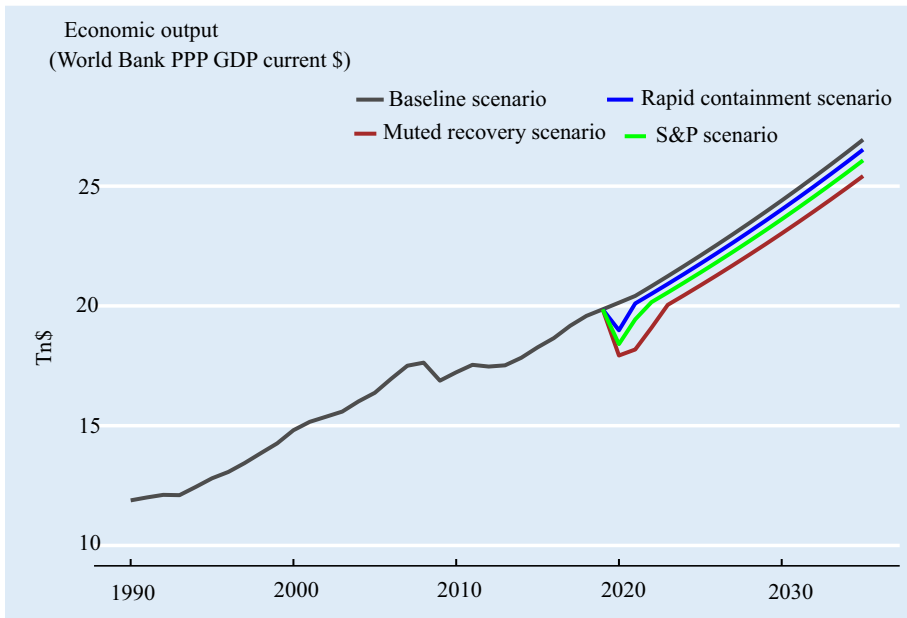


Fig. 1 Economic output (as measured by World Bank PPP GDP current \$) assuming a long-term post-crisis growth rate of 2%

2 Crisis Recovery Scenarios

The impact of the COVID-19 pandemic on economic activity and hence CO₂ emissions will depend on how long the lockdown lasts and when and how the economy will recover. For example, the European Commission recently forecast a contraction of 7.75% in 2020 followed by a rebound of 6.25% in 2021 while European Central Bank (ECB) economists put 2020 Eurozone growth in the range – 5% and – 12% (European Commission 2020). Standard and Poor’s (S&P) forecast an output drop of – 7.3% in 2020 with only a partial rebound in 2021 (S&P 2020), in line with similar numbers from the International Monetary Fund (IMF 2020). S&P (2020) and others highlight further risks to the downside.

We use the McKinsey economic growth scenarios (McKinsey 2020) in our modeling of future CO₂ emissions. The scenarios vary on the speed of containment of the pandemic and the success of measures to protect the economy and the financial system. Based on this, we consider the McKinsey ‘Rapid containment’ and ‘Muted recovery’ scenarios and compared with the emissions projection before the COVID-19 crisis (baseline scenario). We also include the S&P (2020) growth forecast for additional comparison. In the ‘Rapid containment’ scenario, the pandemic is contained by Q3 2020. In the ‘Muted recovery’ scenario, there are further lockdown measures in Q4 and more widespread business failures, larger government deficits, credit market distress etc., occur. The ‘Muted recovery’ scenario is more pessimistic than the S&P forecast but is still not a worst-case scenario. The optimistic ‘Rapid containment’ shows a strong economic rebound in 2021 (Fig. 1).

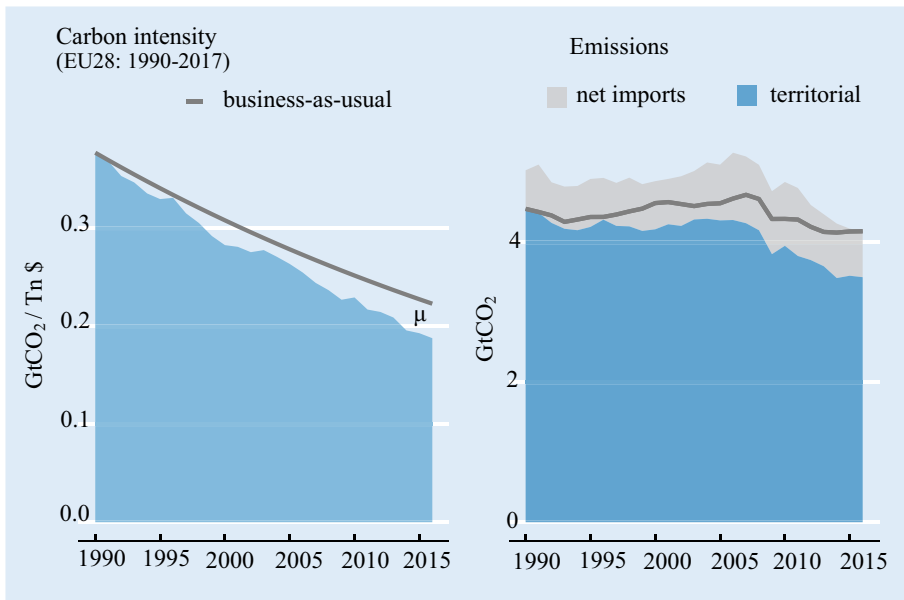


Fig. 2 Carbon intensity and emissions (fossil CO₂ and cement production) for EU28. The solid line indicates business-as-usual (BAU) carbon intensity assumed to follow a 2% annual decay from 1990. The fractional difference between the BAU lines and blue areas corresponds to the effect of climate policy μ . Note from Fig. 2 that with $r=2\%$ the implied value of μ for the EU was 0.15 in 2017. Net imports of carbon emissions to EU28 from international trade are also shown for comparison

3 CO₂ Emissions Model

We estimate the relationship between CO₂ emissions and economic activity as a function of time. Following Nordhaus (2017), emissions $E(t)$ at time t are linearly related to business-as-usual (BAU) emissions intensity $\sigma(t)$ and economic output $Y(t)$:

$$E(t) = (1 - \mu(t))\sigma(t)Y(t) \quad (1)$$

We assume that $\sigma(t) = \sigma_0 e^{-rt}$, where r is the rate of autonomous emissions reduction. The fraction μ represents the gap between BAU and the observed emissions intensity (Nordhaus 2017) and reflects the effect of climate policy. Values of r compatible with historical EU data lie in the range 1.0% to 2.5% (global values are between 0.8% and 2.1% in the DICE integrated assessment model). Values outside this range would imply implausibly high or low a role for climate policy in emissions reduction. Note that r has been the dominant source of emissions intensity reduction from 1990 to date (see Fig. 2). However, this can be expected to change as the EU moves to a more aggressive policy stance, leading to higher values of μ . Integrated assessment models also estimate policy costs using abatement cost curves that are convex functions of μ (EMF 2010; Nordhaus 2017). A higher emissions reduction target corresponds to a higher value of μ and therefore higher costs.

Equation 1 captures longer term effects of lower economic output and policy adjustment but it is not expected to describe the immediate effects of an economic shock such as COVID-19 pandemic precisely. We can illustrate this using the example of the great

financial crisis of 2008. Equation 1 implies that the percentage change in emissions due to a shock is:

$$\frac{dE}{E} = \frac{d\sigma}{\sigma} + \frac{dY}{Y} - \frac{d\mu}{(1-\mu)} \quad (2)$$

In 2009, during the great financial crisis, EU economic output fell by 4.3% while emissions fell by 8.2%. With $r=2\%$, Eq. 2 implies a 1.9% increase in μ i.e. a significant reversal of climate policy measures in 2009. This is incorrect as no such policy reversal occurred. Indeed, the discrepancy reflects a strong sectoral contraction in carbon intensive industry and cement production that is not captured by Eq. 1. However, over the two year period 2009–2010, emissions fell by 5.3% and output fell by 2.3%. With $r=2\%$, Eq. 2 implies that μ increased by 1%. This is a plausible value as climate policy measures continued to strengthen during the crisis. It is also evident from Fig. 2 that the overall fall in carbon intensity over 2009–2010 was in line with the long term trend. Of course, it is possible that longer term effects on carbon intensive sectors such as transport may occur in the aftermath of COVID-19. While this is an important area for future research, our model assumes that the current crisis follows the pattern seen following the great financial crisis, where departures from Eq. 1 were short-lived.

To summarize, given a BAU emissions reduction rate r and economic growth assumptions such as the long-term growth rate, the value of μ and thus 2030 emissions $E(t)$ can be inferred. For simplicity, in our estimation of 2030 emissions, we assume a linear increase of μ from its current value to the target value in 2030.²

4 Results

Figure 3 shows the effect of the pandemic on emissions in 2030 estimated for the ‘Muted recovery’ and S&P economic growth scenarios. We first estimate the emissions under the current policy measures designed to achieve 40% emissions reduction by 2030, the ‘maintain (continue) current policy measures’ policy option. We find that these economic growth scenarios lead to an early achievement of the 2030 target in 2027. The ‘rapid containment’ economic scenario also results in an early achievement of the 2030 target, albeit by only 0.7 years. We compare these new trends with a path to reduce emissions by 52.5% in 2030, the midpoint of the Green Deal target range under consideration. Even under the more pessimistic economic recovery scenario, we see that current policy measures are insufficient to achieve a 52.5% reduction by 2030.

Finally, we compare an alternative policy setting where in light of the lower economic growth, the only policy measures implemented are those necessary to achieve a 40% reduction by 2030, the ‘maintain current target’ policy option shown in Fig. 3. It is clear from the graph that this policy option moves away from the straight line path to net zero emissions in 2050 envisaged under the European Green Deal and is an effective relaxation of climate mitigation policies.

Table 1 compares the implications of COVID-19 for emissions based on existing and the Green Deal policy measures. The current 40% EU emissions target would be

² Note that non-CO₂ greenhouse gases (equivalent to about 20% of CO₂ emissions) are excluded from this analysis.

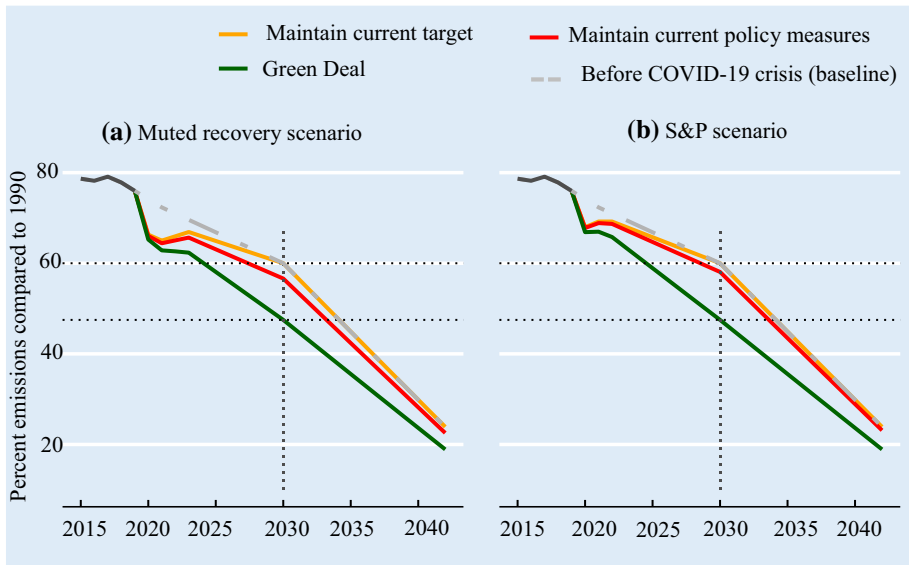


Fig. 3 (a) Modelled emissions relative to 1990 in ‘Muted recovery’ economic scenario. (b) Emissions relative to 1990 using the S&P economic forecast. The 40% emissions reduction targets are achieved earlier than 2030 if the current policy measures designed to achieve 40% emissions reduction in 2030 are maintained. Only the Green Deal puts Europe on a straight line path to zero emissions in 2050

Table 1 Implications of COVID-19 for the current policy and a 52.5% green deal target

Scenario	Policy	Reduction in 2030 (%)	Years before 2030 40% reduction reached	Estimated % cost saving vs pre-COVID (baseline)
Muted recovery	Continue	43.3	2.6	−6%
	Green deal	52.5	5.9	−11% to −16%
Rapid containment	Continue	41	0.7	−1.5%
	Green deal	52.5	5.2	−3% to −4%
S&P	Continue	41.9	1.5	−3%
	Green deal	52.5	5.5	−6% to −8%

achieved 2.6 years earlier than baseline under ‘Muted recovery’ if current policy measures are continued and lead to emissions reduction of 43.3% in 2030. Under the Green Deal policy measures, this reduction is already achieved in 2024 under all scenarios.

Using an illustrative abatement cost function $0.0205\mu^{1.4}$ (EMF 2010; Nordhaus 2017), we estimate the cumulative 2021–2030 savings relative to the pre-crisis baseline in the ‘Muted recovery’ economic scenario as 143Bn\$, 56Bn\$ and 156Bn\$ under ‘maintain current target’, ‘maintain (continue) current policy measures’ and Green Deal policies respectively. Other costs associated with the economic downturn are not included. Table 1 shows the illustrative percentage cost savings from cumulative discounted cost differences for 2021–2030 relative to the pre-COVID-19 baseline scenario. Note that the impacts are quite modest in the V-shaped ‘Rapid containment’ scenario. More results on the sensitivity of Green Deal illustrative costs to key modeling parameters are provided in the “Appendix”.

5 Discussion and Conclusions

In this short paper, we examine the impact of various economic recovery scenarios after the COVID-19 crisis on 2030 EU emissions targets with a range of policy approaches. Like other societal impacts of a recession, the longer-term climate impacts will depend on the speed and nature of the economic recovery and government policies implemented (see, Carlsson-Szlezak et al. 2020).

All modeling estimates indicate that the 2030 40% emissions reduction goal is likely to be achieved ahead of time under the three economic recovery scenarios modeled if we continue to implement existing policy measures. A slower economic recovery will reduce the time needed to meet the 2030 target. This assumes that the current policy approaches continue as planned and no other barriers to emissions reduction arise due to the COVID-19 pandemic, such as financial or innovation constraints. Our results also show that if governments choose to keep the 40% emissions target in 2030 and relax their existing emissions policy measures, the future emissions mitigation trajectory will need to be steeper to achieve 2050 targets.

The COVID-19 crisis comes at a complex moment for European climate policy as it pivots from a 40% 2030 emissions reduction target to a more ambitious European Green Deal. We also examine the impact of the COVID-19 pandemic on the 2030 Green Deal targets. We find that even with slower economic recovery, existing policy measures will not be sufficient to achieve the Green Deal targets and thus the longer term Paris climate agreement. However, with sustained lower economic activity, we estimate that it will be significantly less expensive to achieve lower greenhouse gas emissions targets than previously thought. Governments could push for stronger emissions targets and associated policy measures for 2030, perhaps as part of an economic stimulus package under the framework of the Green Deal under negotiation in Europe.

The European and global economy has undergone a major shock. As governments are considering how best to reboot their economies, they could make public financial support for business conditional on climate action and environmental resilience. Innovative ideas are needed to develop a more sustainable economic structure that creates employment in green sectors and businesses, for example, in the provision of energy efficient construction and services, renewable energy, or intelligent transport services and infrastructure (Janssen 2020).

Understanding the consequences of the COVID-19 pandemic on climate policies and targets reveals policy options and research questions. The stronger measures needed to reach Green Deal goals may be less costly now than previously anticipated. In this paper, we have not considered the other societal costs and benefits associated with the reduction in economic output. Further modeling is needed to estimate how climate policy, investment and economic recovery can be aligned.

Funding This work has been partly funded by the Irish Government Department of Communications, Climate Action and Environment. It has also been supported in part by a research Grant from Science Foundation Ireland (SFI) under the SFI Strategic Partnership Programme Grant No. SFI/15/SPP/E3125. The views expressed are those of the authors alone.

Appendix

Sensitivity Analysis

Realized emissions reduction relative to 1990 in the ‘continue policy’ option depends only on the loss of output relative to baseline due to the pandemic (see Fig. 1). The relationship is simply $T = T_0 + (1 - T_0) \frac{Y_{baseline} - Y}{Y_{baseline}}$, where T is the emissions reduction achieved in 2030, T_0 is the original emissions reduction target and $Y_{baseline}$ is baseline output in 2030. For example, current policy measures would be sufficient to reach a 50% reduction target if output in 2030 were 17% below the baseline. Clearly the target overshoot $T - T_0$ is insensitive to the BAU emissions intensity assumption and only weakly sensitive to baseline growth assumptions.

On the other hand, the illustrative abatement costs are sensitive to both assumed BAU decay in carbon intensity and baseline economic growth. Of course, costs also depend on the assumed total abatement cost curve model. Figure 4 shows the dependence of European Green Deal abatement costs on parameters in the ‘muted recovery’ scenario. Note that the cost of Green Deal 2021–2030 is \$1.3Tn with our central parameters, smaller than the cost of measures to deal with the pandemic.

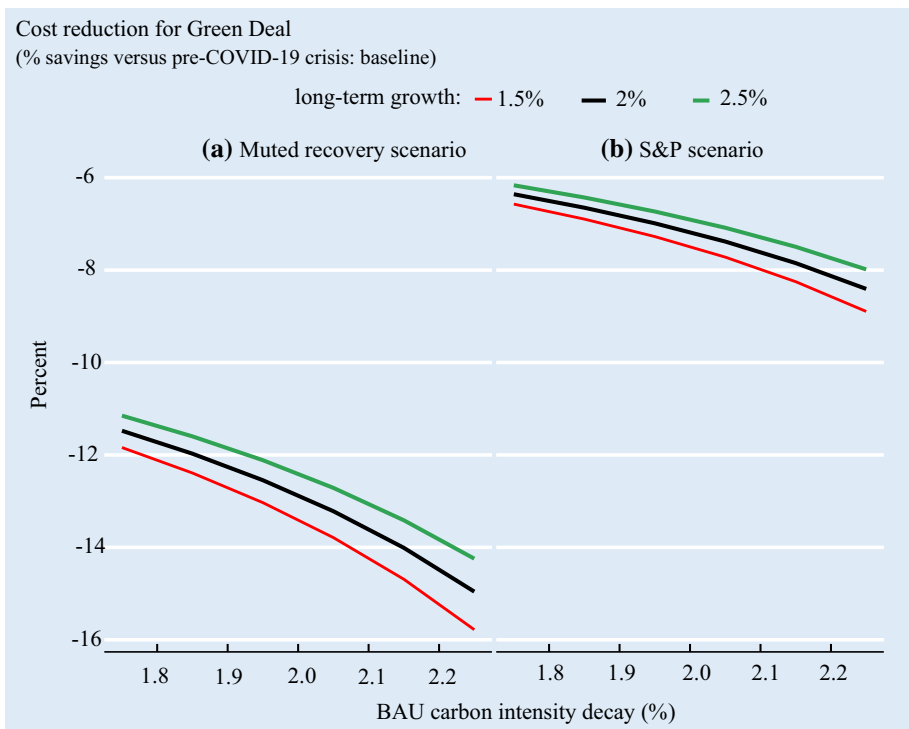


Fig. 4 Sensitivity of Green Deal illustrative costs to key modeling parameters relative to a baseline of no COVID-19 pandemic. The x-axis is the BAU carbon intensity decay rate, and % cost reductions are shown for long term growth rates 1.5%, 2% and 2.5%. Savings for ‘muted recovery’ for example lie in the range –11% to –16% (see Table 1)

References

- Carlsson-Szlezak P, Reeves M, Swartz P (2020) Understanding the economic shock of coronavirus. *Harvard Business Review*. <https://hbr.org/2020/03/understanding-the-economic-shock-of-coronavirus>
- Energy Modeling Forum (EMF) (2010) Climate change control scenarios. Stanford University. <https://emf.stanford.edu/projects/emf-22-climate-change-control-scenarios>
- European Commission (2020) Spring 2020 Economic forecast: a deep and uneven recession. https://ec.europa.eu/commission/presscorner/detail/en/ip_20_799
- European Commission (2019) A European Green Deal; 2020 Climate and Energy Package. https://ec.europa.eu/clima/policies/eu-climate-action_en
- European Council (2014) A policy framework for climate and energy for the period between 2020 and 2030. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0015>
- International Energy Agency (2020) Global energy review 2020, OECD/IEA, Paris. *Global Energy and CO₂ Emissions in 2020—Global Energy Review 2020—Analysis*
- International Monetary Fund IMF (2020) World Economic Outlook, April 2020: The great lockdown. <https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020>
- IPCC (2018) Summary for policy makers: In: *Global warming of 1.5°C*. <https://www.ipcc.ch/sr15/>
- Janssen D (2020) Beware of jobs vs. climate clash in virus aftermath, EU warned. *Euractiv.com*. <https://www.euractiv.com/section/climate-environment/news/beware-of-jobs-vs-climate-clash-in-virus-after-math-eu-warned/>
- Jiang X, Guan D (2017) The global CO₂ emissions growth after international crisis and the role of international trade. *Energy Policy* 109:734–746
- McKinsey (2020) COVID-19: briefing materials. <https://www.mckinsey.com/~media/mckinsey/business%2520functions/risk/our%2520insights/covid%252019%2520implications%2520for%2520business/covid%252019%2520march%252025/covid-19-facts-and-insights-march-25-v3.ashx>
- Nordhaus WD (2017) Revisiting the social cost of carbon. *Natl Acad Sci* 114:1518–1523
- Peters G, Marland G, Le Quéré C et al (2012) Rapid growth in CO₂ emissions after the 2008–2009 global financial crisis. *Nat Clim Change* 2:2–4
- Saadat S, Rawtani D, Hussain CM (2020) Environmental perspective of COVID-19. *Sci Total Environ* 728:138870
- Standard and Poor's (2020) Economic research: COVID-19 deals a larger, longer hit to global GDP. <https://www.spglobal.com/ratings/en/research/articles/200416-economic-research-covid-19-deals-a-larger-longer-hit-to-global-gdp-11440500>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.