The SDG Impact Assessment Tool - a free online tool for self-assessments of impacts on Agenda 2030

K. Martin Eriksson, Gothenburg Centre for Sustainable Development, Chalmers University of Technology and University of Gothenburg, Gothenburg, Sweden
K. Martin Eriksson, Gothenburg Centre for Sustainable Development, Chalmers University of Technology and University of Gothenburg (corresponding author)
martin.eriksson@chalmers.se
Gothenburg Centre for Sustainable Development
GMV Chalmers
412 96 Göteborg
Sweden
Anders Ahlbäck, Gothenburg Centre for Sustainable Development, Chalmers University of Technology and University of Gothenburg, Gothenburg, Sweden
Mathias Gustavsson, SWECO Sweden, Gothenburg, Sweden
Nina Silow, Gothenburg Centre for Sustainable Development, Chalmers University of Technology and University of Gothenburg, Gothenburg, Sweden
Jan B. C. Pettersson, Gothenburg Centre for Sustainable Development, Chalmers University of Technology and University of Gothenburg, Gothenburg, Sweden

Abstract

This paper presents the SDG Impact Assessment Tool, an online resource for self-assessments of impacts on the Sustainable Development Goals (SDGs). In addition, it presents a brief example of an SDG Impact Assessment and some existing and potential applications of the tool. The United Nations (UN) 2030 Agenda and the SDGs are a resolution for attaining sustainable development throughout the world, but also represent a framework towards which the sustainability of almost any activity can be evaluated. Although quantitative methods are indeed pivotal for achieving sustainable development, they are often limited to specific scientific fields and cannot encompass all aspects of all SDGs, including normative societal values. A qualitative and reflective approach, however, is not reserved for scientists in specific fields but can be used by anyone. Using such an approach in the tool presented here represent a good starting point for companies or other organizations that want to learn about the SDGs and minimize their negative impacts. The tool employs a self-assessment of impacts on each of the 17 SDGs, in terms of Direct positive, Indirect positive, No impact, Indirect negative, Direct negative or More knowledge needed, and outputs a graphical visualization of the results. The tool also encourages users to formulate a strategy on how to mitigate negative impacts, increase positive impacts and fill potential knowledge gaps, which can be a starting point for a more comprehensive sustainability strategy for companies or other organizations.

Introduction

The United Nations (UN) 2030 Agenda for Sustainable Development, with its 17 Sustainable Development Goals (SDGs) and 169 targets, calls for sustainable transformation of societies across the globe[1]. This framework is one of the most ambitious and important global agreements in recent history, challenging communities, industry and governments at national and regional levels to change their business as usual operations to more sustainable ones. The 17 SDGs pinpoint major challenges in

[1] United Nations (2015) Transforming our world - the 2030 agenda for sustainable development. United Nations, New York.

areas as diverse as poverty, health, education, equality, production and consumption, global warming, biodiversity and safe, fair and inclusive institutions. As emphasized by the UN[1] – the interlinkages and integrated nature of the SDGs are crucial for their implementation. Therefore, the SDGs should be treated as a 'whole', meaning, for example, that actions to achieve one SDG should avoid negative impacts on others. This holistic approach calls for transdisciplinary cooperation that breaks up current silo structures in society.

Through an SDG indicator set[2], countries are urged to monitor progress on the national level and provide quality data as part of a global follow-up and review process, coordinated by the High-Level Political Forum (HLPF). The progress towards achieving the SDGs are tracked and compiled to monitor target compliance and SDGs in need of further action[2]. Although the SDGs are not legally binding, national governments are urged to translate them into national legislations and construct frameworks to promote action and involve various stakeholders (local authorities, industry, academia and civic society) wherever relevant.

Moving the global society towards the sustainable transformation that the Agenda 2030 calls for, will require support and action from actors across all sectors, domains and disciplines. Relevant policies, business strategies and research need to be aligned with a potential contribution to the SDGs in mind. Given the complexity of the SDG framework – the broad range of topics they cover and their interlinked nature – such a task is, however, easier said than done. Since the implementation of Agenda 2030, there is a growing need among stakeholders in society to evaluate actions against their potential impact on the SDGs. Several tools have emerged to help businesses, policy and other stakeholders to take on the SDGs. These include examples focused on guiding business to align their strategies according to the SDGs (SDG Compass); helping organizations to identify relevant SDGs (SDG Selector); inspiring action (SDG Industry Matrix); localizing the SDGs (The Toolbox) and some takes on the challenging task of calculating impacts of business operations on the SDGs (Ramboll's SDG impact assessment tool).

The development of tools for SDG evaluation raises a couple of questions:

- To what extent could the need for SDG evaluation be fulfilled by deploying existing methodologies, such as environmental impact assessments or Life Cycle Assessments (LCA), or are new methods needed?
- What level of accuracy would such methods need to have in order to facilitate informed decision-making in the implementation of the SDGs?
- Given that sustainable development at its heart is depending on normative societal values[3] – to what extent is it possible to have a deterministic and objective approach in SDG evaluations?

The aim of this paper is to present the SDG Impact Assessment Tool[4], which is designed, first and foremost, to enable stakeholders to make a self-assessment of their

[2] United Nations (2017). The sustainable development goals report. United Nations, New York.
[3] Grunwald A. (2004). Strategic knowledge for sustainable development: The need for reflexivity and learning at the interface between science and society. International Journal of Foresight and Innovation Policy 1:150-167.
[4] SDG Impact Assessment Tool (2019). Available at https://sdgimpactassessmenttool.org

impacts on the SDGs. The tool employs a qualitative and reflective approach to identify positive and negative impacts as well as identifying knowledge gaps, to aid strategic decision making and learning in the context of Agenda 2030.

Methodology

The SDG Impact Assessment Tool is a free online tool that visualizes the results from a self-assessment of how an activity, organization or innovation (henceforth simply called the 'object') impacts the SDGs. It aims to stimulate users to get a better understanding of the SDGs, identify relevant sustainability perspectives and to prioritize actions ahead. The tool helps the user to take on the SDGs in a simple and structured approach that encourages reflection and collaborative learning.

The methodology involves five steps (Fig. 1). As the SDGs span a wide competence spectrum, the first step encourages users to "Gather your forces" and apply the tool in a workshop format. This step aims to include people with different competencies in the process and to apply an interdisciplinary and holistic view. In the second step, "Define, refine and draw the line", a description of the object needs to be provided. This description should give the background of the object under assessment and provide the explanations needed to fully understand it. The description should also frame the scope of the assessment. Typical framing considerations include the components of the assessment, dependencies between the actors and stakeholders involved, the spatial and temporal limits of the assessment, life cycle perspectives and whether the assessment is done in absolute or comparative terms (e.g. the object compared to business as usual). The main aim of this step is to identify and describe in what real-world scenario it is relevant to pose the question: what impact might this have on the SDGs?

Figure 1. The five steps in the SDG Impact Assessment Tool method.

In the third step, "Sort the SDGs", the users should sort the SDGs in terms of relevance for the object under assessment. This step is not part of the production of the results of

the assessment. Instead, it primarily aims to get the users to start thinking about the overall relations between the assessment object and the SDGs. This also enables the user to subsequently assess SDG impacts in order of relevance to the study object.

In the fourth step, “Assess your impact”, the impacts of the object on each SDG is assessed. The impacts are categorized as:

- Direct positive impact
- Indirect positive impact
- No impact
- Indirect negative impact
- Direct negative impact
- More knowledge needed.

The process of selecting one of these options can be operationalized into a set of binary questions, addressing 1) the knowledge and confidence level in the assessment, 2) the size of the impact and 3) the type of impact (Fig. 2). The first binary question is “*Do we know enough about the objects’ potential impact on the SDG to be able to make an assessment?*”. If the knowledge and confidence level is too low to make a robust assessment, the More knowledge needed category should be chosen. It’s worth to note that identification of such knowledge gaps are equally important results as the other impact categorizations since it is impossible to make informed decisions when knowledge is lacking. Furthermore, lack of knowledge for the relations between the assessment object and specific SDGs pinpoints the need for new collaborations or research on specific topics.

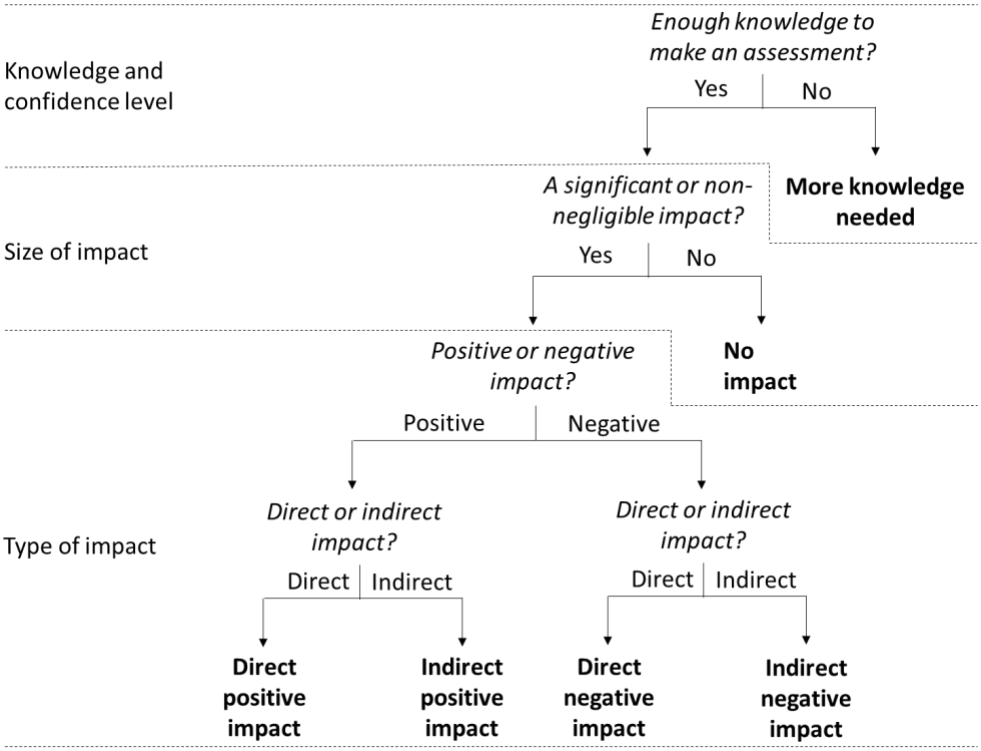

Figure 2. Flow chart outlining the knowledge and confidence level in the assessment, the size of the impact and the type of impact. Questions are shown in italics and categorizations in bold text.

If the knowledge and confidence level is high enough to make an assessment, the second binary question is "*Is there a significant or non-negligible impact from the object on the SDG?*". If there is no impact or if the impact is negligible, the No impact category should be chosen. What constitutes a negligible impact can, of course, be a question of debate. In practice, it is the user who decides this, but it should be stressed that arguments for the categorization No impact should explain why a potential impact is judged to be negligible.

If, on the other hand, there is a significant impact from the object on the SDG, the next binary question is "*Is the impact positive or negative?*", followed by the question "*Is the impact direct or indirect?*". The two last questions should result in a categorization of either Direct positive, Indirect positive, Direct negative or Indirect negative impact. The categorization of impacts as Direct and Indirect relates to the order of events following the implementation of the object. Direct (positive or negative) impact should be chosen when the implementation of the assessment object will have an immediate one-step effect on an SDG. Indirect (positive or negative) impact is chosen when the implementation of the assessment object will give rise to effects on SDGs further down the chain of events. For example, installing solar cells in a remote village with previously no electricity could have a Direct positive impact on SDG 7 "Affordable and Clean Energy for All", since people get access to electricity. But it might also have an Indirect positive impact on SDG 4 "Quality Education" since by having access to light in the evenings, people can read and study.

For each SDG, the selected impact category must be motivated and explained. The rationale for the categorization should be given, and qualitative or quantitative arguments, as well as references to support claims made, should be included. Since the methodology is based on a self-assessment, the results are entirely dependent on the knowledge level and ambition of the users.

The last step in the methodology, "Choose strategy forward", encourages users to formulate a strategy on how to further improve the sustainability characteristics of the object. Based on the result of the self-assessment, users can formulate actions to mitigate negative impacts, increase positive impacts and fill knowledge gaps. Actions can also include finding partners or collaborators to fill the current knowledge gaps. This step can be further developed into formulating a more comprehensive sustainability strategy for companies or other organizations.

As indicated by the grey arrow in Fig. 1, an iterative process in the SDG impact assessment is encouraged. The results of an assessment might reveal that competence to fill knowledge gaps are missing, or that the description of the object in step two ("Define, refine and draw the line") needs to be revised. The need for such revisions might, however, be revealed already in earlier steps, for example during the fourth step, "Assess your impact".

Application and output

The tool outputs a graphical visualization of the results of the assessment, the given description of the object, the motivations and explanations for the categories chosen for each SDG, and the text outlining the strategy for improving the sustainability

characteristics of the object. Hence, all input given to the assessment is displayed in the output.

In order to illustrate the output visualization (Fig. 2), and to exemplify some reasoning in an SDG impact assessment, the results from a small and preliminary SDG impact assessment of cars with electric batteries compared to those with combustion engines is presented below. The intention is not to provide a comprehensive assessment, but rather to provide examples of reasoning to illustrate typical Positive and Negative, as well as Direct and Indirect, impacts.

SDG impact assessment of batteries in electric cars

The underlying purpose of this assessment example is to compare electrical cars with conventional cars. The main difference between these two is the drive-line (electrical vs. combustion). Hence, the assessment is framed in terms of the production and use of electric car batteries compared to production and use of combustion engines. The assessment is global, instead of being made at a national or regional level.

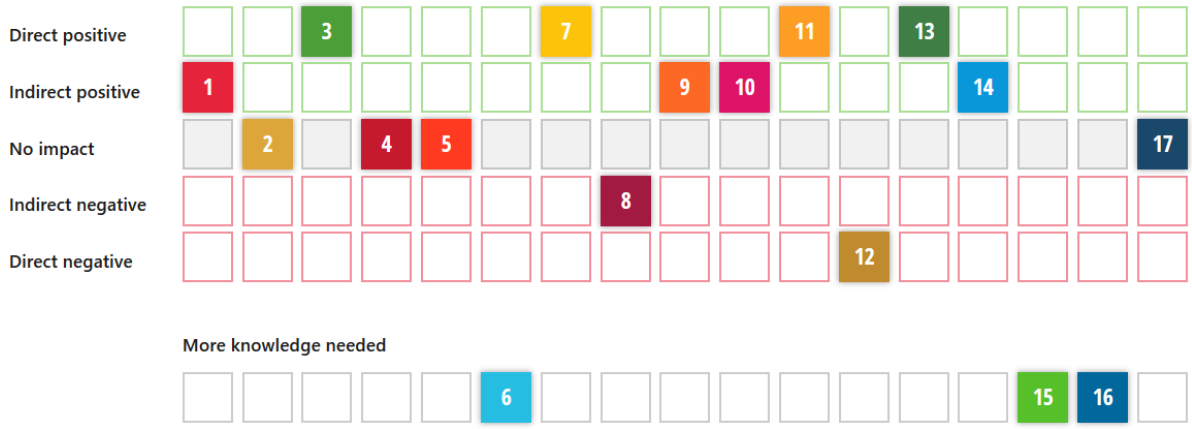

Figure 2. Visualization of the results from the SDG impact assessment example, i.e. the assessment of cars with electric batteries compared to those with combustion engines. Impact types are listed to the left and an impact type is indicated using a colored square with a number indicating the SDG in question.

As can be seen in Fig. 2, the impact on the SDGs are shown as colored squares (coloring corresponds to their respective SDG) in the categories Direct positive, Indirect positive, No impact, Indirect negative, Direct negative and More knowledge needed from top to bottom, and in ascending order from the left to the right side. Since the category More knowledge needed signals that no impact assessment can be made due to insufficient knowledge, this category is partly broken out from the other categories to highlight the SDGs for which initiatives to gain new knowledge are needed.

In this assessment, it is assumed that the electricity to charge the batteries comes from renewable sources. Hence, scaling up the use of electric power in cars would reduce CO_2 emissions and have a Direct positive impact on SDG 13 (Fig. 2). As the CO_2 emissions to the atmosphere will decrease, the CO_2-induced acidification of the oceans will also decrease, which constitutes an Indirect positive impact on SDG 14. The transition from combustion to battery power in cars is not assessed to have any

significant impact on SDG 2 (Zero Hunger), SDG 4 (Quality Education) or SDG 5 (Gender Equality). However, an Indirect negative impact is assessed for SDG 8 (Decent Work and Economic Growth. It is difficult to predict whether the transition from combustion to electric vehicles impacts economic growth, but there is a clear risk it negatively impacts the working environments and increases child labor in mining. Increased battery production requires increased mining of e.g. lithium and cobalt, and such mining activities have frequently been associated with poor working environments and child labor[5]. Furthermore, the minerals used in batteries are finite non-renewable resources, located in specific areas, and the predicted increased demand for these minerals might pose severe problems for a sustainable use of these resources[6 and 7]. Hence, the increased use of batteries in cars gives a Direct negative impact on SDG 12 (Responsible Consumption and Production). It is worth noting that the use of fossil fuels in cars also has a Direct negative impact on SDG 12 since these fuels are non-renewable.

The sustainability impacts caused by the transition from combustion to electric vehicles certainly have several knowledge gaps. For example, it is currently unknown how artisanal mining affects the land and water ecosystems (SDG 14 and 15). It is currently highly uncertain how a transition from oil demand and revenue in certain countries to demand and revenue from battery minerals in other countries would affect the geopolitical situation. It is also uncertain how this transition would impact water resources and life on land. Hence, the category More knowledge needed is given to SDG 6, SDG 15 and SDG 16.

Application examples

The SDG Impact Assessment Tool has successfully been used to evaluate SDG impacts from innovations and small-scale companies, in this context called solutions, for the Solutions Initiative Forum (SIF) events[8] and the accompanying Solutions Reports by SDSN Northern Europe[9 and 10] . More than 60 such solutions have been evaluated. For these events and reports external scientific reviews of the assessments where made.

The tool has also been used to broaden the scope of the research in more specific topics. The MISTRA Carbon Exit research program[11] aims to identify and analyze the technical, economic and political opportunities and challenges for Sweden to reach the target of net-zero greenhouse gas emissions by the year 2045. The program includes case studies in the four areas of Energy carriers, Buildings and Transportation infrastructure, Transportation and Local Arenas, all aiming to provide low carbon

[5] Goldman J. 2017. Electric vehicles, batteries, cobalt, and rare earth metals. Union of Concerned Scientists: Union of Concerned Scientists; [accessed 2019]. https://blog.ucsusa.org/josh-goldman/electric-vehicles-batteries-cobalt-and-rare-earth-metals.

[6] Zhang SG, Ding YJ, Liu B, Chang CC. 2017. Supply and demand of some critical metals and present status of their recycling in weee. Waste Manage 65:113-127.

[7] Tkaczyk AH, Bartl A, Amato A, Lapkovskis V, Petranikova M. 2018. Sustainability evaluation of essential critical raw materials: Cobalt, niobium, tungsten and rare earth elements. J Phys D-Appl Phys 51:26.

[8] SDSN Northern Europe. Solutions initiative forum - SIF. [accessed 2019]. https://www.unsdsn-ne.org/our-actions/solutions-initiative-forums/.

[9] SDSN Northern Europe (2017). Oceans solutions report. Avaliable at https://www.unsdsn-ne.org/wp-content/uploads/2017/05/Oceans-Solutions-Report_Pages_Web.pdf

[10] SDSN Northern Europe (2018). Intergration solutions report. Avaliable at https://www.unsdsn-ne.org/wp-content/uploads/2018/05/Integration-Solutions-Report_20180517.pdf

[11] MISTRA Carbon Exit. 2018. Pathways to net zero greenhouse gas emissions in supply chains. [accessed 2019]. https://www.mistracarbonexit.com/.

products and services. SDG 13 is, of course, of great importance in the program, but the case studies also include SDG impact assessments of how the suggested pathways might impact the rest of the SDGs. Large scale climate actions are typically associated with potential conflicts, such as with biodiversity and land use, as well as synergies, such as with economic growth opportunities and security of energy supply. The tool will be used to perform analyses of SDG conflicts and synergies based on the developed scenarios of how to achieve net-zero greenhouse gas emissions.

Another application for the tool is to use it in education. When students assess how a specific activity, organization or innovation impacts the SDGs, they will get a better understanding of the complexity of sustainable development and the opportunities and difficulties of SDG implementation. The tool is a user-friendly resource for teachers when arranging case study exercises or workshops and represent a starting point for deepened discussions about sustainability and impacts on the SDGs. When students identify knowledge gaps during the SDG impact assessment, they can be stimulated to seek new knowledge in various other research fields. Furthermore, the approach to assess SDG impacts in specific case studies enables teachers to easily apply the pedagogy of Problem Based Learning (PBL), which has been recommended by various studies[12, 13 and 14] .

Discussion

The application and use of the SDG Impact Assessment Tool open up for many theoretical perspectives on sustainability. For example; what kind of approach can be used in SDG impact assessments; to what degree of certainty can impact assessments on all SDG be made, including direct and indirect impacts; and how can the SDGs be assessed on an aggregated level. This paper is a mere presentation of the tool and its underlying methodology, with some applications to address some aspects of the approach used.

The tool is based on a reflective approach to inspire learning. Both qualitative and quantitative arguments can be used in the motivation for SDG impacts. To quantify SDG impacts are indeed pivotal for achieving sustainable development. However, quantitative and deterministic approaches are often limited to specific scientific fields and it is hard to foresee that such a method can encompass all aspects of all SDGs, including normative societal values. A qualitative and reflective approach is not reserved for scientists only and can be used by anyone. Using a qualitative and reflective approach in the tool represents a good starting point for companies or other organizations that want to learn about the SDGs and minimize their negative impacts.

[12] Guerra A. 2017. Integration of sustainability in engineering education why is pbl an answer? Int J Sustain High Educ 18:436-454.
[13] Gunter T, Akkuzu N, Alpat S. 2017. Understanding "green chemistry' and "sustainability': An example of problem-based learning (pbl). Res Sci Technol Educ 35:500-520.
[14] Tejedor G, Segalas J, Barron A, Fernandez-Morilla M, Fuertes MT, Ruiz-Morales J, Gutierrez I, Garcia-Gonzalez E, Aramburuzabala P, Hernandez A. 2019. Didactic strategies to promote competencies in sustainability. Sustainability 11:24.

A recent report by the UN[15] and a recent paper by Sachs et al.[16] outlines six entry points and six transformations, respectively, which represent frameworks for how the SDGs can be implemented. Although the themes for these entry points and transformations are not strictly identical, several themes are common to both, for example, decarbonization, sustainable urban cities and communities, human health and wellbeing, sustainable food and the environmental commons (land, water and ocean ecosystems). These entry points and transformations will require actions by, and cooperation between, governments, institutions, agencies, the private sector and civil society across different sectors, regions and governance levels. The entry points and transformations are holistic, i.e. their implementation does not intend to disfavor each other. However, at lower organizational levels, such as companies and civil society organizations, where decisions favoring SDG implementation take place, there are clear risks that actions having positive impact on one SDG can have negative impacts on others. Especially when indirect impacts are considered. Such situations can potentially be avoided by using the SDG Impact Assessment Tool.

Currently, the tool only treats knowledge level and confidence in the assessment of impacts as a selection between More knowledge needed or significant impact (Fig. 2). Furthermore, the confidence level for the identified impacts is not included in the tool. There are, however, possibilities to describe the knowledge and confidence level in the motivations for each SDG. For example, the confidence scale used by the Intergovernmental Panel on Climate Change (IPCC) in their assessments of degree of certainty in assessment findings in the Technical Summary[17] of the AR5 Climate Change 2014 report, can be employed when assessing SDG impacts and documented in the motivations.

Concluding remarks

Through its systematic approach, the tool provides a structured method to assess complex questions about impacts on the SDGs and map their impacts. The resulting SDG impact assessment can function as a strategic background document to make informed decisions on actions to reduce negative impacts, or to seek additional knowledge to fill knowledge gaps or verify results. As such, the tool can contribute to strategic work on sustainability in various sectors in societies around the world.

[15] Independent Group of Scientists appointed by the Secretary-General, Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development, (United Nations, New York, 2019).

[16] Sachs J.D., Schmidt-Traub G., Mazzucato M., Messner D., Nakicenovic N. and Rockström R. (2019). Six Transformations to achieve the Sustainable Development Goals. Nature Sustainability 2, 805-814.

[17] Mastrandrea M.D. et al. (2011) The IPCC AR5 guidance note on consistent treatment of uncertainties: a common approach across the working groups. Climate Change 108: 675, https://doi.org/10.1007/s10584-011-0178-6