Sustainable Development in the Wake of Covid-19

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Article

Abstract

The ´decade of action´ to achieve the ambitious 17 Sustainable Development Goals by 2030 is off to a very challenging start. With progress on the achievement of most SDGs already lagging behind even before the Covid-19 crisis – our analysis finds that the pandemic negatively affects the achievement of 144 targets (almost 90%) of the SDGs. However, 66 targets (ca. 40%) could potentially benefit from the changes spurred by the crisis, given that the appropriate decisions are made. Holistic response and leadership are needed to ensure an inclusive economic recovery while protecting the environment. Furthermore, our analysis of the literature documents the unprecedented speed of the international community to assess the impacts of the pandemic. Future research should gather data to better understand the impacts of the pandemic locally and globally, and produce long-term analyses to inform the sustainable recovery across all SDGs.

Introduction

With only 10 years left to achieve the objectives of the 2030 Agenda for Sustainable Development in early 2020, the world was already not on track for the achievement of most Goals and targets by 2030[1]. For instance, before the Covid-19 crisis the United Nations (UN) estimated that without accelerated action by 2030 over 7% of the global population would live below the poverty line, 200 million children would still be out of school, and the number of undernourished people would exceed 840 million[1,2]. Furthermore, before the crisis, food insecurity was on the rise, the share of urban population living in slums was increasing, and environmental targets were not on track to be achieved[1]. The Covid-19 crisis worsens the already difficult global situation. The pandemic is an unprecedented health emergency with cascading impacts across the 2030 Agenda for Sustainable Development. It is an aggregate shock to all countries that has exposed vulnerabilities of vital supply chains and fragilities of public services, deepened inequality, and is testing peace and solidarity across geographic levels and scales.

The research and broader international community has mobilized to understand how the pandemic is affecting our societies, politics, economy and environment. A plethora of studies have emerged to gauge the short term impacts of the pandemic on key sectors. The recent 2020 UN Sustainable Development Goals report[1] highlights some impacts of the Covid-19 crisis across SDGs, and looks at the data needs to track progress. However, in spite of the global data collection effort, it is only able to measure the "initial impact of Covid-19 on specific Goals and targets." [1] Recent research has also called to evaluate and rethink how the SDGs are resilient to such crises – and how they could be revised and prioritized in light of the recent developments[3,4]. However, a holistic, evidence-based analysis on how the Covid-19 crisis could negatively or positively impact the achievement of each target in Agenda 2030 is missing. To fill this gap we investigate how the Covid-19 crisis impacts the 169 targets of the Sustainable Development Goals. The analysis is based on a consensus-based expert-driven approach with a structured literature search, informed by previous studies aimed at mapping SDGs interlinkages[5–7]. The method is reported at

the end of this analysis and the full results are reported in the Supplementary Information and summarized in Figure 1.

Negative impacts of the Covid-19 crisis on the SDGs

We find that nearly 90% of all SDGs targets are expected to be negatively affected by the crisis (144 targets). As a health crisis, Covid-19 affects the achievement of the majority of the targets within SDG3 on good health and wellbeing, with particularly severe cascading impacts for the poor, vulnerable and marginalized groups of the society. Exposure to the virus has hit the global healthcare force hard resulting in disproportionately high fatalities[8] and straining efforts towards health outcomes. Additional to the direct impact, the pandemic is associated with several other negative health effects, such mental health related illnesses[9]. With all SDG1 targets on No-Poverty negatively affected by the crisis, the impact on the daily earners, migrants, smallholder farmers, women and children will be severe[1,10−12]. The World Bank estimates that Covid-19 could push up to 100 million people into extreme poverty in 2020[13]. With the loss of their daily earnings, the poor are increasingly vulnerable due to lack of social security with no health insurance, unemployment benefits, etc. Economic consequences are dire, with the majority of the targets within SDG8 on decent work and economic growth affected. Unemployment is set to reach record highs, with sectors such as the travel industry, manufacturing, wholesale and retail trade, and real estate and business activities most affected[14]. These sectors are labour intensive and employ millions of low-paid, low-skilled workers and a disproportionate number of young people. The ILO is warning that 1.6 billion workers in the informal economy—nearly half of the global workforce— risk of losing their livelihoods[15]. The crisis is exacerbating inequalities (SDG10) [10,11]. Because of income inequalities, different individuals have very different abilities to cope with the crisis (undermining targets 10.1, 10.3-10.5, 10.7-10.c). In fact, inequality has been associated with increased Covid-19 spread[16], with a direct relationship between access to basic amenities and increase of communicable diseases including Covid-19[17]. The pandemic has also made migrant workers, refugees and minorities more vulnerable to discrimination and xenophobia. Epidemics deepen existing inequalities for women and girls[18−20], undermining SDG5. Gender tensions and violence may be increased by overload of domestic and care work, quarantine and tightened family economy, undermining target 5.2 [21,22]. The pandemic consequences will be particularly severe in poor and densely populated urban areas, undermining efforts on SDG11 on sustainable cities and communities. Efforts in conservation work and safeguarding for sites of natural and cultural heritage are being undermined (SDG11). Furthermore, the estimated lost learning in three quarters of the world [23] will widen the global inequalities in access to education between children from different socioeconomic circumstances and jeopardise all targets in SDG4.

International stability and peace-making are at stake. All targets across SDG16 on peace, justice and strong institutions are negatively affected by the crisis. While the UN has appealed for an immediate global ceasefire during the pandemic, there is no sign of a global truce yet [24]. Furthermore, the pandemic has obstructed on-going peacekeeping operations globally. Peacekeepers need to be kept safe from the pandemic. Also, contributing member-states are reluctant to expose their forces to military operations.

Additionally, the crisis has enabled many leaders to accumulate or grab power at the cost of democracy and individual rights (harming target 16.7). In at least 55 countries elections have been postponed[25]. Global partnerships as described by SDG17 are expected to face a setback. Resulting economic crisis in high income countries will force an inward-looking approach, limit their overseas aid budget (impacts target 17.2), and reduce their willingness and ability to ease the debt burden of indebted countries (against 17.4).

The goals related to key food (SDG2), water and sanitation (SDG6), energy (SDG7), and industrial (SDG9) services are directly affected. Covid-19 crisis caused rampant supply chain disruptions, including vital manufacturing industries and essential agri-food chains[26]. All but one targets in SDG2 are affected negatively, as Covid-19 pandemic may add an additional 83 to 132 million people to the ranks of the undernourished in 2020[2] and worsen the nutritional status of most vulnerable populations due to the disruption of supply chains, loss of income, trade-related deficits and workers movement restrictions - also resulting in a rise in food prices, and food waste (against target 12.3). Economic growth priorities after the crisis might halt progress on water pollution and efficiency (targets 6.1-6.5), on renewable and efficient energy systems (targets 7.2, 7.3), and on the sustainability of the industrial sector (SDG9). By affecting supply chains, infrastructure projects and incomes, the crisis affects the progress on modern energy access (7.1), and possibly energy security[27]. There is a risk that the Covid-19 crises and the disruption of economic activities gives a reason to justify the extension of subsidies and governmental bailouts for carbon-intensive industries, delaying progress on targets 7.2, 7.3, and SDG13. Furthermore, social distancing imperatives might boost individualized rather than public and shared modes of consumption, against outcomes for SDG12[28].

The adverse impacts on environmental targets, notwithstanding some short-term gains (see below) are causing concerns. Covid-19 crisis has already diverted attention and delayed measures to address SDG13 on Climate Action and the Paris Agreement. The effects of the pandemic obstruct global environmental stewardship and leadership in combating multiple environmental crises with negative effects on ecosystems targets in SDG14 and 15. The Covid-19 crisis is delaying progress under crucial negotiation processes, with the UNFCCC COP 26 and CBD COP 15 postponed due to the crisis. Current low and even negative oil prices undermine the cost-competitiveness of low-carbon solutions[29]. Regulatory actions, such as subsidies and stimulus to carbon and resource intensive sectors along with roll-backs in environmental regulations will most likely delay integration of climate action into policies and strategies. The flow of climate and sustainable finance to developing nations will most likely decline. Finally, the pandemic has resulted in important indirect effects on the environment. In particular, highly increased medical waste is having negative effect on landfills and marine environments[30,31].

Opportunities from the Covid-19 crisis across the SDGs

Depending on short- and medium- term decisions the Covid-19 pandemic may potentially push critical actions on the Global Agenda by months or years, or present a window of opportunity for rebuilding our societies towards sustainable development. In fact, while we found mostly negative effects, we also

found 67 targets that could potentially benefit from the current situation (ca. 40%). Starting from the environment, transmission and the zoonotic origin of the virus are raising awareness of anthropogenic pressures on ecosystems. Some ecosystems might be benefiting from reduced economic activity, tourism and movement of people, with short-term gains across SDGs 14 and 15. Air pollution in cities is at its lowest level in decades, with NO_2 emissions down by an average of 30%[32], benefitting health outcomes. Furthermore, studies suggest that human lockdown and its eventual relaxation can be viewed as a Global Human Confinement Experiment to understand the positive and negative effects of human presence and mobility on a range of natural systems[33]. In the short term, Covid-19 is set to cause the largest ever annual fall in CO_2 emissions in 2020, with daily global CO_2 emissions decreased by 17% by early April 2020 compared with the mean 2019 levels[34]. Many have argued that the dramatic changes could be the starting point for a sustainable recovery, that could benefit both the climate and biodiversity[35,36],

There has been an unprecedented level of collaboration in medical research with benefits across SDG3 (except some notable exceptions) while exemplifying the advantages of global cooperation. Medicines and vaccines have never been developed this fast[37] - giving a clear precedent on the advantages of global cooperation. Increased North-South and South-South cooperation at the various levels along with global technology facilitation mechanism and coordination to contain and find a cure for Covid-19 (benefitting SDG17) will provide lessons learned for the years to come.

While some industries will be set back, others can innovate and flourish - with examples in the medical and online services and communications industries (SDG9). The Covid-19 crisis might also catalyse the transformation of global supply chains towards shortened, more circular and local models (SDG12) - presenting an opportunity to reduce over the longer term the prevalence of lifestyles premised on large volumes of energy and material throughput[28]. The crisis gives an opportunity to rethink sustainability and resilience of food, water and energy supply chains (SDG 2, 6 and 7). The recognition of the importance of a functioning water and sanitation system to address the pandemic is supporting advances across SDG6. Cities are already rethinking mobility, public spaces, and services provisions. As an example, Milan, one of the hardest-hit cities, planned to use the Covid-19 crisis to significantly decrease traffic in the long term by installing bike lanes as people return to their daily lives [38].

An assessment of what we know so far

At the time of writing, only a few months from the start of the Covid-19 crisis, the research and international community have produced an unprecedented amount of research and analysis on its effect across all disciplines (Fig 2). In fact, for almost 80% of the SDG targets we can find at least one reference in academic or grey literature providing information on the effect of the pandemic on the target´s achievement. For a minor share of the targets (ca. 15%) we could only find discussions in news outlets on the possible impact, and only for around 5% of the targets we did not find any evidence of a connection. There are, however, disparities across SDGs and study types.

We find that the widest research efforts have been focused on understanding the direct health (SDG 3), subsistence related (SDG 2), and economic implications (SDGs 1, 8 and 9) of the Covid-19 crisis. Also, other direct impacts on the measures that have been used to fight the pandemic have been looked into, with a range of studies appearing on how the crisis affected livelihoods in cities (SDG 11), or how measures affected equality and household violence (SDGs 10 and 5). In some SDGs, the dedicated analyses of international and topical organizations have helped in advancing the knowledge of the impacts – highlighting the value of these agencies in advancing the knowledge in certain disciplines. Notable examples are the role of FAO an the World Food Programme in understanding implications on SDG2 [26,39], and of the International Energy Agency in analysing impacts across the energy sector and SDG7[29,35]. Furthermore, the UN, supported by appointed experts, is gathering data to quantify the impacts of the pandemic on the SDGs indicators[1]. Across the environment-centered goals, while we could find studies estimating the Covid-19 crisis short-term impacts on climate mitigation, local pollution and ecosystems, mostly speculative studies and opinions were available on some environmental aspects (e.g. climate adaptation or long-term effects on ecosystems). Finally, across most targets looking at international cooperation, peace, justice and strong institutions (SDGs 16 and 17) we found limited available studies directly aiming at understanding the long-term effects of the pandemic.

This initial assessment of literature, while showing the unprecedented advancements in science during the first half of 2020, is helpful in understanding some of the gaps to be assessed in the future. Across most disciplines, the focus has been on the short-term effect of the pandemic, while mostly speculative and opinionated studies are available looking at the long-term effects. Studies quantitatively studying the effect of the pandemic on the SDGs outcomes are limited to date due to two main reasons. First, the data challenges encountered due to Covid-19. The global indicator framework for the SDGs is revised annually and followed by data updates. The latest revision was made in the 51st session in March 2020 (E/CN.3/2020/2, Annex III). The lack of basic health, social and economic data has always been a challenge, but the Covid-19 crisis has made the situation worse by disrupting routine operations in the global statistical and data system, with delays in planned censuses, surveys and other data programmes and large geographical disparities. Although the statistical community has adapted by setting up mechanisms to ensure operational continuity, further investments and support for data innovations (especially integrated geospatial and statistical information; and non-traditional data) are urgently needed[1]. Second, the spread of the pandemic is at different stages in different continents and countries. At the time of writing, countries in Europe have already seen the initial peak in infections, while infections are rising in the Americas and parts of Asia and Africa. Any global quantitative analysis of Covid-19 impact on SDGs will thus provide an inaccurate spectrum of impacts at this stage. A coordinated global effort, guided by the UN and SDSN, will be needed to ensure countries gather the relevant data to fully understand the pandemic´s impacts on al SDGs. As data becomes available quantitative analyses will be direly needed to understand the real impacts of the pandemic on all SDGs.

The choices to make on the global agenda

The nature of the pandemic has two inherent characteristics: first, no one can be left behind, even if a small group is left exposed, the pandemic will resurge; second, it requires cooperation and solidarity in action and response at the local, national, regional and the global level. While this is a major challenge, it is also the core objective of the SDGs, which is a UN-led global commitment. So far, the main focus of the pandemic response at the national level has been on SDG3 (pandemic response), SDG 1&2 (short-term cash transfers, food & social security), SDG8 (short to medium term monetary & fiscal interventions for economic recovery) and SDG9 (innovation for Covid-19 vaccine and drug development). The environmental benefits described above are potentially short lived and might disappear as economies begin to recover. The aggregate nature of this pandemic shock threatens the financing that is critical to the implementation of Agenda 2030, especially in the overseas financial and technical aid to the developing and emerging countries. GDP losses in rich countries[40] risk undermining the necessary official development assistance flows to developing countries[1] – while projected falling remittances will remove an economic lifeline for many households[1]. According to the IMF, 170 countries will have negative economic growth in 2020 and will face the worst downturn since the Great Depression [41].

The world after Covid-19 is an open landscape where, depending on decision made at local, national and international level, the world could either use all the opportunities presented by the crisis (some in green in Fig. 1), or get further away from achieving the SDGs. The key risk that the world is facing is that as the economic crisis advances, countries will favour solutions that prioritise short-term economic gain, carbon-intensive investments and isolated sovereign interests. Such a strategy would negatively affect most targets of the 2030 Agenda. International cooperation, targeted decision making and democratic processes are crucial for a sustainable recovery. However, for the last 14 years, there is a significant decline of democracies around the globe[42] and this process has been further expedited by the COVID-19 pandemic. In this context, the SDG targets are also likely to be adversely affected by increasingly non-democratic policy-making. Moreover, while the World Bank has already made 160 billion dollars available for the low income countries for the pandemic response[43] and the UN has called for a 2.5 trillion Corona package for developing countries[44]; only a limited debt moratorium has been agreed for low income countries and no agreement has been reached on expanded Special Drawing Rights from IMF. Unlike 2014 when the UN Security Council declared the Ebola outbreak in West Africa as a threat to international peace and security, Covid-19 has not been formally recognized. There is a lack of unanimity amongst global powers, resulting in indecision on expanded Special Drawing Rights, debt moratorium, global truce and lifting of international sanctions.

The international community should instead get together to coordinate recovery efforts that address environmental planetary crises – climate change and ecosystems and biodiversity loss – else a critical window of opportunity to avoid their worst impact will be irreversibly lost[45]. Sustainable plans could support climate action while boosting the economy[35]. Shared recovery strategies should focus on vulnerabilities and increase the resilience of socio-economic systems, while addressing preparedness responses and disaster risk reduction for future crises[46]. Furthermore, picking key action areas for the

sustainable recovery with benefits across all the SDGs will be crucial – and could be informed by previous work identifying transformations to be operationalized within the structures of governments[47].

Having the past progress on delivering the SGDs been more substantial we would now leave in a more resilient and better-prepared world for the Covid-19 crisis. The pandemic has highlighted the systemic risks and the vulnerability of the hyper connected transport systems, globalised and high-risk production systems, consumption patterns and lifestyles. As and when countries 'return to normal', we should be cognizant of the fact that it was these naturally reinforcing systems that created and propagated the Covid-19 crisis in the first place. There is a need to meet this challenge with greater and coordinated action, that is proportional to the Covid-19 threat and impact and not to maintain the convenient status quo. In the times to come, we cannot afford to lose track of the medium and long-term global visions of all goals in the Agenda 2030. Analyses such as the one presented here are needed at the regional, national and provincial levels to inform holistic recovery plans focusing on all SDGs, when possible also complemented and informed by quantitative data. International cooperation needs to rise to the challenge, with increased support for less developed and developing economies to build resilient systems that are socially and economically inclusive. Strengthening social and physical infrastructure, creating equal opportunities for all, enforcing environmental laws and regulations, enabling technology transfers, and removing trade-barriers for low-income countries can be part of the solution. Furthermore, the crisis provides an opportunity to redirect investments and subsidies towards climate-compatible and nature-based strategies. Irrespective of the monumental challenges, this decade of action has the potential for global cooperation and solidarity, without leaving anyone behind.

Methods

In this section we describe the process employed to obtain the results described in this Brief Communication and reported in full in the Supplementary Material. The goal of the analysis was to answer the two questions: A) Can the Covid-19 crisis impact negatively the achievement of the SDG target? And B) Can the Covid-19 crisis impact positively the achievement of the SDG target? for each of the 169 targets within the 17 SDGs. The methods were adapted from previous studies assessing SDGs interlinkages, in particular Fuso Nerini et al. (2018)[5] and (2019)[6], and Vinuesa et al. (2020)[7]. The methods can be summarized as a consensus-based expert driven literature search, with discussions to reach consensus as shaped discussed by Butler et al. (2015)[48] and Morgan (2014)[49].

Each SDG was first evaluated by one of the authors, depending on the area of their expertise. The allocated author then carried out a first literature search for each target in that SDG, and then filled the table with the found positive and negative impacts. A structured review process was adopted to reach a consensus on the results for questions A and B for all 169 targets. Another two authors were allocated to each SDG to evaluate and complement the impacts and reasoning presented by the author that developed the first assessment. The role of the reviewers was to bring up additional points of view and considerations, while critically assessing the analysis.

The expert-driven literature search to support the identified impacts of Covid-19 included studies in academic journals and grey literature (e.g. UN and other national and international organization reports). Given the novel nature of the Covid-19 pandemic, when academic and grey literature was not found, information from reputable mainstream media outlets was used. Other sources of information, such as educated conjectures, public beliefs and social media posts were not considered as acceptable evidence.

In practice, for each target, the authors looked for references within these three groups (in order of search):

1. Peer-reviewed journals and preprint articles
2. Grey literature (international organizations, national and subnational agencies)
3. Mainstream news outlets, and news articles from national and international agencies

The material collection was carried out through Google Scholar for groups 1 and 2 above. Google scholar was chosen given the high speed of inclusion of new Covid-19 related articles in the database, and the inclusion of preprints and reports, that are not captured by other scientific databases such as Scopus. Furthermore, a simple google search was used to identify evidence from group 2 and not available in Google Scholar and news articles from group 3 (filtering by news). Only when references from the first two groups could not be found the authors used references in the third group. English was selected as the exclusive language for the research in both databases it is by far the most employed in the international arena, and also because it is generally considered as the international academic language[50]. Results were chronologically filtered to be published after July 2019 – given the appearance of the Covid-19 virus in the second half of 2019.

In both cases, in order to photograph studies addressing Covid-19 across groups 1-3 above, the generic keyword Covid-19 was employed as research criterion, together with the keywords listed in below by SDG:

- SDG 1: SDG 1, no poverty, social protection, vulnerable population, basic services, economic resources, property, vulnerability to extreme events, development cooperation, poverty eradication
- SDG 2: SDG 2, zero hunger, nutrition, food production, genetic diversity of seeds and plants, agriculture, agricultural markets, food price
- SDG 3: SDG 3, good health and wellbeing, health, maternal mortality, newborn and children health, epidemics, premature mortality, non-communicable diseases, drugs, alcohol, road traffic, sexual and reproductive health-care services, universal health coverage, chemicals, pollution, tobacco, vaccines, medicines
- SDG 4: SDG 4, quality education, learning outcomes, childhood development, university education, vocational skills, gender and education, education facilities, scholarships, teachers
- SDG 5: SDG 5, gender equality, violence against women and girls, unpaid care, domestic work, equal opportunities, sexual and reproductive health

- SDG 6: SDG 6, clean water and sanitation, safe and affordable drinking water, sanitation and hygiene, water quality, water pollution, water-use efficiency, water management, water-related ecosystems, international cooperation and capacity-building on water
- SDG 7: SDG 7, affordable and clean energy, modern energy services, access to energy, renewable energy, energy efficiency, international cooperation on energy, energy infrastructure
- SDG 8: SDG 8, decent work and economic growth, employment, gross domestic product, GDP, economic productivity, resource efficiency, work, labour, human trafficking, migrant workers, financial institution, banking, trade
- SDG 9: SDG 9, industry, infrastructure, innovation, environmentally sound technologies, technology development, information and communications technology, support and aid
- SDG 10: SDG 10, reduced inequalities, income growth, equal opportunities, discrimination, migration, official development assistance, migrant remittances
- SDG 11: SDG 11, sustainable cities and communities, housing, basic services, transport, urbanization, cultural and natural heritage, disasters, urban environmental impact, peri-urban, Sendai framework
- SDG 12 : SDG 12, Responsible consumption and production, natural resources, food waste, management of chemicals, waste generation, circular economy, fossil fuel subsidies
- SDG 13: SDG 13, climate action, climate change, climate adaptation, climate-related hazards, climate change mitigation, United Nations Framework Convention on Climate Change, Paris Agreement, climate pledges, COP
- SDG 14 : SDG 14, life below water, oceans, seas, marine resources, marine pollution, marine and coastal ecosystems, ocean acidification, fish stocks, fisheries
- SDG 15: SDG 15, life on land, terrestrial ecosystems, forests, desertification, land degradation, biodiversity loss, droughts, floods, biodiversity, flora and fauna, invasive species, poaching and trafficking of species
- SDG 16 : SDG 16, peace, justice and strong institutions, violence, trafficking, rule of law, arm flows, organized crime, corruption, global governance, fundamental freedoms, terrorism
- SDG 17 : SDG 17, partnership for the goals, tax and revenue, official development assistance, debt sustainability, cooperation, trade, exports, World Trade Organization, policy coherence, capacity building

As an example for SDG1, 9 singular searches were done both in Google Scholar and Google: Covid-19 + SDG1; Covid-19 + no poverty; Covid-19 + social protection; Covid-19 + vulnerable population; Covid-19 + basic services; Covid-19 + economic resources; Covid-19 + property; Covid-19 + vulnerability to extreme events; Covid-19 + development cooperation; Covid-19 + poverty eradication. The keywords were chosen by the authors as representative for the SDG in consideration and its single targets. In total 178 single searches were done with the combinations of words listed above.

Results from the search in Google Scholar were sorted by relevance, and the authors looked at the first 30 to 50 results for each search described above, selecting and reading the articles and reports assessed as most relevant to the interlinkage. In the cases in which several relevant articles on the interlinkage of interest were found within the first 30 results the author stopped the search. Otherwise it continued to up to 50 articles. In fact, in the methodology, one published study on the subject was considered enough for capturing an impact in the supplementary table as, given the vast range of studies on all the SDG areas, the literature search was not exhaustive. For instance, when inserting only the first combination of keywords above in Google Scholar (Covid-19 + no poverty) over 17.000 results are returned. However, for nearly all targets several references are provided, and the ranking by relevance in Google Scholar maximize both the reputability and topical relevance of the analyzed articles.

Furthermore, to assess the status of found evidence at the time of submission, the authors categorized evidence on interlinkages in the following categories (adapted from Vinuesa et al, 2020[7]):

- References from groups 1 and 2 above and directly assessing/studying the particular interlinkage and with global applicability are of type (A)
- Anecdotal or speculative studies, or studies with only local applicability from groups 1 and 2 are of type (B)
- Other references from Group 3 are of type (C)

In order to avoid any bias associated with the different amounts of references in the various targets, we considered the highest ranked reference only for assessing references for a target. Let us consider the following example: for a certain target two references of types (A) and (C) document an impact of Covid-19 on the target, the evidence on that target will be assessed with (A). The full results of the analysis are reported in the supplementary material.

Limitations Of The Study

The presented analysis has limitations, as Covid-19 impacts on certain targets could have been missed by the authors, or there might not be published evidence yet on such interlinkage. When analyzing literature with the methods described above a certain degree of subjectivity is present in the selection of references and interpretation of the results. Nevertheless, the employed methods, being based on varied literature tried to minimize the subjectivity of the assessment. For nearly all reported interlinkages several papers, reports and news articles were analyzed, and several references are provided to overcome the subjectivity of single referenced studies and capture a broader picture. Furthermore, the assessment for each of the 169 targets was assessed and reviewed by at least three authors. Another limitation is that the presented study only provides qualitative insights on the targets based on available literature, without analyzing quantitative trends for the SDGs indicators. While that is in line with the stream of academic literature that this study contributes to (e.g. [5-7]) as data becomes available future work should attempt at quantifying the impact of the Covid-19 crisis on the single SDG targets´ indicators and tracking. Also, future work should attempt at adding interlinkages or evidence to the analysis, as more studies become

available. The work presented here is an analysis at the global level capturing the state of the evidence at the time of submission. Similar analyses at the local national and subnational level would provide more case-specific information, and possibly be a very valuable starting point to inform post Covid-19 recovery plans.

Declarations

Data availability:

All data generated or analysed during this study are included in this published article (and its supplementary information files).

Contributions:

all authors contributed to the analysis and writing of the analysis. FFN coordinated inputs from the other authors.

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Figures

Figure 1

Covid-19 crisis impacts on the SDGs targets Each block in the diagram represents a target, except under SDG13 where P.A. represents the Paris Agreement (see the Supplementary Information for additional details on the targets). For targets highlighted in green or orange we found published evidence that Covid-

19 could potentially affect positively or negatively such target, respectively. The absence of highlighting indicates the absence of identified evidence. Note that this does not necessarily imply the absence of a relationship.
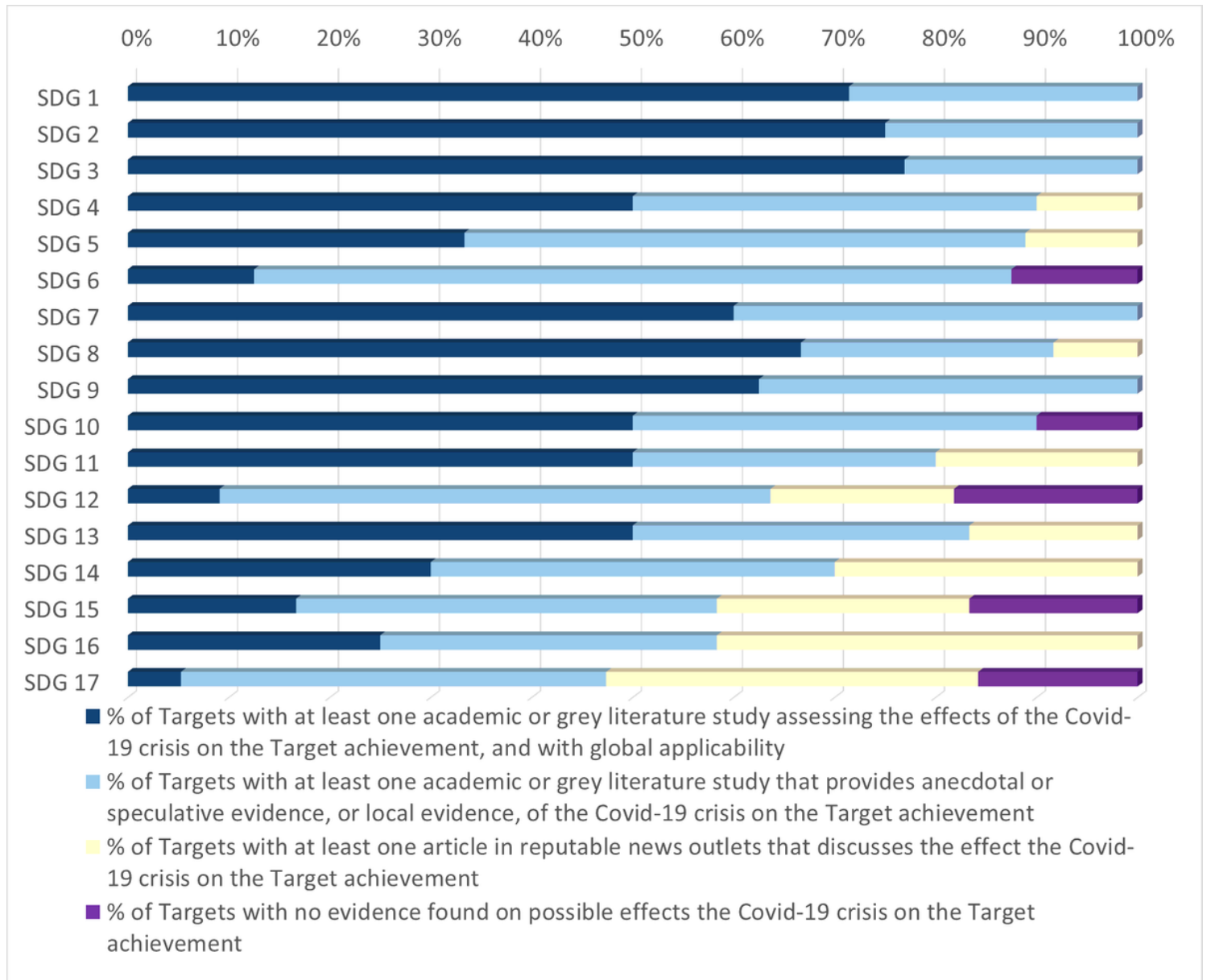

Figure 2

An assessment of the collected evidence The image represents the cumulative % of targets for each SDG for which we found at least: one academic or grey literature study assessing the effects of the Covid-19 crisis on the target achievement, and with global applicability (Dark blue); one academic or grey literature study that provides anecdotal or speculative evidence, or local evidence, of the Covid-19 crisis on the target achievement (light blue); one article in reputable news outlets that discusses the effect the Covid-19 crisis on the target achievement (yellow); or no evidence found on possible effects the Covid-19 crisis on the target achievement (purple). Note that the last category does not necessarily imply the absence of a relationship – but rather that the authors could not find relevant evidence with the methods described at the end of the analysis.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SI.SustainableDevelopmentinthewakeofCovid19.pdf