

Energy and Climate Policy in the Post COVID-19 era Comparative Analyses on Germany and Japan

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Executive Summary

The COVID-19 pandemic had a deep impact on all economies around the world. Lock-downs and the restrictions of movements have led to decreasing GDP, income losses, decline of consumption and new behavior patterns. Communication modes changed with an overwhelming push to digitalization, entering all fields of life. The traffic volume dropped massively, especially in air travel and public transport. As a result, CO₂ emissions and energy consumption - in Japan especially oil - decreased substantially. Germany even exceeded its CO₂ reduction goal for 2020 (-42%).

In spite of the suffering of millions of people around the world, some of the pandemic's impacts may also hold chances for future well-being and global climate protection using the huge global stimulus programs as an "once-in-a-lifetime" opportunity to initiate and foster a more ambitious economic structural change in the direction of sustainability. The German and Japanese recovery packages actually include energy transition support and climate action. But there are doubts whether they are sufficient up to now to lead to a „green structural change“ and to what extent the green spending activities are compatible with the priorities of current climate protection scenarios and strategies in both countries. International analyses of the "Energy Policy Tracker" and the Vivid Economics / Finance for Biodiversity Initiative indicate that the recovery programs of most countries still direct more financial aid into fossil fuels than in clean energies or to sectors and activities that are rated as green. In the next years "Austerity Policies" to refinance the increased public debt, reluctant to incentivize the energy transition and climate mitigation, could thwart more climate protection. The universal use of digitalization and revitalized preferences of car mobility may entail larger "ecological rucksacks", and the lack of inclusive growth could enforce existing inequalities.

Against this background, it is suggested to set up a more comprehensive German-Japanese research project that compares the long-run effects of the COVID-19 crisis for Germany and Japan, and analyzes whether and under which conditions - supported by international cooperation and mutual learning - the pandemic could encourage a new dynamic for a Great Transformation towards climate neutral societies or may lead to a rebound back to the “old Normal” of unsustainable growth patterns.

1. Introduction

The COVID-19 pandemic has highlighted previously existing economic, social and cultural weaknesses or strengths, contradictions of interests and inequalities worldwide like in a magnifying glass and with great speed. It is the world event in peacetime since the 1930s, which - even more profound than the world financial crisis of 2008/2009 - has brought the global systemic interrelationships and vulnerability of the "One World" into the everyday consciousness of the world community. At the same time, warnings were given during the pandemic and in connection with the huge global recovery programs not to postpone the fight against other urgent crises such as climate change. Instead, integrated strategies are necessary in order to protect against the pandemic and achieve an economic recovery, more sustainable economic development and ambitious climate protection at the same time with the recovery programs.

At the "Climate Ambition Summit" (12 December 2020) UN Secretary General Antonio Guterres delivered an alarming speech¹ which urgently called for highest climate mitigation ambition of all worldwide recovery packages. This is a serious wake-up call for all countries including Germany and Japan: "The recovery from COVID-19 presents an opportunity to set our economies and societies on a green path in line with the 2030 Agenda for Sustainable Development. But that is not yet happening. So far, the members of the G20 are spending 50% more in their stimulus and rescue packages on sectors linked to fossil fuel production and consumption than on low-carbon energy. This is unacceptable. The trillions of dollars needed for COVID-19 recovery is money that we are borrowing from future

¹ <https://www.un.org/sg/en/content/sg/statement/2020-12-12/secretary-generals-remarks-the->

generations. This is a moral test. We cannot use these resources to lock in policies that burden future generations with a mountain of debt on a broken planet” (Antonio Guterres 2020).

The IEA² demands as well that the huge global stimulus programs should be used as an opportunity to initiate a more ambitious economic structural change in the direction of sustainability and climate protection. Thus, there is a growing fundamental consensus worldwide that after the COVID-19 pandemic the “New Normal” cannot remain the “Old Normal”. According to Albert Einstein's famous sentence: "Problems cannot be solved with the same way of thinking that created them".

At the time this short study was prepared (12/2020), most countries worldwide were in a second wave of the COVID-19 pandemic. In this respect, it is still too early to attempt a final assessment of the effects of the pandemic on the energy system. It surely entails new risks, but also opportunities. Both directions have been vividly discussed. Voices pointing to *potential chances* of the crisis, are seeing a change in policy style from a (neoliberal) "Night Watchman State" to a (keynesian) "Shaping State", are hoping for an accelerated green structural change through recovery programs and value chains becoming more deglobalized and resilient. A potential re-evaluation of system-relevant work, reduced working hours and adjusted wage levels, and chances to induce more justice through ecological and social tax reforms are being discussed. These voices also underline the chances for a sustainable transformation of the mobility sector with soft tourism and less air and cruise travel, expanded bicycle infrastructure and fewer commuters due to more home office, less business trips and more videoconferences.

² e.g. IEA <https://www.iea.org/reports/sustainable-recovery>

Other voices fear social insurance and wage cuts to refinance public debt - reluctance to (pre-)finance the energy transition and sustainable development or rising unemployment and poverty, especially in the global South. They expect less diversity in trade (Internet), culture, sports, international exchange and an enforced two-tier health and care system. They point to even larger 'ecological rucksacks' of digitalization and warn that the pandemic, also in the transport sector, could have rather opposite effects with even more individual automobility to be expected instead of public mobility. All of this resulting in less intergenerational justice and international solidarity.

Thus, there is a high level of uncertainty about what are temporary effects and what new trends permanently triggered by the COVID-19 pandemic will come up. It is also interesting to compare possible different effects of the COVID-19 pandemic in Japan and Germany not only in terms of the scope and structure of the state recovery programs, but also in terms of political and socio-ecological effects.

This short and preliminary study focuses on Germany and Japan and tries to identify possible impacts of COVID-19 on the economy and related energy consumption/CO₂-emissions and on possible induced long-term structural and behavior changes. It analyzes the recovery programs and their possible impacts on sustainable structural change and on the style of policy making. Finally, it suggests to set up a more comprehensive German-Japanese research project that compares the long run effects of the COVID-19 crisis for both countries.

2. Socioeconomic impacts and related energy consumption and CO₂ emissions

The effects on the economy and related energy consumption and CO₂ emissions worldwide and in both countries in 2020 and 2021 are challenging. Economy slows in every part of the world. This entails new risks, but also opportunities to steer the economic development towards more sustainability and climate protection.

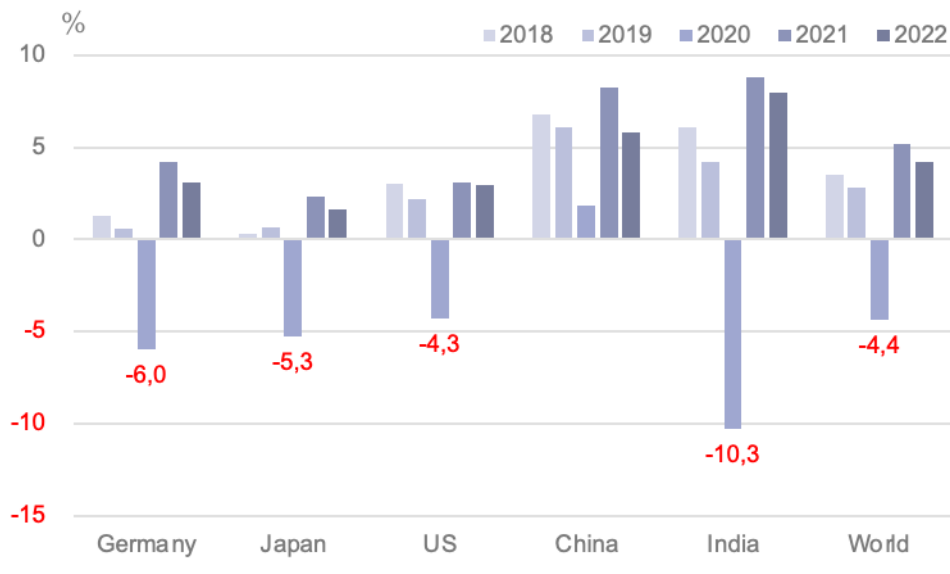


Figure 1 GDP growth rate of major economies
Source: IMF, World Economic Outlook Database, October 2020

The world's oil demand shrank significantly and saw a historically high over supplied oil market which led to a negative crude oil price. But after that, production cut of the OPEC Plus has quickly rebalanced the market.

This chapter gives a brief overview of how the pandemic affected peoples' lives, work and industries in Japan and Germany.

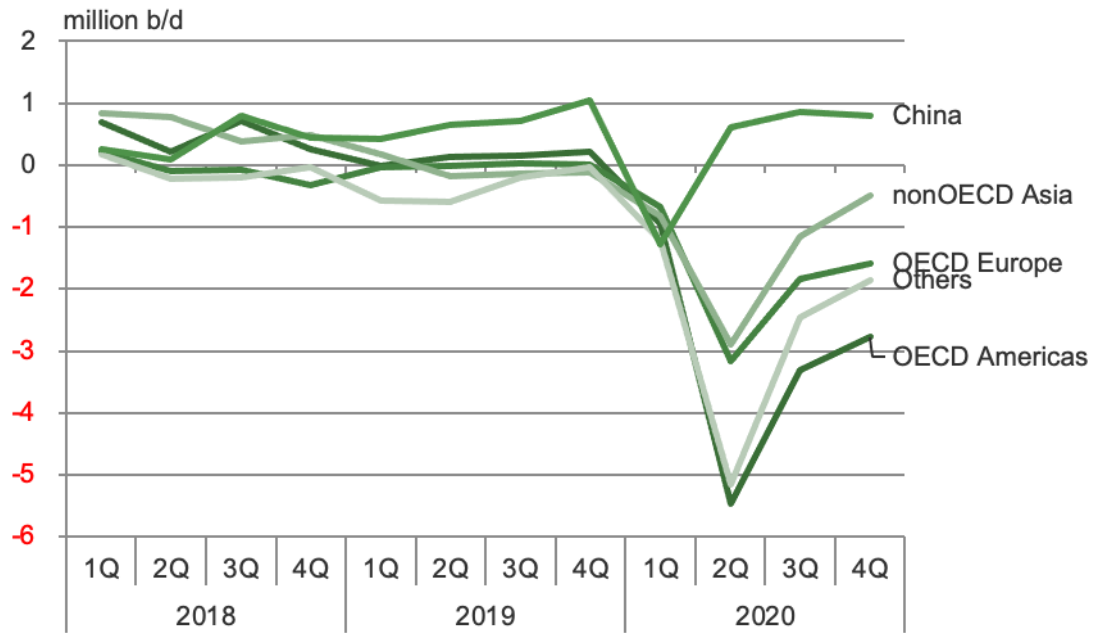


Figure 2 Trajectory of change of oil demand in major regions
Source: IEA, Oil market report

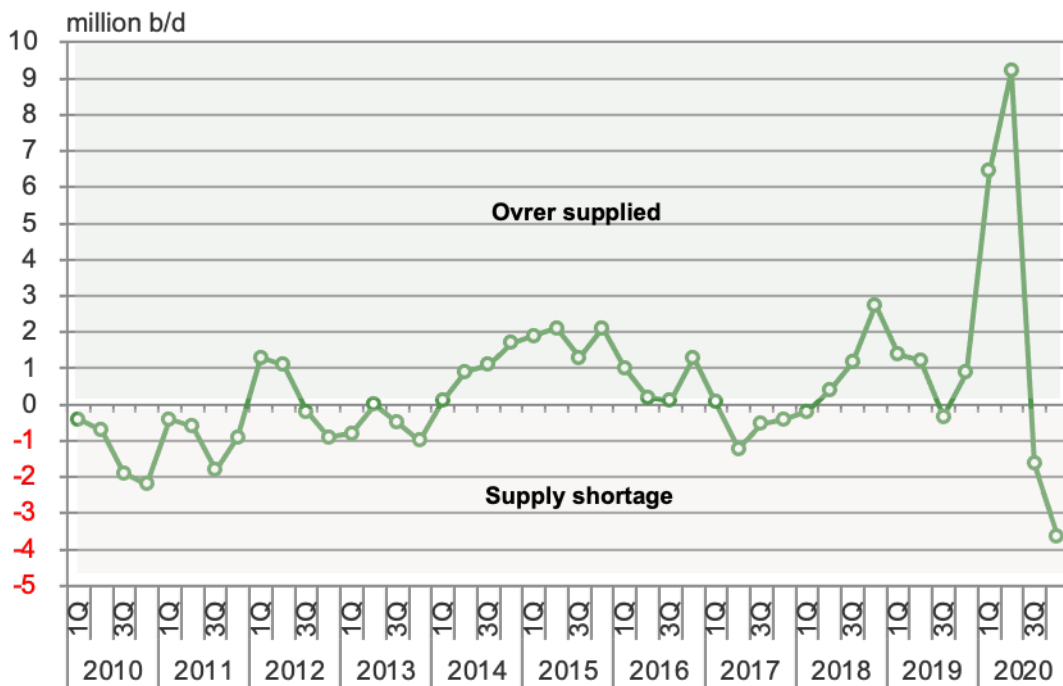


Figure 3 Trajectory of net crude oil balance
Source: IEA, Oil market report

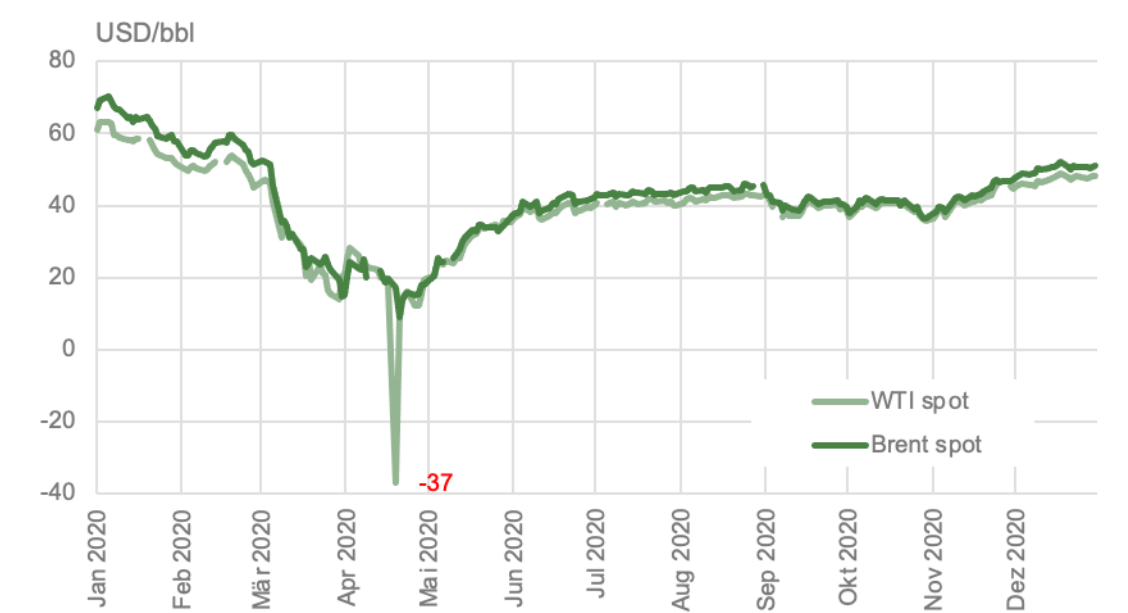


Figure 4 Trajectory of Brent and WTI spot crude oil price
Source: IEA

2.1 Japan

COVID-19 put various influences on Japanese society and economy. In Japan, a state of emergency was declared through the steps shown in the table below. The state of emergency was not a compulsory measure with penalties, but a request to voluntarily reduce the chances of contact between people to 20-30% of the normal level. In this respect, it is different from the so-called "lock-down" taken in Europe. Although it was lax restriction compared to that in European nations, we saw a significant depression of economy particularly in the second quarter of 2020 which we didn't experienced even during a financial crisis in 2008 and 2009.

Table 1 History of the declaration of the state of emergency

| Date of issue | Period until | Subjected region |
|----------------------|--------------|--|
| 7 April 2020 | 6 May 2020 | 7 prefectures including Tokyo |
| 16 April 2020 | 6 May 2020 | Expanded to all regions |
| 4 May 2020 | 31 May 2020 | All regions |
| 14 May 2020 | 31 May 2020 | Reduced to 8 prefectures including Tokyo |
| 21 May 2020 | 31 May 2020 | Reduced to 5 prefectures including Tokyo |
| 25 May 2020 | 25 May 2020 | End of the declaration |

Source: Cabinet secretariat, the Government of Japan
(https://corona.go.jp/news/news_20200421_70.html)

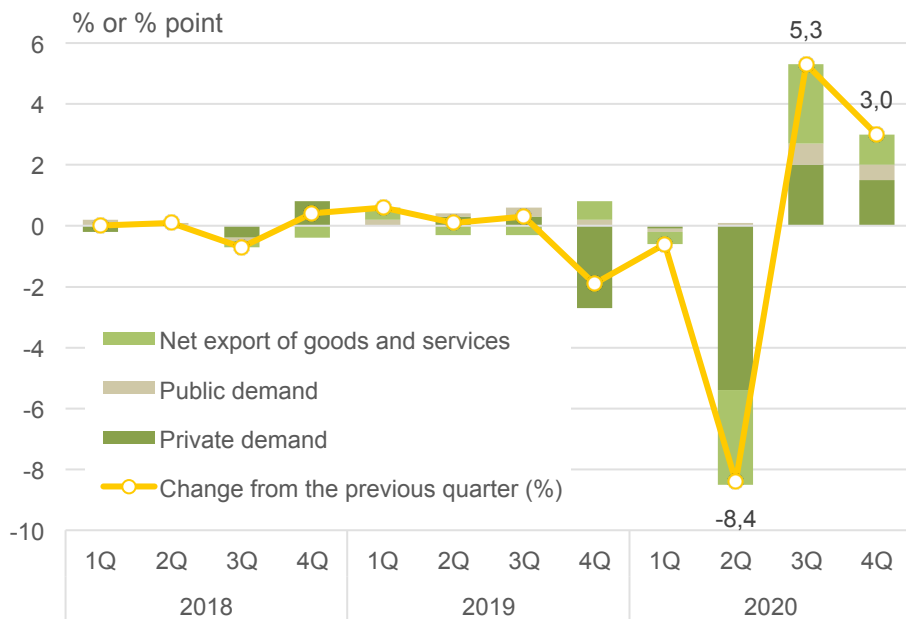


Figure 5 Quarterly GDP (seasonally adjusted) change in Japan

Source: Cabinet office, Quarterly GDP report

Change of life style

It can be said that the decrease in the amount of person trips is the biggest change in a life style. With government publicity to avoid the Three Cs³, people are refraining from going out from home to reduce the risk of infection. Leisure and travel outings decreased the most, and restaurants, gyms, and other non-necessary outings were avoided as much as possible. After the end of the state of emergency on 25 May 2020, the number of people going out gradually increased, but even recently, it is still lower than usual.⁴

Although it is inevitable to purchase daily necessities such as food, the frequency was reduced and visits to large shopping mall, which are likely to be crowded, were avoided. On the contrary, purchase opportunities at small stores near home have not decreased so much.

It has been reported that there is a tendency to prefer individual transport mode, that is, private cars, bicycles, and walking, to public transportation. However, since the amount of transportation itself is decreasing, the replacement rate of public transportation by individual transport mode may not be large.

In terms of consumption, it is characterized by a large increase in the use of online services. Instead of going to stores or restaurants, people have more opportunities to use online shopping and delivery services. In addition to entertainment or learning, daily communication is becoming more common online.

Changes can also be seen in the place of residence. Prior to COVID-19 pandemic, the influx of population into Tokyo exceeded the outflow. However, the number of out-migrants from Tokyo has been excessive for four consecutive months from July to October 2020. In the background, it seems that the number of people affected by COVID-19 is the highest in Tokyo and that the convenience of remote

³ Three Cs stands for closed spaces, crowded places, and close-contact settings.

⁴ Population at major train stations in Tokyo on working day in December is still 10% to 60% less than before Covid-19. (Agoop, 5 December 2020)

communication is widely recognized. Willingness for moving is especially high among the younger generation.

Change of work style

Remote work has become more popular in order to avoid contact with people. Overseas business trips have almost disappeared, and domestic business trips have also decreased significantly. According to a government survey conducted from the end of May to the beginning of June 2020, the percentage of people who used remote work was 34.6%. The use of remote work was high at nearly 50% in education, finance, and wholesale sectors, while it was low at less than 20% in medical care, agriculture, forestry and fisheries, and retail sectors. By region, the remote work utilization rate was high in metropolitan areas including Tokyo. The use of remote work brings about a significant reduction in commuting time. Due to its convenience, many people who have experienced remote work want to continue this, especially in the Tokyo area.

When commuting, there is a growing willingness of avoiding public transportation, which is expected to be crowded. However, in many cases, it is thought that the actual change of commuting mode will be limited, because, for instance, an average commuting time in Tokyo metropolitan area is approximately 45 minutes by public transportation or car which is impossible to switch to commute by bicycle or on foot and because car parking charge is very expensive in business area.

Change of Industry

Production has fallen in many industries due to lower personal consumption and lower economic activity. The Indices of Industrial Production (IIP) has declined sharply in April and May 2020, when the year-on-year declining rate reached to

almost -10%. By industry, the decline in automobiles and steel / non-ferrous metals was large. Production has picked up after June 2020 and has continued to recover. The industrial sector generally has a long investment cycle, and the structure itself cannot change significantly in the period of less than one year from March 2020, when the influence of COVID-19 became clear, to the present.

Meanwhile, COVID-19 poses new risks to business continuity, such as disruption of domestic and overseas supply chains and shortage of personnel due to infection. Companies are seeking to strengthen their business continuity plan (BCP) by diversifying and domesticizing their supply chains and strengthening logistics and inventory management using digital technology.

In Japan, gasoline and jet fuel are the most affected energy after COVID-19.

Damage of other energies, i.e. diesel oil, naphtha for feed stock, natural gas, and electricity are not so significant.

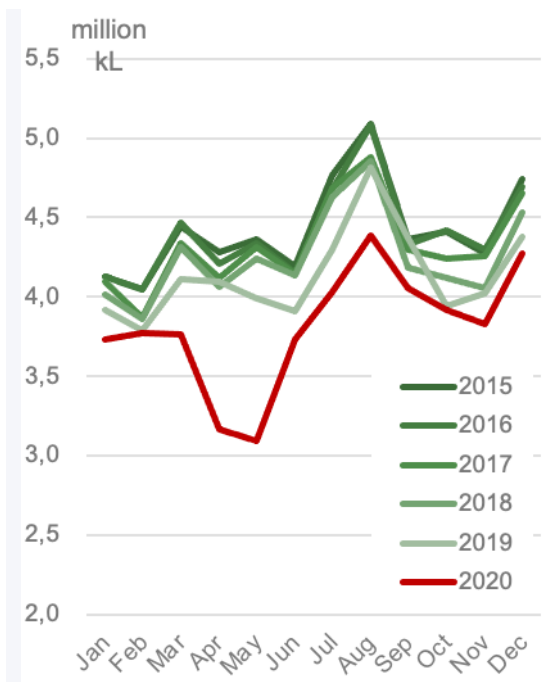
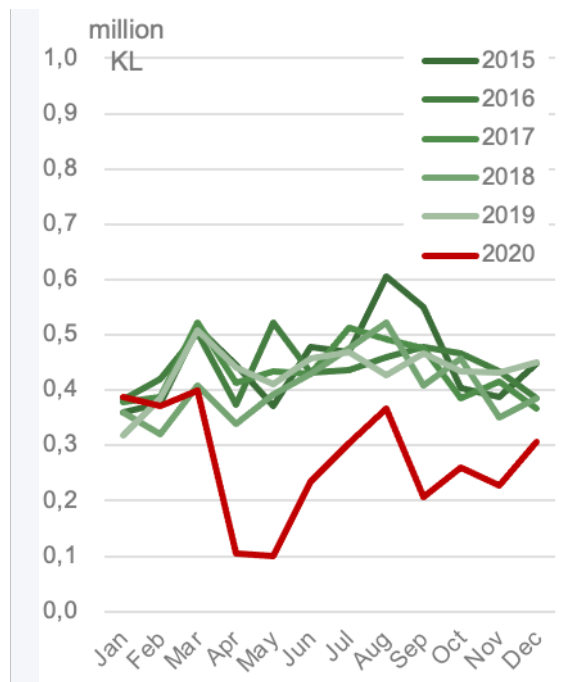


Figure 6 Trajectory of gasoline demand in Japan

Source: IEEJ, Data bank



Trajectory of jet fuel demand in Japan 1

Source: IEEJ, Data bank

2.2 Germany

Before the COVID-19 pandemic it was expected that Germany will miss its 2020 CO₂ emission reduction target of 40% compared to 1990. Especially due to the COVID-19 pandemic, however, it exceeded the target and achieved a reduction of 42.3%.⁵ One of the main reasons cited is the drop in energy consumption in the transport and industry sector.⁶

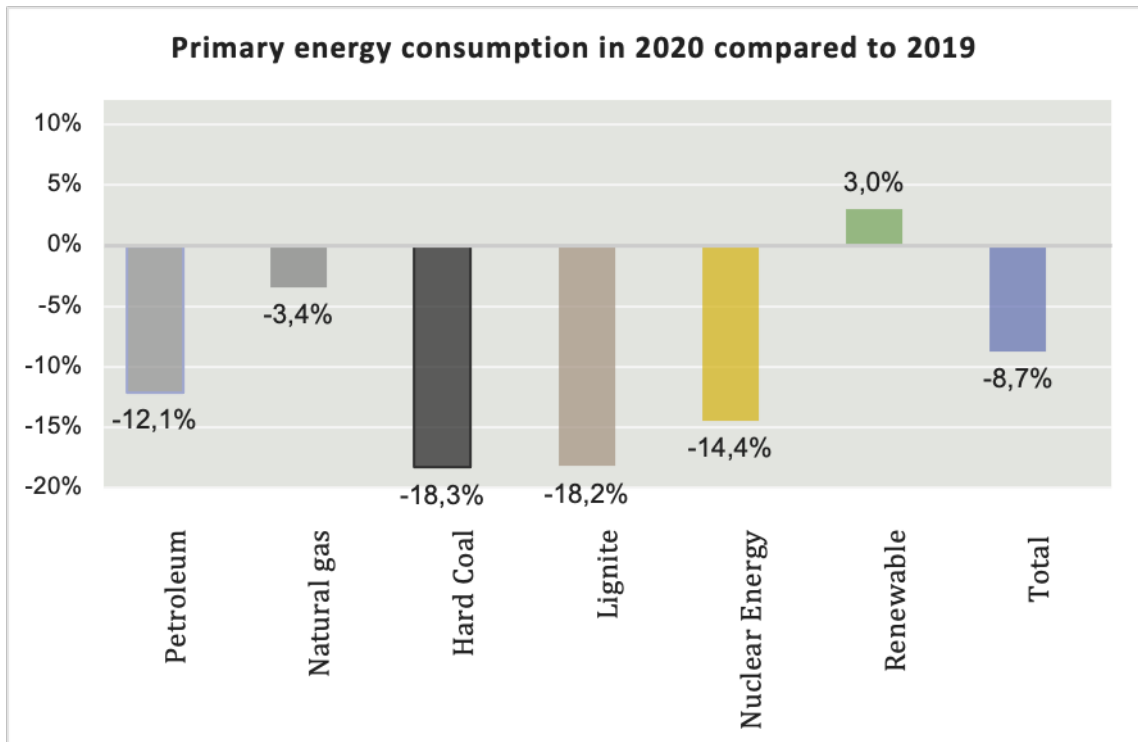


Figure 7 Primary energy consumption in 2020 compared to 2019

Source: AG Energiebilanzen (2020). Energieverbrauch sinkt auf historisches Tief Deutsche Auswirkungen der Corona-Pandemie / Anteil fossiler Energien sinkt. AG Energiebilanzen Pressedienst.

Figure 7 shows that total primary energy consumption in Germany fell by 8.7% in 2020 compared with the previous year, reaching an all-time low of 11,691

⁵ Agora Energiewende, 2021. Die Energiewende im Corona-Jahr: Stand der Dinge 2020. Rückblick auf die wesentlichen Entwicklungen sowie Ausblick auf 2021.

⁶ Emissions were reduced by 80 million tons of CO₂ to 722 million t. Without Corona it would have been only 25 million t (37,8%).

petajoules (PJ) or 398.8 million metric tons of hard coal equivalent (mtce).⁷ Interestingly natural gas was hit less in comparison to coal, nuclear and oil and renewable energy even increased during the pandemic.

But looking to the future, the Agora study warns that more GHG emissions could be expected in all sectors again as soon as the economy catches up.⁸ This chapter describes in more detail the changes in industry, life and working styles that lie behind these numbers.

In Germany, profound measures were taken to slow down the spread of infections.^{9,10,11} In spring 2020, schools, universities, most shops, restaurants and catering, but also service businesses in the field of personal care were closed, gatherings of more than two people were prohibited, and major events were banned. People were asked to follow hygiene rules, and to refrain from private travel and visits, accompanied by travel warnings and quarantine obligations for returnees. In April/May, some of the measures were loosened up. Towards autumn, however, the measures picked up again. Finally, there was another partial lockdown in November, which was further tightened during the winter months. Throughout the year, the pandemic thus changed peoples' lives significantly.

Changes in Industry and other sectors

„After several quarters with shrinking production in the manufacturing sector, the COVID-19 crisis has hit the German economy with unprecedented force. The

⁷ <https://www.ag-energiebilanzen.de/>

⁸ <https://www.br.de/nachrichten/wissen/klimaziele-fuer-2020-in-deutschland-doch-noch-erreicht,SLDZF1G>

⁹ <https://www.handelsblatt.com/politik/deutschland/covid-19-in-deutschland-coronavirus-so-hat-sich-die-lungenkrankheit-in-deutschland-entwickelt/25584942.html?ticket=ST-2066035-yivDatPvWugjA5zjhBnn-ap4>

¹⁰ <https://www.deutschland.de/de/news/bundesregierung-und-corona-krise>

¹¹ <https://www.bundesregierung.de/breg-de/themen/coronavirus/bund-laender-corona-1744306>

simultaneity of multiple supply and demand shocks is likely to be unique compared to previous economic crisis“.¹² The quote summarizes how the overall economic impacts of the COVID-19 crisis are perceived by most economists in Germany. Germany is particularly affected by the global pandemic because it is intensively integrated into global value chains. Domestic industry sales fell by 19.2%, foreign sales by 28.2%. The *automotive sector, machinery and plant engineering industries, aviation industry and the touristic sector* have been hit the most (The National Law Review, February 2, 2021).¹³ The automotive sector suffers due to a collapse in global demand for new cars. Production went dramatically down by 53.6% in May compared to the same month last year.

While the health sector or parts of trade continue to operate more or less fully, the travel industry has almost come to a standstill along the entire value chain with 88% travel and tour operators in short work as well as 71% of hotels.¹⁴ *Lufthansa* is severely affected by the pandemic and had to accept a rescue deal of €9 bn from the government to save it from a collapse.¹⁵

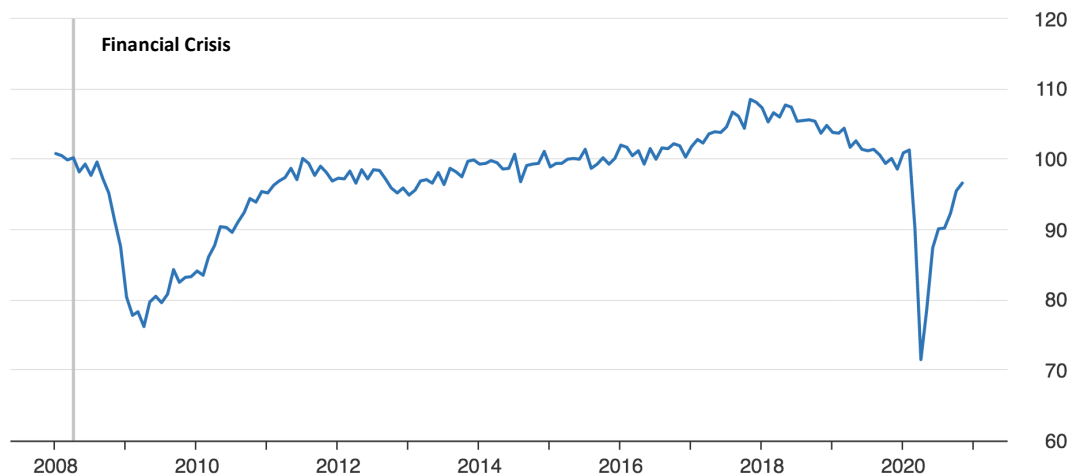
Many industrial enterprises are massively affected by disrupted supply chains and other impairments on the supply and demand side. Sectors where the risk of contagion is lower or where decentralized working is possible (home office) tend to be less affected.

¹² See IW; The German Economic Institute (IW) sees its research as an “advocate of a liberal economic and social order“ (homepage) and working closely with German Industry; <https://www.iwkoeln.de/en/studies/external-studies/beitrag/hubertus-bardt-michael-groemling-germanys-economic-response-to-the-coronavirus-crisis.html>

¹³ <https://www.natlawreview.com/article/reflections-covid-19-views-germany>

¹⁴ <https://www.natlawreview.com/article/reflections-covid-19-views-germany>

¹⁵ <https://www.bbc.com/news/business-52801131>



© Statistisches Bundesamt (Destatis), 2021

Figure 8 Production index in the manufacturing sector

As a result, during the COVID-19 crisis, more companies put their employees on short-time work than ever before. According to estimates based on the results of the ifo Business Survey, the number of employees on short-time work in Germany amounted to 7.3 million in May 2020 (22% of all employees subject to social security contributions). In June, the number decreased slightly to 6.7 million. By comparison: at the height of the financial crisis, the peak of short-time work in May 2009, with just under 1.5 million employees, was only one fifth of the level estimated for May 2020. In the current crisis - unlike in 2009 - service sectors are also affected, and the period over which workers are supported with short-time allowances is longer than in previous crises.^{16,17} About 80% of metal producers are still on *short work*. On average the number of short work is decreasing, but the problem of underemployment continues and public support scheme (about 60-80% of salary) has been extended until December 2021.

¹⁶ <https://www.ifo.de/themen/coronavirus>; <https://www.ifo.de/node/57436>

¹⁷ <https://www.bmwi.de/Redaktion/DE/Pressemitteilungen/Wirtschaftliche-Lage/2020/20201014-die-wirtschaftliche-lage-in-deutschland-im-oktober-2020.html>

29.000 additional possible *corporate insolvencies* have been estimated up to now, but fortunately have been mitigated for months by changes in the insolvency law. But what about future perspectives? (ibid).

With that in mind it is not surprising that short run *consumer spending* fell significantly, because of concerns about possible job losses. Though it is expected that consumption will be a main driver for recovery¹⁸ it is not clear whether this will be connected with energy saving shifts of consumption patterns concerning e.g. on-line shopping, mobility patterns, tourism.

To sum up the economic effects: „The coronavirus pandemic has caused an unprecedented global economic bust. At the same time, it will likely accelerate structural changes, which in turn are driven by digitalization, the energy revolution, decarbonization and demographic changes“ (Intereconomics, 2021, ibid). Thus, the end of the COVID-19 pandemic in terms of illnesses and deaths - however depressingly long this end may lie ahead of us - is by no means the end of the possible far-reaching economic, social and political consequences of the pandemic. Thus, the key question remains what these socioeconomic impacts imply for the energy transition, for fostering a decarbonization strategy and for an integrated crisis management policy.

Is it possible to step forward to sustainable structural change and “better growth” which decouples economic development by innovations and green investments from GHG-emissions? Unfortunately, traditional macroeconomic quantitative analysis and projections are not very powerful to answer this question. On the one hand, there is talk of a double external shock (see above) on the economy and, as a result, massive *quantitative* growth losses. On the other hand, the hope is

¹⁸ <https://www.bundesbank.de/en/tasks/topics/coronavirus-pandemic-continuing-to-shape-german-economy-853776>

expressed that with economic stimulus programs, it might be possible to create V-shaped, quick and high new *quantitative* growth impulses, to catch up to the old growth path again. *But what if the old growth path has not been sustainable at all?*

Change of life style

Around 40% of households suffered income and other financial losses due to the COVID-19 pandemic and related measures¹⁹, and thus became generally more cautious in their planned spending. Concerns about contagion, closed shops and entry regulations, strengthened the use of online trade which increased its sales by 23% in August alone compared to the same month a year before (Destatis, 2020). Food and meal delivery services also experienced a boom. These trends not only led to a noticeable increase in delivery traffic in cities.^{20,21} German households also produced significantly more waste than in previous years. The amount of plastic, other light packaging and glass collected rose by around 6% in 2020 (BDE 2020).²² On the other side, life and consumption shifted from the city centers to the city districts and neighborhoods. Due to the use of home offices, people were increasingly shopping in the small shops on their doorstep and made greater use of the bicycle or walking instead of travelling by car or bus. Suburban locations that have so far not been optimally connected to the city center suddenly gained in attractiveness (PwC 2020²³).

¹⁹ <https://www.bundesbank.de/en/publications/research/research-brief/2020-35-covid-19-pandemic-consumption-849870>

²⁰ <https://www.tagesschau.de/wirtschaft/lieferdienste-onlinehandel-corona-boom-101.html>

²¹ <https://www.firmenauto.de/lieferdienste-im-staedten-wege-aus-dem-verkehrskollaps-10153014.html>; https://merkurist.de/frankfurt/neues-system-stockender-verkehr-durch-lieferservice-forscher-suchen-loesung_Fd4

²² German Association of the Waste Management, Water and Raw Materials Industry (2020)

²³ PwC, 2020.

Although everyday mobility is reduced overall²⁴, the car appears to be the ‘winner among the means of transport in the COVID-19 crisis’, to a lesser extent also the bicycle. Among the ‘biggest losers’ are all public transport modes and car sharing, which trigger feelings of insecurity among users during the pandemic.²⁵

Clear changes also occurred in travel habits, especially when comes to vacation travel. Germans are considered to be the world's travel champions. However, during the COVID-19 pandemic, the popular, but ecologically questionable long-distance travel²⁶ declined seriously.²⁷ Only about one third of German holidaymakers who would have been interested in a cruise in principle were still considering a cruise (Centouris 2020).²⁸ Passenger air traffic came to a virtual standstill at times.²⁹ By contrast, Germany as a popular and low-emission holiday destination increased its share to over 50%. However, holiday destinations in Europe that can be reached by car have so far remained attractive if no travel warning was issued. But air travel at German airports collapsed dramatically (see Fig. 9).

²⁴ <https://www.infas.de/neuigkeit/mobilitaet-und-corona-wie-veraendert-sich-der-alltagsverkehr/>

²⁵ <https://verkehrsforschung.dlr.de/de/news/dlr-befragung-wie-veraendert-corona-unsere-mobilitaet>

²⁶ https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Der_touristische_Klima-Fussabdruck.pdf

²⁷ https://bzt.bayern/wp-content/uploads/2020/07/Reisen-in-Zeiten-von-Corona-BZT_Studie_Juli_2020_PDF.pdf

²⁸ <https://www.centouris.de/aktuelles/news/news-detail/wie-das-coronavirus-das-reiseverhalten-der-deutschen-veraendert/>

²⁹ <https://de.statista.com/statistik/studie/id/72253/dokument/auswirkungen-des-coronavirus-auf-die-luftfahrt/>

Air Passengers at German Airports
Arrivals and Departures in billion

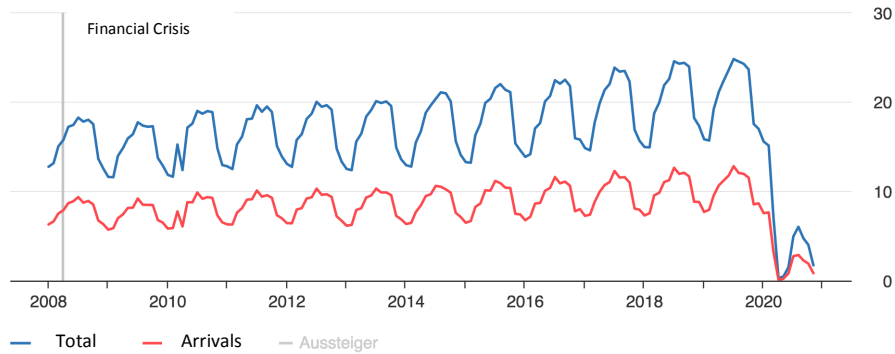


Figure 9 Air passengers at German airports
Source: Destatis (2021)

The requirement to stay at home increased the importance of communication in private life: phone calls, entertainment media, video conferencing, cloud services and streaming offers for event broadcasts (cultural performances, church services, etc.). Data traffic increased by leaps and bounds. Telekom recorded a 76% increase in fixed network communication in March 2020, streaming services and game clouding increased by 30% in this period.³⁰ More cooking, streaming and being most of the time in the home office with a permanent use of computers requires energy. Following a survey by Verifox (2020), the COVID-19 pandemic has increased electricity consumption in many German households, especially among younger consumer groups. They estimate up to 150 euros more in electricity costs per year.³¹

³⁰ EY/WI, 2020; The DE-EIX internet exchange in Frankfurt is the largest in Germany and one of the most important worldwide.

³¹ <https://www.rnd.de/wirtschaft/stromkosten-steigen-durch-corona-bis-zu-150-euro-mehr-pro-haushalt-durch-homeoffice-zeit-BSOUAJQA45CX3N2DKXQM5AFATM.html>

Change of work style

Before the COVID-19 crisis, about 77% of German employees commuted daily to work³², taking up to 1.5 hours. Only a minority used home offices. But due to the lock-down, the figure rose significantly to 61%³³, the potential not being exhausted yet (see figure 3). However, the home office potential is very unevenly distributed both by industry, region and social conditions (Ifo 2020). The digital transformation was accelerated by the COVID-19 pandemic in the majority of companies (55%), with large companies implementing the digital transformation more consistently than small ones. Digital tools for communication were introduced (23%) or intensified (36%) as a result of the pandemic. (Correct Subtitle: Share of companies with home office, before, during and theoretically after the pandemic)

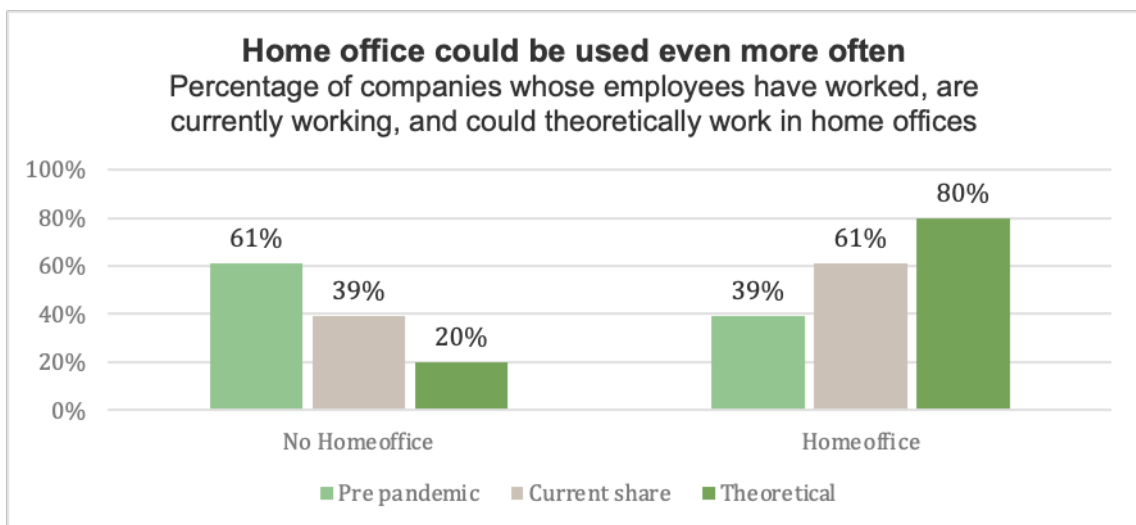


Figure 10 More companies can use home office

Video conferencing was part of the daily work routine for an increasing proportion of the workforce during the COVID-19 pandemic. At the DE-CIX Internet node in

³² https://www.stepstone.de/Ueber-StepStone/wp-content/uploads/2018/04/StepStone_Mobilit%C3%A4tsreport_2018-1.pdf

³³ <https://www.ifo.de/personalleiterbefragung/202008-q2>

Frankfurt, there was a 120% increase in videoconferencing in March. These changes are likely to be permanent (see Figure 4), as HR managers report that they intend to use more home offices (47%), hold more virtual conferences (64%) and fewer on-site meetings (59%) even after the COVID-19 pandemic. In addition, 61% of companies say they plan fewer business trips in the future. In sum, this could amount to a considerable substitution of physical (professional) traffic by data traffic (digitalization). Ernst and Young/Wuppertal Institute (2020) support this trend: "Commuter traffic and business travel each account for 20% of all passenger traffic. [...] it seems realistic that in the long term, 10% of all commuter traffic could be replaced by expanding the home office and 30% of all business trips by virtual meetings. Overall, this would lead to a reduction of 8% in passenger traffic."³⁴ Greenpeace (2020) estimates that CO₂ emissions from transport could be reduced by 5.4 million tons per year if 40% of the employees worked permanently from home two days per week. This corresponds to 18% of all commuting emissions.³⁵

³⁴ Ernest & Young/Wuppertal Institute (2020): Interim report COVID-19 (Own translation)

³⁵ <https://www.greenpeace.de/presse/presseerklarungen/homeoffice-kann-ueber-5-millionen-tonnen-co2-sparen>

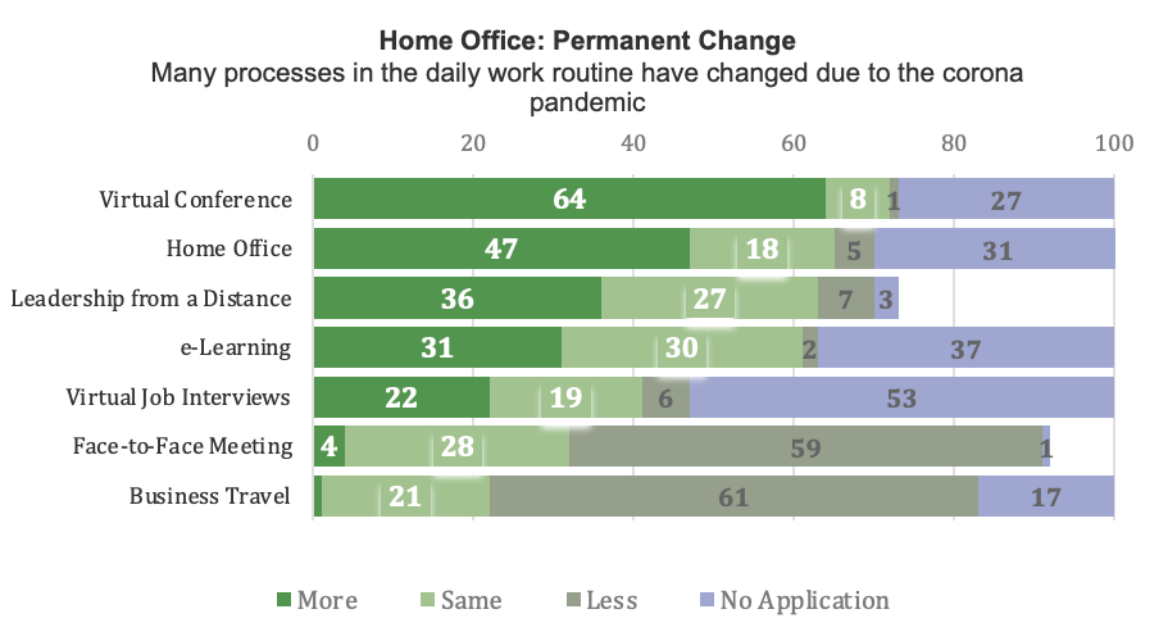


Figure 11 Home Office: Permanent Change

3. Recovery programs and the energy transition

To overcome the massive societal and economic challenges caused by the covid-pandemic crisis, governments all over the world had to take short and medium term action and mobilized enormous financial resources. But the pandemic is hitting the world at a time where already a multitude of enormous societal, ecological and economic challenges exist that need to be solved: If the huge global public recovery programs to overcome the COVID-19 crisis do not take these other challenges into account, but continue with investments in outdated technologies which increase carbon intensity, this may exacerbate other problems, hinder the necessary innovation and reduce the economy’s competitiveness. This holds especially true for the climate crisis.

This chapter gives a brief overview on the stimulus packages in Japan and Germany and tries to identify in how far these measures address greater sustainability.

3.1 Japan

In Japan, two economic stimulus packages have been taken so far in response to COVID-19. There are two main points of economic stimulus packages. The first is the strengthening of the medical system and the emergency protection of industries and individuals affected by COVID-19. Small and medium size enterprises (SMEs) were at a crossroad of business operation, and individuals suffered from declining income and unemployment. It is no wonder that the government puts these protections first. The second is support aimed at economic recovery and future growth. From this perspective, support will be provided that will contribute to strengthening the foundation for growth as well as economic recovery, such as strengthening the supply chain and expanding digital infrastructure. Climate change countermeasures are also included in this respect. However, the only identified support menu is solar PV installation for the manufacturing industry.

Table 2 Budget plan for Covid-19 stimulus package in Japan

| | Total size | | of which, Fiscal expenses | |
|---|---|--------------|---|--------------|
| | Amount | Share to GDP | Amount | Share to GDP |
| The 1 st additional budget (Apr. 2020) | JPY 117.1 trillion (EUR 976 million) | 21% | JPY 48.4 trillion (EUR 403 million) | 9% |
| The 2 nd additional budget (Jun. 2020) | JPY 117.1 trillion (EUR 976 million) | 21% | JPY 72.7 trillion (EUR 606 million) | 13% |
| Total | JPY 233.9 trillion (EUR 1,949 million) | 43% | JPY 120.8 trillion (EUR 1,007 million) | 22% |

Total size = fiscal expenses + contribution of (local government + government agency + bank, etc.)

Assume EUR 1 = JPY 120. Assume nominal GDP in 2019 = JPY 549.5303 trillion.

Source: Cabinet office, Emergency Economic Measures to Cope with the Novel Coronavirus (COVID-19), 20 April 2020, etc.

In addition, the government announced the third stimulus package in December 2020. The package consists of three pillars: "Prevention measure against Covid-19 infection", "transformation of economic structure toward post-corona era", and "strengthening disaster resilience of the land." Of these, "Transformation of economic structure toward post-corona era" clearly states policy for the realization of carbon neutrality, which is different from the past two packages. This is because the government poses the challenge of carbon neutrality as a new growth strategy in response to Prime Minister Suga's declaration of carbon neutrality ambition in October 2020.

Table 3 Japan's budget for Covid-19 third stimulus package

| | Total size | | of which, Fiscal expenses | |
|---|-------------------------------------|--------------|-----------------------------------|--------------|
| | Amount | Share to GDP | Amount | Share to GDP |
| The 3 rd package (Dec. 2020) | JPY 73.6 trillion (EUR 613 million) | 13% | JPY 40 trillion (EUR 333 million) | 7% |

Assume EUR 1 = JPY 120. Assume nominal GDP in 2019 = JPY 549.5303 trillion.

Source: Cabinet office, Stimulus package for peace and hope to protect the citizen's health and life, 8 December 2020

Specifically, the following plan is shown in the package:

- Established a 2 trillion yen R & D support fund. The priority areas are
 - 1) electrification of demand and decarbonization of electricity,
 - 2) realization of a hydrogen society, and
 - 3) carbon capture utilization and storage (CCUS).

- Support decarbonization of automobiles, improve heat insulation of building, and expand use of distributed energy.
- Contributing the decarbonization of the world.

3.2 Germany

In response to the Covid-19 crisis, the German government adopted two economic stimulus packages that were introduced in March and June 2020. The first measure (“Corona Aid Package”) aimed at a short-term support: spending on healthcare & vaccine, short-term work, subsidies for small business owners & self-employers, as well as an expanded duration of unemployment & parental leave. The second package focused at a more long-term economic stimulus and is particularly important regarding its climate impacts as they comprise (besides many other aspects) subsidies and investment in green energy and digitalization.

Summarizing the first package, the Federal Ministry of Economic Affairs and Energy (BMWi) highlights the temporary reduction of VAT (from 19% to 16% / for the reduced rate 7% to 5%; July to December 2020), a child bonus for families and the strengthening of municipalities, as the federal government increased the support for the costs for housing for the needy, compensates half of the municipalities' trade tax losses and strengthens local public transport and the health sector. Furthermore, electricity costs will be reduced: The EEG levy is to be reduced from 2021 onwards through subsidies from the federal budget. A bridging assistance program will support small and medium-sized enterprises.

As part of the second recovery program the so-called “future package” has been decided: Around 50 billion euros (about 38%) will flow into future technology

areas such as the hydrogen economy, quantum technologies and artificial intelligence (see below).

Table 4 German Budget plan for Covid-19 stimulus package

| | Total size | |
|-----------------------------------|---|--------------|
| | Amount | Share to GDP |
| Rescue Package March 2020 | EUR 156 billion (JPY 18700 trillion) | 4,9% |
| Recovery Programm June 2020 | EUR 130 billion (JPY 15600 trillion) | 4% |
| Loans, guarantees and sureties | EUR 757 billion (JPY 90840 trillion) | 24 % |

Assume EUR 1 = JPY 120. Assume nominal GDP in 2019 = EUR 3.44 trillion

Source: <https://www.bundesregierung.de/breg-de/aktuelles/konjunkturpaket-geschnuert-1757558>

Ergebnis Koalitionsausschuss 3. Juni 2020 ;

<https://www.statista.com/statistics/295444/germany-gross-domestic-product/>

In addition, the German government is expanding the access to public guarantees and the volume of available guarantees for firms through the newly created WSF (economic stabilization fund) and the KfW (development bank). Both together enable a volume of at least 757 billions which sums up 24% of GDP. Although the German council of economic experts emphasized that a great share of measures budget have not been used so far.

Climate mitigation measures and sustainability

In the future package, the German recovery program (as of June 2020) does indeed list a number of measures that address sustainable structural change and climate change mitigation, and tries to combine economic and ecological targets. The measures mostly refer to the field of sustainable mobility and the energy transition, while other issues like digitalization and education are supported, yet without

Table 5 Sustainable measures within the second German stimulus package

| Field | Measures |
|---|---|
| Promote investment by businesses and local authorities | <ul style="list-style-type: none"> ▪ Financial support for local public transport: Provision of a one-off extra government subsidy of €2.5 billion for public transport in 2020. |
| Sustainable mobility | <ul style="list-style-type: none"> ▪ Doubled innovation premium (€ 6,000) for purchase of electric vehicle (until 31 December 2021) ▪ Additional invest of in the expansion of state-of-the-art, safe charging infrastructure and in R&D funding for electric mobility and battery cell production (€2.5 billion) ▪ Bonus program in 2020 and 2021 of €1 billion in funding to promote forward-looking investment by manufacturers and suppliers in the automotive industry. ▪ From 2021 onwards: Motor vehicle tax rates, based on carbon emissions (clean cars subject to lower rates than high-emission cars). ▪ Temporary vehicle fleet replacement program to promote electric mobility, aiming at vehicles used by social services in urban traffic and commercial vehicles used by small and medium-sized firms. ▪ Investment in a program to modernize the country’s fleets of buses and heavy goods vehicles to promote the use of vehicles that run on power other than fossil fuels. Temporary increase in funding for electric buses and the necessary charging infrastructure in 2020 and 2021. ▪ Call for an EU-wide HGV replacement program that will provide grants for the replacement of older, higher-emission vehicles (i.e. compliance with Euro 3 to Euro 5 emissions standards) with new vehicles that comply with Euro VI standards. ▪ Provision of €5 billion in additional equity to the railway company Deutsche Bahn, so despite revenue losses due to the Covid-19 pandemic, key investments in the modernization, expansion and electrification of rail networks and the overall railway system will be possible. ▪ |
| Energy transition | <ul style="list-style-type: none"> ▪ Ambitious investment package to promote hydrogen technology to lay the groundwork for new export technologies and make headway towards carbon neutrality in HGV traffic. ▪ Grant to reduce the surcharge levied on electricity consumers to 6.5 cents/kWh in 2021 and to 6.0 cents/kWh in 2022. ▪ The cap on solar power expansion will be revoked and the target for expanding offshore wind power will be raised. ▪ Funding for the CO₂ building renovation program will be raised to €2.5 billion in 2020 and 2021 (an increase of €1 billion). |

Source: <https://www.bundesfinanzministerium.de/Content/EN/Standardartikel/Topics/Public-Finances/Articles/2020-06-04-fiscal-package.html#> (2020/12/07)

further specifications in terms of climate mitigation or sustainability goals. Table 5 presents a more detailed list of the activities.

Finally, the German Recovery Program must be seen in the context of European Programs. The EU's Recovery and Resilience Facility (RRF) will provide member states with up to €672.5 billion in funding intended to support the economic recovery from the COVID-19 crisis. In order to receive these funds, every member state must ensure that at least 37% of spending in its national recovery plan is aligned with the green transition, with the remainder of the funding not doing significant harm to the transition to climate neutrality.³⁶

4. Impacts on policy making and policy style

4.1 Japan

The impact of Covid-19 and its subsequent changes on Japan's policymaking can be broadly expressed by three keywords: "strengthening the supply chain", "digitalization," and "carbon neutrality".

The first "strengthening the supply chain" was set up because the outbreak of Covid-19 disrupted the supply of resources, including not only materials and equipment but also human. For example, in the automobile industry, the domestic production line had to be stopped due to the delayed supply of some parts from overseas such as China. Although each company has taken measures such as diversifying parts suppliers, the disruption of supply chains at the same time

³⁶ https://experience.arcgis.com/experience/f2700c9b597a4aababa4c80e732c6c5c?views=view_17;
<https://greenrecoverytracker.org/>

throughout the world was beyond of their imagining. The situation was exacerbated by the tendency to consolidate manufacturing bases and not holding a large inventory from the economic efficiency point of view. Another example in medical supplies, demand has risen sharply, and general-purpose products have run out due to their reliance on China for much of their supply. Masks were sold at unusually high prices in the e-commerce market, and the government began to regulate it. From these cases, the government emphasizes the need to identify risks in the supply chain and manage crises according to the characteristics of supplies. For energy supply with physical restrictions on domestic production, the government emphasizes the importance to diversify suppliers and secure international trade.

The second "digitalization" aims to strengthen digital infrastructure as a new social infrastructure, a foundation for future growth, or a tool for strengthening the supply chain. Although the importance of digital technology has been recognized since before COVID-19, and efforts have been made to expand its use, its implementation in society has been gradual. However, remote communication has become unavoidable and has become common rapidly, as contact between people has been withheld due to the need to control infection by COVID-19. Various exchanges, leisure and business habits that were traditionally face-to-face have been replaced by remote communication. Such a rapid shift would not have been possible without the coercion of COVID-19. The government sees this as an opportunity and intends to strongly promote digitalization. In the background, there is a recognition that the generalization of remote communication will accelerate new globalization that does not depend on the physical movement of people.³⁷ This decision is also supported by the fact that Japan's industrial structure

³⁷ So called "third unbundling" in "The Great Convergence" (Richard Baldwin, 2016)

is changing from traditional trade-led to investment-led. As the center of gravity of pursuing added value through international exchange is expected to shift to the digital field, Japan is aiming to increase its competitiveness in this arena.

The third "carbon neutrality" is rapidly gaining interest after the announcement by Prime Minister Suga in October 2020. Aiming for economic recovery from COVID-19 and long-term economic growth, the government is trying to position decarbonization as a source of growth for the next generation, along with digitization. Through the development and investment of various innovative technologies and services that contribute to decarbonization, the government will seek not only to build an environmentally sustainable society, but also enhance the competitiveness of the Japanese economy. The future picture assumes carbon neutrality in 2050 and the debates for designing the path to realize it have just begun. The hurdles for achieving the goal are very high, and the process of transforming the industrial structure and energy supply and demand structure may cause pain to the industry and each individual citizen. As such, without the shock of COVID-19, the government might not have been able to make this big decision in a short period of time. If so, the declaration of Carbon Neutrality in 2050 is perhaps the biggest change COVID-19 has made in the energy and climate sector in Japan.

Lastly, it should be pointed out that these three essential points are not independent of each other, but should be structured so that they are interlocked and enhanced with each other. For example, digital technology is an effective tool for strengthening the supply chain, such as inventory management and distribution optimization. It can also be applied to the optimization of energy supply and demand, such as the integration of intermittent renewable energy resources into the power grid. Alternatively, increasing renewable energy, which is essential for achieving carbon neutrality, improve the resilience of the energy supply system

and, as a result, contributes to the strengthening of the supply chain of various goods. In this way, the three elements can complement each other, and it can be expected that the anticipated benefit will be maximized by an integrated approach.

4.2 Germany

In addition to the severe impacts on production and consumption, there is a general consensus, that the COVID-19 pandemic will have important *impacts on public finance and the distribution of income and wealth*. This includes policy changes as well: The *balance of stabilization policy and (ecological) industrial policy* will probably change in Germany in connection with conceptualizing and financing the recovery programs. The public acceptance that ecological industrial policy should aim to change the level and structure of production and investments in a more sustainable direction and by a „just transition“ also at the regional level, has increased. Thus, Covid crisis induced structural change will happen anyway. But it remains to be seen how inclusive possible new growth pattern will be³⁸ and how far state interventions can guide and incentivize them in the direction of decarbonization. In this respect, financial policy is key in a German and European context.

Debt policy in Germany: a paradigm shift at the horizon?

The focus in this chapter is the impact of the pandemic on German finance policy and the underlying change in policy style. From an outside view this focus might be strange. But for the debate on financing recovery and climate mitigation programs in Germany and Europe (“Green deal”) it is very relevant.

³⁸ See <https://www.intereconomics.eu/contents/year/2021/number/1/article/covid-19-and-the-growth-potential.html>

Chapter three has shown that the dimension of the German recovery package is huge. This chapter aims to contextualize this impact on the style of policy making and financing in Germany.

Before analyzing possible changes of the style of policy making it is important to get an idea of the framework that has shaped Germany's fiscal policy over the past decades before the pandemic began. In 2009, after the financial crisis, the fiscal rules in Germany's fiscal policy were changed from the so called "golden rule"³⁹ to the "debt brake", a balanced-budget rule that restricts the structural deficit of the federal government to a maximum of 0.35% of Gross Domestic Product (GDP).⁴⁰ The „golden rule“ in contrast permitted the state to incentivize investments financed through deficit spending and credits⁴¹ and were thus much less restrictive than the debt brake actually is.

Within the last few years, there have been intensified debates in Germany about the extent to which the debt brake was responsible for an investment backlog. The debt brake was implemented only with a general escape clausal that permits the federal government to exceed debt limits in case of natural disasters and extreme situations like crisis. This holds true for COVID-19 crisis, which led to a new level of indebtedness to finance recovery packages and guarantees, discussed in chapter three. Also in the European comparison the size of investment made by the German government is huge: "Within the European Union, the German direct fiscal impulse is by far the largest across all member states. Moreover, including other types of public support such as tax deferrals and state guarantees, the German

³⁹ The golden rule of financial policy states that an increase in public debt can be accepted to the extent that it is accompanied by an increase in net public wealth that is at least as large.

⁴⁰ Potrafke, N., Riem, M., & Schinke, C. (2016). Debt Brakes in the German States: Governments' Rhetoric and Actions. *German Economic Review*, 17(2), 253–275. <https://doi.org/10.1111/geer.12089>

⁴¹ Truger, A., Friedrich-Ebert-Stiftung, & Abteilung Wirtschafts- und Sozialpolitik. (2015). *Reform der EU-Finanzpolitik: die goldene Regel für öffentliche Investitionen*.

figure rises to almost 40% of GDP, which is outstanding in international comparison."(Südekum & Hüther, 2020 p.11f).

Such state intervention was not imaginable across influential political parties and most academic economists before. According to Hüther and Südekum (2020) for many years before the pandemic German fiscal policy has been driven by the neoliberal concept of a reduced state involvement. Thus, the consensus between leading parties on the introduction of the debt brake in 2009 reflected the paradigm of a "Slim State" („Schlanker Staat“) that has been politically and socially dominant since 1980s (Südekum & Hüther 2020, p.38f).

Therefore, to combat the possible disastrous economic impacts of the COVID-19 crisis and to justify the huge financial interventions, led to an intensive public discussion on how the German debt brake can be redesigned. Additionally, there is an ongoing discussion on how to deal with the *debt after the pandemic* and how to reduce the debt. This could further change the policy style by imposing higher income and wealth taxes on very rich people depending on the possibility, that a new coalition comes to power after the elections in autumn 2021. But an opposite policy outcome could be possible as well - a roll back to the past e.g. a stronger austerity policy.

The still dominant position in the government is that the recovery programs were only justified by a general escape clausal. This implies that immediately after the pandemic German financial policy should step back to the „old normal“ of the debt brake. This might only be possible by reducing public expenditures or rising tax revenues.

Thus, a general debate on questions of deficit spending, the priorities of public finance and a possible rationale behind increasing public debt under certain conditions is going on.⁴²

Oversavings and a possible paradigm shift

‘Oversaving’ is the macroeconomic divergence of savings and investments that emerge when both main sectors, private households and industry are generating surpluses relative to their equity (Hickel 2020).⁴³ This means – concerning the national finance balance – that these sectors are net creditors and the state (or foreign countries) are net debtors. In principle, this divergence can be productively closed by deficit spending of the state and thus inducing private investments. Instead, the German fiscal policy has sharpened this discrepancy in the past years through *additional savings* (budget surpluses) that were caused by restrictive fiscal policy: the debt brake.

Thus, the argument concerning the policy style is as follows: Oversavings reduce the scope for state induced private investments, hinder target driven public industrial policies and thereby shrink the potential of transformative dynamic forces, reduce opportunities for innovations, new („green“) business fields and more sustainable growth patterns.

Thus, in the short run the COVID-19 crisis caused a strong shift in German fiscal policy. Due to the huge recovery packages the state used a large amount of public

⁴² This is actually discussed by the rather conservative institute leaders of the IW: Michael Hüther & Jens Südekum. (2020). How to re-design German fiscal policy rules after the COVID19 pandemic. 04/2020.

⁴³ Hickel, R. (2020). Staatliche Kosten der Covid-19-Krise – Die Rechnung begleichen Corona-Solidarfonds, Staatsverschuldung und Vermögensabgabe. Arbeitsgruppe Alternative Wirtschaftspolitik. <https://www.alternative-wirtschaftspolitik.de/de/article/10656381.staatliche-kosten-der-covid-19-krise-die-rechnung-begleichen-corona-solidarfonds-staatsverschuldung-und-verm%C3%B6gensabgabe.html>

money to incentivize private investments e.g. fostering the market introduction of hydrogen and thereby interrupting the circle of oversavings.

Nevertheless, this macroeconomic justification of state deficit spending in favor of future („green“) investments is criticized by those who see the increasing national debt in many countries as a problem of the stability of the financial system. However, Germany's national debt ratio before the COVID-19 crisis was comparatively moderate 59,8% (2019) and is now expected to rise to around 73% (2021) as a result of the COVID-19 crisis.⁴⁴ But even this rising level of debt is now viewed by many economists as unproblematic as long as the interest rate for government bonds is low or even in the negative range: The interest expenditure of the German federal budget fell from a maximum of 40.2 billion (2008) to 11.9 billion (2019); it is estimated that due to *negative interest rates and the relatively high creditworthiness of Germany as a debtor*, by December 2020 the *interest income* for the federal government even totaled 7.1 billion Euros.⁴⁵

In Germany as also in the EU (concerning the financial concept behind the Green Deal⁴⁶), the perception of the role of the state has changed to more proactive policy interventions and „greener“ industrial policies as well. This might have major implications for public incentive programs to foster the energy transition.

The favorable development of the interest rates for public bonds is one reason behind this change. Another and maybe a long-term new trend is a changing attitude of the broad public and also growing fractions of the industry towards more ambitious climate mitigation. This change was driven by a strong global youth movement (Fridays for Future) in 2019, by new scientific information, by decisions

⁴⁴ iwd 2020, <https://www.iwd.de/artikel/neuerschuldung-in-corona-krisa-unausweichlich-468294/>

⁴⁵ <https://www.reuters.com/article/germany-bonds-idUSL8N2IV2AM>

⁴⁶ e.g. European Commission 2020 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu_en

declaring climate emergency (e.g. EU parliament Nov 11, 2019)⁴⁷ and by analytical evidence that the macroeconomic net-effects of climate protection are beneficial for economic development and competitiveness of the German industry.

The policies of a „Great Transformation“

It is not only the perception of the economic role of the state and its fiscal policy which might change by the impact of the COVID-19 crisis. Furthermore, it is likely that the many priorities of government tax revenues (see above) and especially of government spending policy, will also change. For example, it is conceivable that major changes will take place in favor of accelerated digitization of schools, to increase the resilience of the health system, to decide on interventions for the labor market in favor of more home offices and maybe on new priorities in transport policy, e.g. in favor of cycling and walking, at the expense of the long-distance tourism and air travel. It can be taken for sure that politics has to react to social changes and behavioral shifts, which can be intensified or slowed down by the COVID-19 pandemic. It is also possible that much debated scientific impulses for a fundamental "Great Transformation" (WBGU 2011) will acquire new socio-political relevance. This also applies to questions of governance in energy and climate policy as well as broader citizen participation.

The report published by the WBGU (2011) outlined that in order to conduct a fundamental socio-ecological transformation, the German society has to leave the business as usual path as soon as possible. It thereby emphasized already in 2011 the importance of a more proactive state („gestaltender Staat“) to enable and

⁴⁷ <https://www.euractiv.com/section/climate-environment/news/european-parliament-declares-climate-emergency/>

guide a socio-ecological transformation. Therefore, it is important to analyze in detail the governance of transformation in the light of new challenges and social learning due to the COVID-19 pandemic. For example, energy system transformation and more ambitious decarbonization strategies have gained importance in all Member States of the EU, which might require a change in multi-level energy and climate mitigation governance. On the one hand, local action, citizens participation and decentralized technologies will be more important especially when it comes to secure acceptance for structural economic change and deep transformation processes. On the other hand, a coordinated action at the EU level across countries will be essential for a successful EU-wide implementation of policies and measures. This could mean that EU-regulation and governance, e.g. conducting energy and resource efficiency, supporting a circular economy and reducing the fleet consumption for sustainable car mobility will gain more importance.

In sum, on the one hand, the list of *possible* deep and dramatic changes due to the COVID-19 in Germany and Europe is growing the longer the pandemic lasts and the more it puts pressure on society, economics and politics. On the other hand, uncertainty about only short run changes or long run shifts is growing dramatically.

5. Preliminary comparisons

The aim of GJETC studies is to compare topics of mutual interest in both countries at first with a country specific perspective. This generates information on possible similarities and differences. An additional step can be to explain *the reasons and drivers* behind similar or different developments to generate more specific information for learning from each other. In this preliminary short study, only a

very brief comparison of selected topics is possible. This comparison can be extended by conducting a more comprehensive study (see section 6.)

5.1. Different health background

As of January 21, 2021 there were 2,100,618 numbers of infections and 40,936 numbers of deaths in Germany. In Japan, in contrast, there have been 345,221 confirmed cases of infections and 4,743 numbers of deaths.⁴⁸ Accordingly, the numbers of other countries in Asia (e.g. China, South Korea) were much lower than in the USA or in European Countries (e.g. Britain, France, Italy or Spain).⁴⁹ This striking discrepancy holds the more true if you relate the figures to the different numbers of the population.

The analysis in this paper started in the light of these different health impacts of the COVID-19 crisis without aiming to explain possible reasons behind it. But it can be expected that the different country specific health impacts will have a significant influence on the economy, on the public perception of the pandemic, on the responses of politics and the policy style and especially on the duration, the concrete strategies and the impacts of the lockdown measures. For example, in Germany the fear of an exponential growth of infections, of a growing number of daily deaths and the impact of even more dangerous mutations of the virus have strongly influenced the duration and the severeness of the lockdown. It would be interesting to compare if similar policy reactions happened in Japan and which economic and social effects were related to it.

⁴⁸ Compare <https://www.nippon.com/en/japan-data/h00673/>

⁴⁹ See the concrete figures in <https://www.nippon.com/en/japan-data/h00673/>

5.2 General economic context: Different recovery perspectives?

Does the global economic context cause different patterns of socioeconomic recovery in Germany and Japan? Up to now (January 2021) the impacts of the COVID-19 pandemic on global economic developments were serious but differently spread all over the world. For the years after the pandemic unequal economic perspectives are expected as well according to global projections. For example, the latest World Economic Outlook of the International Monetary Fund (IMF)⁵⁰ depicts the following different economic impacts of the pandemic on economic recovery for advanced economies and emerging markets/developing economies:

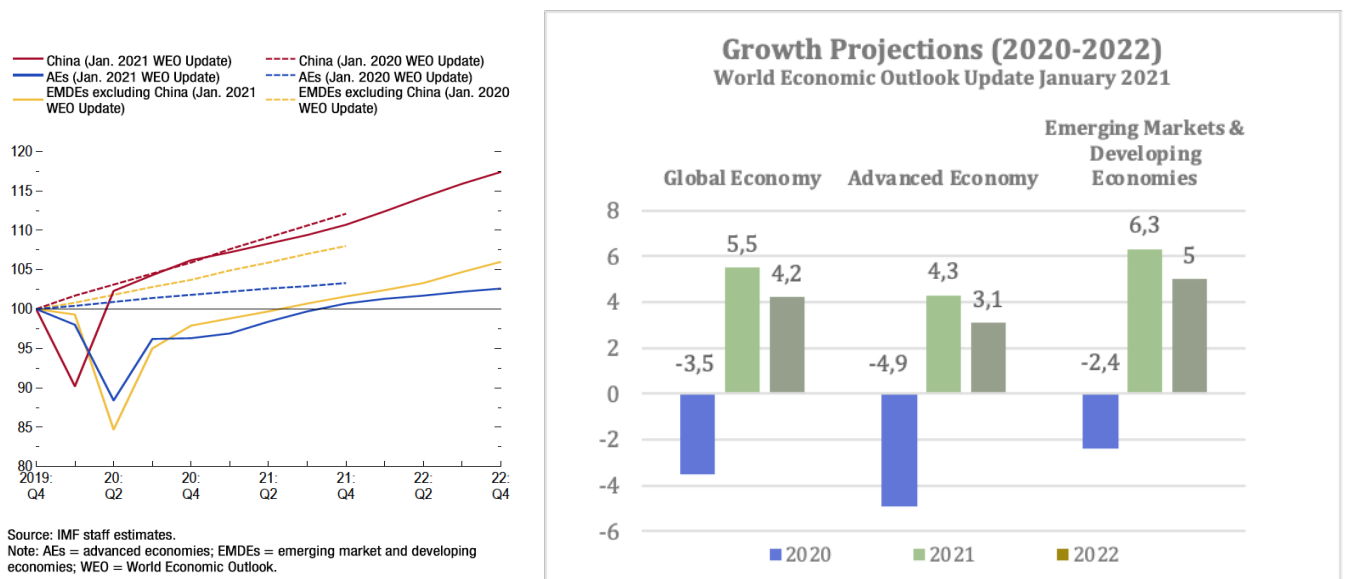


Figure 12 Divergent recoveries: WEO Forecast for Advanced Economies and Emerging Markets and Developing Economies (Index, 2019: Q4 =100)

Source: IMF <https://www.imf.org/en/Publications/WEO/Issues/2021/01/26/2021-world-economic-outlook-update>

⁵⁰ <https://www.imf.org/en/Publications/WEO/Issues/2021/01/26/2021-world-economic-outlook-update>

According to these projections, e.g. China will recover much quicker than advanced economies. Will this be the case in other Asian countries, including Japan, as well?

The economic analysis by the OECD⁵¹ (as of 12/2020) expects a *reduction* in GDP of 4.2% for the global economy in 2020. *Japan's* GDP is expected to decline by 4.25% in 2020, with a slow increase of 2.25% in 2021 and 1.5% in 2022 if another stimulus program is launched. For *Germany*, the OECD is forecasting a slump in growth of minus 5.5% in 2020 and a slow recovery of 2.8% in 2021 and 3.3% in 2022.

In the consequence, CO₂- emissions and energy consumption in 2020 fell in both countries. As has been shown, in *Germany*, CO₂ emissions were reduced by about 80 million t of CO₂ (55 million t due to the pandemic). Energy consumption in *Germany* fell by 8.7%, reaching 11,691 petajoules.⁵² In *Japan*, primary energy supply fell by 9.1%, reaching 18,275 petajoules.⁵³ Consequently, CO₂ emissions were reduced by about 10% as higher carbon content energy, i.e. oil and coal, experienced larger drop than natural gas.⁵⁴

If the vaccine delivery is not delayed and new outbreaks are contained, a V-shaped recovery in *Germany* and *Japan* might be possible. But *Japan* and *Germany* are „no save heaven“⁵⁵ in a globalized world. It is not only a matter of justice but of economic rationality as well to support other countries, especially when they are

⁵¹ OECD (2020), OECD Economic Outlook, Volume 2020 Issue 2: Preliminary version, No. 108, OECD Publishing, Paris, <https://doi.org/10.1787/39a88ab1-en>

⁵² <https://www.ag-energiebilanzen.de/> (17.12.2020)

⁵³ IEEJ, Data bank

⁵⁴ A simple estimation by multiplying the emission intensity of imported crude oil, imported steam coal, and LNG.

⁵⁵ http://www.oecd.org/wirtschaftsausblick/dezember-2020?utm_source=berlin-newsletter&utm_medium=email&utm_campaign=ecooutlookdec2020&utm_content=de&utm_term=berlin

poor, with sufficient vaccine facilities. But the activity gap on this challenge is still huge. Thus, it might be a too optimistic estimation when the OECD states: "In many countries, economic output will not have reached the level of 2019 even by the end of 2021."⁵⁶

When it comes to more detailed analyses on *possible long lasting effects* in Japan and Germany the picture is very dispersed and uncertain. Although massive sector and industry-specific slumps are noted as a result of the COVID-19 crisis, their possible effects e.g. on structural change in the post-COVID-19 period are not recorded in aggregated macroeconomic projections.

For example, the crisis has put a spotlight on *globalized supplier dependencies* and a lack of crisis resilience. What lessons learned were derived from this impact in Germany and Japan? Will both countries return to the "old" growth path and if so, will this meet the requirements of the future? For example, a new trend of regional reorientation and "...restructuring of supply and production processes along very stretched-out international value-chains" (ibid) might occur. Thus, by new patterns of international division of labor the relation between national and externalized energy consumption and GHG-emissions might change.

Production in the automotive sector went dramatically down in both countries. But in Germany the automotive sector also suffers because the transformation to more sustainable transportation patterns (including e-mobility) has started years before the COVID-19 pandemic and was not taken seriously by German car makers; but the shift to e-cars is now changing rapidly. In Japan, social changes as well as climate action is demanding a structural shift in the automobile industry, which is

⁵⁶ http://www.oecd.org/wirtschaftsausblick/dezember-2020?utm_source=berlin-newsletter&utm_medium=email&utm_campaign=ecooutlookdec2020&utm_content=de&utm_term=berlin

said to be "once in 100 years". COVID-19 is irreversibly changing communication and living styles. This also poses difficulties in operating public transport, which is more energy- efficient than automobiles. Both Japan and Germany, which have been world leaders in the automobile industry, are under pressure to seek out sustainable mobility services.

5.3 Comparable impacts on specific sectors and life style

Some observed specific effects in Japan and Germany are similar: the traffic volume decreased, public transport and especially air travel were reduced strongly, while the preferences of transport modes in both countries turned towards the car, bicycle and walking. Communication modes changed with an overwhelming push to digitalization, the use of ICT entered various fields of life, including work, leisure, education, communication. For Germany, there even might have been a behavior shift in „a greater acceptance of technology“ (Grömling 2021).⁵⁷ In Japan, it is considered to have a larger impact on changes in working styles. Work-style reforms aimed at pursuing a better work-life balance and improving labor productivity have long been attempted. In addition, it has long been pointed out that there is a need for further streamlining of administrative procedures and business through digitalization. These movements seem accelerating under the Covid-19 by the use of ICT.

Nevertheless: The estimation of the overall net effects of forced digitalization (including electricity and resource consumption of the ICT-infrastructure) seems completely unclear in Germany and in Japan as well.

⁵⁷ <https://www.intereconomics.eu/contents/year/2021/number/1/article/covid-19-and-the-growth-potential.html>

The decreased industry production, disturbed value chains and closed shops, restaurants, hotels, art facilities, public and private services etc. led to dramatic income losses, decreased consumption and increasing inequality. In Germany this is discussed with growing concern and rising public awareness. This might have an important impact on energy consumption as well e.g. on the challenge how to fight energy poverty and how to step forward in the direction of more sustainable mobility for all and transportation justice. In this respect, it would be highly interesting to learn from the experiences of Japan concerning public transportation.

In Japan, the share of public transportation is high, especially in metropolitan areas, which has contributed to improving the energy efficiency of the transport sector. However, the decline in passenger transport demand has created difficulties in the operation of public transportation, and if this situation persists, it will be necessary to review the management of public transportation.

5.4 Are German and Japanese recovery programs green enough?

“Governments have a once-in-a-lifetime opportunity to shape a better energy future” (IEA, 2020, p.15). The IEA’s Special Report on Sustainable Recovery⁵⁸ developed a „Sustainable Development Plan: „The plan provides a significant boost to jobs and growth [...] and helps (to) put the world on a trajectory in line with international climate goals [...].” Compared to these goals and the detailed suggestions of the IEA „to shape a better energy future“, the national recovery programs of most countries could be improved. Against this background the question „are the German and Japanese recovery programs green enough, as well as effective enough as an economic stimulus?“ and how the programs in both countries can be improved should be analyzed in greater detail. Last not least this

⁵⁸ <https://www.iea.org/reports/sustainable-recovery>

might create an important global signal: The world and especially the G20 urgently need good practice examples and Japan in cooperation with Germany could take the lead!

For example, the “Energy Policy Tracker”⁵⁹ found that the G20 recovery programs against the economic consequences of the COVID-19 crisis had flowed 374 billion dollars into the energy sector, of which around 205 billion dollars went into fossil fuels and only about \$ 130 billion in "clean" energies. This undoubtedly is bad news for climate mitigation!

The German and Japanese recovery packages include sustainability aspects, referring to research and development, the decarbonization of automobiles, heat insulation of buildings, the decarbonization of energy production, and ambitious strategies for the development of hydrogen technology: As has been shown about one third of the *German Recovery Program* is focused on the „Future package“. But are the priorities and the allocated amount of public resources in line with current German decarbonization targets and scenarios? This has not been analyzed yet.

In the second *Japanese Recovery Program* climate change countermeasures are also included. However, the only identified support menu is solar PV installation for the manufacturing industry. A third stimulus package consists of three pillars: "Prevention measure against COVID-19 infection", "transformation of economic structure toward post-COVID-19 era", and "strengthening disaster resilience of the land." The second pillar clearly states policy for the realization of carbon neutrality. But will the expected renewed upswing in economic growth lead to a „green structural change“ fostering climate protection?

⁵⁹ Energy Policy Tracker 2 (September 2020) <https://www.energypolicytracker.org/region/g20/>

In general: For no country, neither for Germany nor Japan, it is sufficient just to record the quantity of the "green" expenditure shares within the recovery programs. Instead, the questions have to be answered whether and how far:

- green investments encourage sustainable structural change and accelerate climate protection ambitions?
- the net impact of technological shifts to digitalization - including additional resources and electricity consumption - drive the decarbonization e.g. by video conferencing, commuting traffic, home office, online shopping, E-learning, etc.?
- social learning and long-term behavior changes are taken place e.g. concerning global supply chains, tourism, air travel, consumption patterns, leisure, culture etc. ?
- policy learning changes the policy style e.g. to more proactive policy making and conducting (ecological) industrial policies?

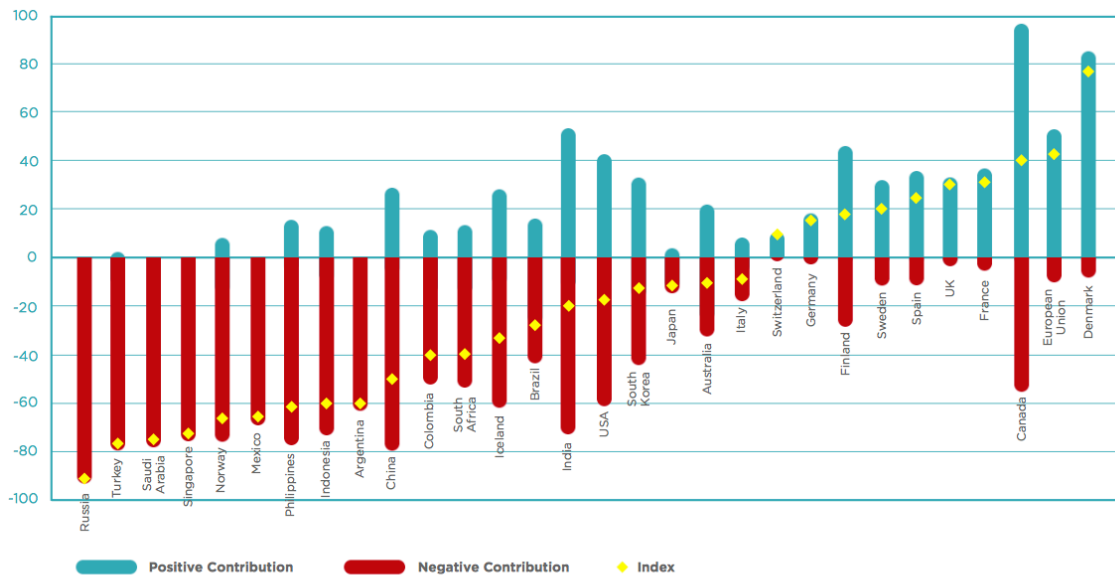
Especially, it remains to be seen to what extent the green spending activities are compatible with the priorities of current climate protection scenarios and strategies in both countries. And last not least: Can the comparison of the "green part" of recovery programs with their broad variety of different national priorities demonstrate that international cooperation and mutual learning could help to shape a common and better energy future?

In order to classify these questions, it makes sense to put the Japanese and German COVID-19 stimulus programs in a global context in a snapshot (as of February 2021). The data sets and the temporal dynamics play an essential role in scoring the performance of the individual countries. At the time of this writing, the most recent, most comprehensive and globally comparative analysis was that of the Vivid Economics/ Finance for Biodiversity Initiative. This analysis assumes that by this point

in time a total of US \$ 14.9 trillion has flowed into COVID-19 stimulus programs. However, according to the institute's assessment, only US \$ 1.8 trillion of this was targeted to sectors and activities that are rated as green. The different stimulus programs of individual countries are compared and evaluated using the “Greenness of Stimulus Index”. This index “... assesses the effectiveness of the COVID-19 stimulus efforts by G20 countries and ten other nations in ensuring an economic recovery that takes advantage of sustainable growth opportunities, and builds resilience through the protection of the climate and biodiversity” (ibid, p.2).

It should be noted that the analysis does not evaluate greenness in the life cycle of technologies, and that the national economic situation and industrial structure significantly affects the policy of stimulus measures.

International comparison with the Greenness of Stimulus Index



Source: Vivid Economics using a variety of sources, consult Annex II for the entire list of sources
Note: Updated on 1 February 2021

Source: VividEconomics/Finance for Biodiversity Initiative, ibid, S.6⁶⁰

⁶⁰ <https://www.f4b-initiative.net/post/global-covid-19-stimulus-continues-to-damage-environment-but-us-could-catalyse-greener-recovery>

According to this comparison, the (net) contribution to green activities (in particular to protecting the climate and biodiversity) would only be positive in 10 of the 30 countries. Even if this can only be a snapshot, it does provide clues as to how leading global countries (G20) are positioning themselves against the background of the COVID-19 pandemic in relation to climate protection and related future business areas.

6. Preparing a more comprehensive research program

With this background it seems to be advisable to conduct a more comprehensive study on the impacts of COVID-19 at the end of the year 2021 when more empirical data and analysis are available.

It has been demonstrated that there are many open research questions and the quicker research tries to give answers to them the better for our countries. As a follow up a Post COVID-19 study should compare latest overall economic projections of Germany and Japan and look into specific crisis induced structural changes and sector developments e.g. in industry, transportation and households. These economic projections should then be analyzed concerning related energy consumption and GHG-emissions in the short run and beyond.

In this respect two basic research questions must be answered:

- (1) Will the COVID-19 pandemic accelerate climate mitigation strategies in Japan and Germany or will it cause a slash back, comparable to the situation after the financial crisis 2008/2009?
- (2) Can the energy relevant impacts of the COVID-19 pandemic be influenced by policies and measures and how does this contribute to decarbonization strategies?

If in times of the „new normal“ (after the COVID-19 pandemic) energy consumption and GHG-emissions would be coupled with economic development as in times of the „old normal“, a strong rebound effect back to old development pathways of GHG can be expected. Instead, it should be analyzed whether the COVID-19 pandemic has opened a window of opportunity for the departure from „business-as-usual“.

The interesting point for research on the energy impact of the COVID-19 pandemic is that on the one hand, evidence-based new developments can be analyzed concerning the impact on energy consumption and GHG-emissions, e.g. it is interesting to explain why renewable energy production seems to be less affected than traditional energy sources.⁶¹ Apparently, the limits of this part of research could be the lack of empirical data. Thus, estimates whether the effects will be long lasting or only short run under the immediate impact of the COVID-19 pandemic must sometimes focus on robust ranges of preliminary data. On the other hand, it is interesting to analyze where the pandemic has opened windows of opportunities for politics, industry and the civil society to foster climate mitigation strategies which have been conceived to be impossible resp. publicly unacceptable before the pandemic; e.g. this might be possible with new concepts and strategies for a more sustainable and climate benign transportation system in Germany and Japan.

Japan and Germany are strongly interconnected with the global economy and international trade. Thus, the comparison of energy and GHG-emissions in both countries has to start with analyzing the embeddedness in global developments.

⁶¹ One reason is obvious for countries, where green electricity is protected by FIT and/ or priority dispatching

For Germany as a Member of the European Union changes of the European policy context (e.g. the European Green Deal⁶²) are especially important.

Conceptualizing a common Japanese-German research program on the impact and possible long-term effects on energy consumption and GHG-emissions the following topics should be included:

Overview and assessment of the international development concerning more ambitious or more reluctant decisions on climate protection during or induced by the COVID-19 pandemic (e.g. US, EU, China, Japan)

Review of latest post COVID-19 projections of global economic development and related energy consumption and GHG-emissions

Comparing the current economic projections and related impacts of the COVID-19 pandemic on total energy consumption and GHG – emissions (2019-2021) in Japan and Germany

Comparison of the concepts and measures for refinancing / deleveraging of public debt caused by the recovery programs and possible impacts on inclusive and green growth

Possible effects of the debt relief programs on the level of ambition and financial support for climate protection programs (e.g. for the decarbonization of the building stock or industry)

Change in public opinion about the importance of climate protection during the COVID-19 pandemic e.g. development and activities of social movements (Friday4Future etc.)

Explaining similarities and differences of the perception, impacts and responses in Japan and Germany

⁶² See for an overview https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu_en

Status and outlook for long-lasting behavior change due to COVID-19 and its impacts on energy consumption and GHG emission in Germany and Japan

Comparing the effects of crisis increased digitalization e.g. on work, communication, mobility, education, consumption

Preliminary estimate of increased energy and resource consumption caused by digitalization based on existing studies

7. Conclusions

Even when vaccination campaigns can stop the pandemic on a national scale, the global impacts will still heavily influence the interconnected economies of Germany and Japan eventually for years. Though a final national balance of the impact of COVID-19 might not be realistic in 2021, many new answers are possible. Working on the energy transition of Japan and Germany since four years, the GJETC recognizes that the COVID-19 crisis has caused profound new opportunities and challenges for both countries. Will it foster a chance for a Great Transformation towards climate neutral societies, or will there be a rebound back to the “Old Normal” of unsustainable growth patterns? Further research should identify sectors, technologies, behaviour changes and fields of activities, where and how impacts of the crisis might contribute to foster the transition to a carbon neutral economy up to 2050. At the same time, it is necessary to look on possible counterproductive new developments and to propose a mix of policies and measures to mitigate them.

In addition, it is important to place the comparative bilateral German-Japanese analysis of the causes, the spread and the fight against the COVID-19 pandemic and its consequences in a global context. In this respect, it is very helpful to consider the Triple R (response, recovery, redesign) framework that was developed in

position papers by IGES⁶³ and applied to the global analysis of the implication of COVID-19 for the sustainability of environment-energy system. The paper also puts the initiative of the Japanese Minister of the Environment, Shinjiro Koizumi, (“Platform 2020 for Redesign”) in the context of other global initiatives⁶⁴ with the conclusion: “Indeed, COVID-19 has broadened the environmental scope of sustainability and resilience and more explicitly underlined the importance of an integrated approach.”⁶⁵

And let us add: Facing the challenges of multiple crises such as climate change and the COVID-19 pandemic has also raised new questions for international research cooperation. We are happy that after four years of fruitful cooperation in the GJETC we were able to create trust in order to find joint solutions even for controversial and difficult topics of the energy transition. In this respect, the experience gained in analyzing and overcoming the problems caused by COVID-19 will be a further encouragement to intensify our cooperation.

⁶³ <https://www.jstor.org/stable/pdf/resrep29010.pdf?refreqid=excelsior%3Ad5e5befdfcc5d29a7cf5d81f-fce8b840>

⁶⁴ <https://www.jstor.org/stable/pdf/resrep29010.pdf?refreqid=excelsior%3Ad5e5befdfcc5d29a7cf5d81f-fce8b840> or *ibid*, p.2

⁶⁵ *ibid*, p.16

Bibliography

- AG Energiebilanzen, 2020. Energieverbrauch sinkt auf historisches Tief Deutliche Auswirkungen der Corona-Pandemie / Anteil fossiler Energien sinkt. AG Energiebilanzen Pressedienst.
- Agora, E., 2021. Die Energiewende im Corona-Jahr: Stand der Dinge 2020. Rückblick auf die wesentlichen Entwicklungen sowie Ausblick auf 2021.
- Baldwin, R., 2017. The Great Convergence: Information Technology and the New Globalization (excerpts). *Journal of Economic Sociology* 18, 40–51.
<https://doi.org/10.17323/1726-3247-2017-5-40-51>
- Bayrisches Zentrum für Tourismus, 2020. Reisen in Zeiten von Corona. URL <https://bzt.bayern/wp-content/uploads/2020/07/Reisen-in-Zeiten-von-Corona-BZT-Studie-Juli-2020-PDF.pdf>
- BBC, 2020. Coronavirus: Lufthansa agrees €9bn rescue deal with Germany.
- Bernard, R. et al., 2020. How are households' consumption plans affected by the COVID-19 pandemic?
- BMWi, 2020. Die wirtschaftliche Lage in Deutschland im Oktober 2020. URL <https://www.bmwi.de/Redaktion/DE/Pressemitteilungen/Wirtschaftliche-Lage/2020/20201014-die-wirtschaftliche-lage-in-deutschland-im-oktober-2020.html>
- Bundesbank, 12.2020. Coronavirus pandemic continuing to shape German economy. URL <https://www.bundesbank.de/en/tasks/topics/coronavirus-pandemic-continuing-to-shape-german-economy-853776>
- Cabinet office, 2020. Survey on life consciousness and behavior under the Covid-19, Tokyo: Cabinet office
- Cabinet office, 2020. Emergency Economic Measures to Cope with the Novel Coronavirus (COVID-19), Tokyo: Cabinet office
- Centouris, July 2020. Centouris. URL <https://www.centouris.de/aktuelles/news/news-detail/wie-das-coronavirus-das-reiseverhalten-der-deutschen-veraendert/>

- Clodius, S., 2020. Im virtuellen Supermarkt. URL <https://www.tagesschau.de/wirtschaft/lieferdienste-onlinehandel-corona-boom-101.html>
- De Jong, N., 2018. Wege aus dem Verkehrskollaps. Wie sich Lieferdienste in Städten wandeln. URL <https://www.firmenauto.de/lieferdienste-im-staedten-wege-aus-dem-verkehrskollaps-10153014.html>
- Destatis, 2020. Kaufhäuser in der Krise: 2,4 % weniger Umsatz im August 2020 gegenüber Vorjahr. Pressemitteilung Nr. N 063. URL https://www.destatis.de/DE/Presse/Pressemitteilungen/2020/10/PD20_N063_45212.html
- DLR Verkehr, n.d. DLR-Befragung: Wie verändert Corona unsere Mobilität? Verkehrsmittelnutzung, Einkaufs-, Arbeits- und Reiseverhalten. URL <https://verkehrsforschung.dlr.de/de/news/dlr-befragung-wie-veraendert-corona-unsere-mobilitaet>
- Energy Policy Tracker, 2021. G20 countries Energy Policy Tracker. URL <https://www.energypolicytracker.org/region/g20/>
- EY Japan, 2020. Survey on consumer behavior change in Japan by the new coronavirus, Tokyo: EY Japan.
- Fillmann, A., September 2020. Reflections on COVID-19 – Views From Germany. URL <https://www.natlawreview.com/article/reflections-covid-19-views-germany>
- German Association of the Waste Management, Water and Raw Materials Industry, 2020. Abfall in Zeiten von Corona - Papier kaum verändert, mehr Glas und Leichtverpackungen. URL <https://www.bde.de/presse/abfallmengen-corona-weihnachten/>
- Greenpeace, 2020. Homeoffice kann über 5 Millionen Tonnen CO₂ sparen. URL <https://www.greenpeace.de/presse/presseerklaerungen/homeoffice-kann-ueber-5-millionen-tonnen-co2-sparen>
- Grimm, B. et al., 2009. WWF Deutschland. Der touristische Klima-Fußabdruck. WWF-Bericht über die Umweltauswirkungen von Urlaub und Reisen. URL https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Der_touristische_Klima-Fussabdruck.pdf

- Gröming, M., 2021. COVID-19 and the Growth Potential. URL <https://www.intereconomics.eu/contents/year/2021/number/1/article/covid-19-and-the-growth-potential.html>
- Guterres, A., 2020. Secretary-General's remarks at the Climate Ambition Summit. <https://www.un.org/sg/en/content/sg/speeches/2020-12-12/remarks-the-climate-ambition-summit>
- Hüther, M., Südekum, J., 2020. How to re-design German fiscal policy rules after the COVID19 pandemic.
- ifo institut, August 2020. Homeoffice und Digitalisierung unter Corona (2. Quartal 2020). URL <https://www.ifo.de/personalleiterbefragung/202008-q2>
- IGES, Implications of COVID 19 for the Environment and Sustainability (Version 2) Perspectives from the Tripe R (Reponse, Recovery, Redesign) Framework
<https://www.jstor.org/stable/pdf/resrep29010.pdf?refreqid=excelsior%3Ad5e5befdfcc5d29a7cf5d81ffc>
[e8b840](https://www.jstor.org/stable/pdf/resrep29010.pdf?refreqid=excelsior%3Ad5e5befdfcc5d29a7cf5d81ffc)
- infas, 2020. Mobilität und Corona: Wie verändert sich der Alltagsverkehr? URL <https://www.infas.de/neuigkeit/mobilitaet-und-corona-wie-veraendert-sich-der-alltagsverkehr/>
- Klaus, K., 2021. Klimaziele für 2020 in Deutschland doch noch erreicht.
- Ministry of Economic, Trade and Industry, 2020. White Paper on International Economy and Trade 2020, Tokyo: Ministry of Economic, Trade and Industry
- Ministry of Economic, Trade and Industry, 2020. Report on IIP, Tokyo: Ministry of Economic, Trade and Industry
- Ministry of Finance, 2020. Report on measures against Covid-19, Tokyo: Ministry of Finance
- Nadel, S., 2020. IEA: COVID-19 cut energy efficiency investments, but efficiency plays notable role in global economic recovery packages. URL <https://www.aceee.org/blog-post/2020/12/iea-energy-efficiency-plays-notable-role-global-economic-recovery-packages>
- Nomura Research Institute, 2020. Response and challenge of business supply chain against Covid-19, Tokyo: Nomura Research Institute

- Potrafke, N. et al., 2016. Debt Brakes in the German States: Governments' Rhetoric and Actions. *German Economic Review* 17, 253–275. <https://doi.org/10.1111/geer.12089>
- PwC, 2020. Global Consumer Insights Survey 2020 – Europe Edition Urban Disturbance: How the COVID-19 pandemic is transforming city life. URL <https://www.pwc.de/en/handel-und-konsumguter/global-consumer-insights-survey-2020-europe-edition-urban-disturbance.pdf>
- Statistic Bureau of Japan, 2020. Report on Internal Migration in Japan, Tokyo: Statistic Bureau of Japan.
- Statista, n.d.. Auswirkungen des Coronavirus (COVID-19) auf die Luftfahrt. URL <https://de.statista.com/statistik/studie/id/72253/dokument/auswirkungen-des-coronavirus-auf-die-luftfahrt/>
- Stepstone, 2018. Mobilitätsreport. https://www.stepstone.de/Ueber-StepStone/wp-content/uploads/2018/04/StepStone_Mobilit%C3%A4tsreport_2018-1.pdf
- Truger, A., 2015. REFORM DER EU-FINANZPOLITIK. Die Goldene Regel für öffentliche Investitionen.
- Wenzel, F.-T., 2020. Corona-Pandemie: Stromkosten steigen um bis zu 150 Euro jährlich pro Haushalt. URL <https://www.rnd.de/wirtschaft/stromkosten-steigen-durch-corona-bis-zu-150-euro-mehr-pro-haushalt-durch-homeoffice-zeit-BSOUAJQA45CX3N2DKXQM5AFATM.html>
- Bundesregierung, April 2020. Wir müssen ganz konzentriert weiter machen. URL <https://www.bundesregierung.de/breg-de/themen/coronavirus/bund-laender-corona-1744306>
- VividEconomics and Financed for Biodiversity Initiative, 2020. Greenness of Stimulus Index, An assessment of COVID-19 stimulus by G20 countries and other major economies in relation to climate action and biodiversity goals. URL <https://www.vivideconomics.com/wp-content/uploads/2021/02/Greenness-of-Stimulus-Index-5th-Edition-FINAL-VERSION-09.02.21.pdf>
- Wuppertal Institut, Ernst & Young, 2020. Zwischenbilanz COVID-19: Umweltpolitik und Digitalisierung. https://wupperinst.org/fa/redaktion/downloads/publications/COVID-19_Umwelt_Digitalisierung.pdf