Stockholm Environment Institute

Interactions among the Sustainable Development Goals in Sri Lanka

A systemic assessment

SEI report
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Sigiriya, Central Province, Sri Lanka © PUNEET VERMA / 500PX / GETTY

Foreword

This report is the outcome of the participation of many.

It is the result of a collaborative process between the government of Sri Lanka, the United Nations Development Programme (UNDP) Sri Lanka, the UNDP Regional Hub for the Asia Pacific, the Centre for Poverty Analysis (CEPA) and Stockholm Environment Institute (SEI).

The findings presented in the report result from a process of exchange of information, ideas, and expertise on matters related to achieving the 17 Sustainable Development Goals that make up the UN Agenda 2030. This exchange involved stakeholders representing academia, the public sector, civil society, and UN agencies in Sri Lanka. SEI contributed methodological expertise, and SEI authors wrote the report using the information from all project partners and participants.

The work was financially supported by UNDP under the contract “Understanding SDG Interactions to Strengthen Vertical Policy Coherence and to Support Prioritization and Sequencing Country Level Pilot and ‘Tool Development’”.

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The opinions expressed in the report are those of the authors only and do not necessarily represent UNDP’s official position.

Executive summary

A systemic perspective on SDG implementation

The 2030 Agenda for Sustainable Development calls on governments and other actors to pursue 17 Sustainable Development Goals (SDGs), divided into 169 targets. The SDGs constitute a highly integrated agenda, covering a broad range of policy areas that will inevitably interact with each other. The integrated nature of this agenda poses both challenges and opportunities for successful implementation. Attaining the goals and targets will largely depend on successfully tackling trade-offs and leveraging synergies. For SDG planning, policymaking and implementation, it is important to identify critical trade-offs and synergies in their specific context.

The purpose of this report

This report constitutes a knowledge base on critical SDG interactions in Sri Lanka. The contents aim to support more coherent implementation of the country's sustainable development agenda. The results also provide input to support priority setting across different parts of the 2030 Agenda. The insights can inform new institutional arrangements, including cross-sectoral partnerships and collaborations, that will be needed for more integrated implementation of the 2030 Agenda.

The report is the result of the project, "Mapping interactions between SDG targets", which was initiated in 2017 by a consortium of the Sri Lankan Ministry of Sustainable Development, Wildlife and Regional Development; the Sri Lankan Ministry of National Policies and Economic Affairs; the United Nations Development Programme (UNDP) Sri Lanka; the UNDP Regional Hub for the Asia Pacific; and Stockholm Environment Institute (SEI), with technical support from the Centre for Poverty Analysis (CEPA).

The study is one of the first applications of the SDG Synergies approach that cover interactions across all 17 SDGs and that has been government led from the start. Beyond results of relevance for SDG implementation in Sri Lanka, the report provides valuable lessons for representatives of other governments interested in applying a systemic approach to SDG implementation, and for researchers and practitioners interested in the methodology.

How this report was prepared

This report outlines the underlying process of and presents the results generated by the application of the SDG Synergies approach. SEI developed this approach for analysing interactions between SDG goals and targets in support of more coherent implementation of the 2030 Agenda.

In Sri Lanka, the process followed three steps:

1) Selecting targets for analysis. An Expert Committee assigned by the Ministry of Sustainable Development, Wildlife and Regional Development selected 36 SDG targets to be included in the analysis, based on three criteria:

- applicability (relevance of the target to Sri Lanka);
- implementability (the feasibility to implement the target in the country context in the short term); and
- transformational impact (potential transformational impact of the target in the country).

The selection was adjusted to ensure coverage across all 17 SDGs, in discussion with the Expert Committee.

2) Using expert assessments for scoring. Target interactions were scored during a national consultation workshop that brought together 40 experts from government, civil society, UNDP and the UN Resident Coordinator's Office; and national experts and academia. The experts assessed the direct interaction between pairs of the 36 targets, amounting to a total of over 1200 interactions. The score was set in relation to a guiding question: "In Sri Lanka, if there is progress on target X, how would this influence progress on target Y?"

Scoring was done using a seven-point scale, ranging from strongly promoting influence (+3) on the positive side, neutral (0), to strongly restricting influence (-3) on the negative side.

3) Analysing results to reveal trade-offs and synergies. SEI carried out network analysis, to identify systemic patterns of trade-offs and synergies across the targets. The Expert Committee also selected four areas for which more in-depth network analysis was carried out.

MAIN FINDINGS

- Pursuing progress on the 36 targets included in the analysis is a highly synergistic undertaking. Only 2% of all direct interactions between the selected targets involve trade-offs. So, progressing on a target generally promotes progress on other targets, too.

- The greatest degree of outward influence comes from three targets: strengthening policy coherence, reducing corruption, and enhancing climate change capacity. This means that these targets they have the largest potential to accelerate achievement across the full set of targets analysed.

- The lowest degree of outward influence stems from two targets: improving access to drinking water, and expanding decent housing. These low levels of synergy do not mean that these two targets are less important. Rather, their implementation requires careful attention to mitigate the trade-offs they pose. Indeed, if these trade-offs are surmounted, large gains can be made.

- The largest degree of inward influence stems from enhancing agricultural and economic productivity. That is, progress on these two key targets is largely influenced by developments in other targets.

- The lowest degree of inward influence stems from two targets: access to information, and reduced corruption. This means that these two targets do not receive a lot of support from progress in other targets. At the same time, progress on other targets does not slow down progress on these two issues. Achieving progress may require interventions that are specifically targeted to support these two targets.

- Progress on the 2030 Agenda in Sri Lanka will likely require collaborative arrangements beyond siloed or sector-based approaches that do not reflect the systemic features of the agenda itself. The report identified no clusters or subgroups of targets that are more closely interlinked than others. This is simply because, in the Sri Lankan context, all 36 targets selected are closely intertwined. The findings suggest that systemic SDG implementation in Sri Lanka will have to go beyond identifying sub-groups with shared interests and synergies. Sri Lanka should strive to create collaborative processes that ensure representation of all the goals, at least over time.

Findings for four selected policy areas

Additional analysis was conducted for four targeted policy areas chosen by the Expert Committee These areas are: social protection; food, nutrition and agriculture; drinking water; and housing. Key insights are as follows:

1) Social protection

Progress on social protection (target 1.3) has a large promoting influence on other targets, and does not have a restricting influence on any of the included targets. Progress on social protection systems is presumed to reduce poverty and increase incomes – which have a range of positive effects on economic development, including innovation and technology use, and investments
in small- and medium-sized enterprises. Social protection systems are also critical for reducing hunger and malnutrition. Such systems target poor and vulnerable people who are often food insecure and malnourished. Further, an expanded social protection system is considered as part and parcel of policies for greater equality, including gender equality by increasing the economic independence of women.

Improved social protection is enabled by progress on food and nutrition, equality, reduced corruption and policy coherence. It is weakly restricted by sustainable resource management. Two important factors influence the ways in which the interactions play out. These concern matters about how social protection and poverty reduction contribute to economic growth, and how poverty reduction (through social protection) leads to more sustainable behaviour. These areas may merit further attention in policy and research.

2) Food, nutrition and agriculture

Progress in areas concerning food, nutrition and agriculture (targets 2.1-2.4) affects almost all the targets included in the analysis. The targets promote poverty reduction and social protection, by securing availability of nutritious food all year round and by providing resilient livelihoods to Sri Lanka's many smallholders, many of whom are poor. Reduced malnutrition promotes early childhood development, primary education, learning and psycho-social well-being, and increases academic performance. Food, nutrition and agriculture all promote economic development by increasing labour productivity through reduced malnutrition, and increasing smallholder productivity and incomes.

Progress in food, nutrition and agriculture is in turn highly dependent on progress in other areas, and is enabled by progress in areas of education, water, economic development, climate and policy coherence. Increased agricultural productivity has potential trade-offs with environmental sustainability, including water pollution and deforestation. Agricultural productivity and environmental sustainability interact in complex ways. For example, agriculture's impacts depend on choices made about how to boost farms' productivity. Will chemical fertilizers and pesticides be used? Will production increases take place on existing or new land? Will increased incomes lead small-scale farmers and workers in the fishing industry to adopt more sustainable practices? These issues merit further attention.

3) Drinking water

Progress on access to drinking water (target 6.1) has a promoting influence in the areas of food, nutrition and agriculture; education; and economic development. Clean drinking water could reduce the prevalence of water-borne diseases and malnutrition, thereby improving the productivity of the farming community and labour in general, and enhancing children's school performance. Improved access to drinking water could also reduce the time spent, mostly by women, to fetch water; this would contribute positively to gender equality.

However, access to drinking water is one of the targets that has the most restricting influence on other targets, including in other areas of water management, and on natural resources and freshwater and marine ecosystems. The restricting influence relates to a lack of monitoring and institutional coordination, and a risk for increased wastage of water. Choices of technology and monitoring systems, institutional coordination and public awareness could mitigate the trade-offs. The results also show that the water targets are all closely interconnected. Future studies could investigate the potential of more integrated approaches to water management.

4) Improved housing

Improved access to adequate, safe and affordable housing (target 11.1) promotes poverty reduction. Improved housing can increase the assets of households, and provide space and opportunities for home-based livelihoods and income-generating activities. The target is also seen as intrinsically interlinked with improved access to drinking water.

Housing, however, also has a range of potential restricting influences in the areas of water, transportation, and natural resource management. Key factors that affect the restricting interactions relate to i) water treatment practices and water consumption; ii) transportation needs in developed areas; iii) building materials; iv) the location of city expansion; v) energy sources for electricity generation; and vi) waste management.

Improved housing is enabled by progress on equality – in particular, reforms to ensure housing for all citizens – and increased household incomes, which allow for investments in housing.

Overall results

The overall results of the study show a clear synergistic pattern for progressing on SDG targets in Sri Lanka; far more synergies than trade-offs were identified. The generally synergistic nature of the interactions is promising for successful SDG implementation, and shows that there is potential for virtuous cycles and for good return on investments. Further, the trade-offs identified are often not deterministic. The trade-offs typically depend on how progress is made – a matter affected by choices that are under the control of governments and other actors that determine planning priorities, implementation practices, and technological investments. Awareness of potential trade-offs and the potential of associated mitigating efforts can thus go a long way in strengthening the coherence in implementation of the 2030 Agenda. In Sri Lanka, the agenda is closely interconnected with a high number of strong interactions between targets. The results of this report underscore the need for institutional coordination and cross- sectoral implementation of the agenda. They also underline the value of drawing on systemic assessments of SDG interactions in such processes.

The report provides systemic and context-specific analysis of key SDG interactions of relevance to national-level policymaking and implementation of the SDGs in Sri Lanka. The results support more coherent policymaking by identifying key synergies and trade-offs that should be considered in SDG implementation. The results also inform prioritization across the different parts of the agenda, by highlighting systemic effects and identifying targets with the most synergistic potential.

The analysis further identifies where cross-sectoral collaboration would be particularly beneficial to support overall progress on the 2030 Agenda. Results present opportunities to better align institutional arrangements and collaboration with the interconnectedness of the targets; such coherence could emerge by comparing current institutional arrangements and national budgeting in Sri Lanka with the findings of this analysis to identify gaps or overlapping mandates.

The report also provides insights on synergies and trade-offs related to four selected policy areas. The greater detail of analysis on these key issues supports national planning and budgeting related to these specific policy areas in Sri Lanka.

The report provides valuable lessons for policymakers and decision-makers interested in applying a systemic approach to SDG implementation, and for researchers and practitioners interested in the methodology.

Production of cinnamon sticks, Sri Lanka © AROMÍR CHALABALA / GETTY

1. A systemic perspective on SDG implementation

The contribution of a systems perspective for SDG implementation

The 2030 Agenda for Sustainable Development calls on governments and other actors to pursue 17 Sustainable Development Goals (SDGs), divided into 169 targets. The goals and targets cover a broad range of policy areas that will inevitably interact with each other. The United Nations has stressed that the 2030 Agenda should be viewed as an integrated, indivisible whole, and that all of the targets – be they of an economic, social or environmental nature – are equally important (UN, 2015).

This poses both challenges and opportunities for successful implementation of the SDGs. Policymaking must take this into account. In practice, progress on one target can restrict or even undermine progress on another, and these trade-offs must be mitigated, or at least anticipated. Conversely, progress towards one target can facilitate, support, or even automatically generate progress in others; thus, taking advantage of the synergies can accelerate progress, and allow more cost-efficient implementation. Attaining the goals and targets will largely depend on successfully tackling trade-offs and leveraging synergies within this broad agenda (Pradhan et al., 2017). Systems thinking is therefore vital in SDG planning and implementation.

How the targets interact depends heavily on contexts and circumstances. Policymaking for the 2030 Agenda is, by definition, future oriented. It is impossible to foresee with confidence how targets will interact as progress is made. Reliable and context-specific data on SDG interactions are often not available. Therefore, given the urgency for transformative change in line with the 2030 Agenda, methods and approaches that enable policymaking to account of the interactions based on the best available knowledge are badly needed (UN, 2018).

This report demonstrates how the SDG Synergies approach has been used to better understand how progress towards different goals and targets of the 2030 Agenda for Sustainable Development in Sri Lanka could affect progress in other parts of the agenda. The results can serve as one input to strengthen policy coherence, and support priority setting and cross-sectoral collaboration that reflect the interconnectedness of the 2030 Agenda.

Supporting policy coherence

For governance to be effective in achieving the 2030 Agenda, public policies should be coherent with one another, and evidence based (CEPA, 2018). A solid knowledge base is needed that considers how making progress on the different SDGs interact so that policies do not unintentionally reinforce unsustainable patterns. A science-informed analysis of interactions can support more coherent and effective decision-making, follow-up and monitoring; such analysis can also stimulate knowledge gathering, learning processes and multi-stakeholder partnerships in support of effective goal implementation (ICSU, 2017).

Priority setting that respects the whole

With limited resources available, any government is bound to prioritize certain actions and policy areas in the implementation of the SDGs. At the same time, they have committed to making progress on the whole 2030 Agenda. Systemic analysis can inform priority setting that better reflects these two aims by identifying areas where interventions can best support overall SDG progress, and by avoiding inefficiencies due to conflicts between goals.

Thanks to scientific advances in areas like cross-impact analysis and network analysis, systemic analysis of the SDGs can also look into relationships between targets that would be too complex for most human minds to process (Panula-Ontto et al., 2018; Weimer-Jehle, 2006). Such analysis is useful at the early stages of policymaking because it brings to light interactions that might otherwise come as surprises further down the line in SDG implementation.

Organizing cross-sectoral collaboration

While the need for policy integration and coherence has been recognized for decades, progress in practice has been limited. Most public administrations are not optimally organized to deal with the kinds of multi-sectoral, multi-scale, multi-actor, transdisciplinary and intergenerational issues that characterize implementation of the SDGs (Weitz et al., 2018).

Effective implementation requires the involvement of a range of different policy areas and stakeholders. Systemic analysis can help to identify where collaboration would be particularly beneficial, and to address specific issues where there are mutual advantages or trade-offs due to conflicting interests.

Identifying needs for policy innovation

Progress towards the SDGs is likely to require new policy instruments, or new uses of existing instruments, as well as new business models and innovative technologies. By highlighting challenges to progress on the SDGs, and by informing where change is needed to unlock progress, the findings of this analysis can be used to guide innovation and partnerships between, for example, the public sector and industry, to drive SDG progress.

The SDG Synergies approach

This report presents key results from applying the SDG Synergies approach developed by researchers at Stockholm Environment Institute (SEI). SDG Synergies is a semi-quantitative approach designed to facilitate systemic analysis of interactions between sets of policy targets and goals – and to do so in a way that reflects the real-world context in which implementation will happen (Weitz et al., 2019). The approach was first presented in a paper in the journal *Sustainability Science*: "Towards systemic and contextual priority setting for implementing the 2030 Agenda" (Weitz et al., 2018). In addition to the application in Sri Lanka presented in this report, applications in Mongolia (Barquet et al., 2019) and Colombia (Lobos et al., 2020) have helped to further develop and refine the approach.

Cutting through complexity

SDG Synergies combines qualitative assessment of target interactions with quantitative network analysis. This combination enables it to look beyond simple interactions between pairs of targets; to analyse more complex, systemic relationships; and to express them in ways that are easier to grasp and communicate. The SDG Synergies approach helps to cut through the complexity of dealing with large numbers of target interactions, and to capture in a nuanced way how progress towards one target could affect progress in a broad range of targets and associated policies in a specific setting (Barquet et al., 2019).

A common language and transparency

SDG Synergies supports users to assess interactions with the help of a guiding question and a seven-point scale that ranges from the most positive to the most negative influence – thereby providing a common language for discussing interactions. The scores are entered into a "cross-impact matrix", and justifications for the scores are documented. (See "Applying the SDG Synergies approach in Sri Lanka" on page 11, for further detail.) In this way, SDG Synergies allows direct comparison between qualitatively different interactions, and makes it easy to track, question and revise the assumptions underlying the analysis. The use of a seven-point scale of interactions also means the analysis can be far more nuanced than approaches using a simple binary scoring – positive vs. negative, or synergies vs. trade-offs.

Adaptive to context

How interactions play out depends on the context, including differences in geography, governance and technology (Nilsson et al., 2016). Generic analyses that exclude context are therefore of limited use for policymaking. Flexibility is built into the SDG Synergies approach, so it can be adapted for the specific context, For example, stakeholders are invited to

participate in the selection of targets, goals or indicators to be analysed; the policy questions to be addressed; the scale at which interactions to be considered; and the type of data to be used in the process.

All in all, the SDG Synergies approach offers decision-makers a systemic view of the SDGs, highlighting how interactions between different targets can shape the outcomes of policy choices. Compared to traditional sectoral approaches to policymaking, it equips policymakers with a more robust information basis as they plan for implementation of the indivisible 2030 Agenda.

A learning process

The SDG Synergies approach benefits from transdisciplinary perspectives. The more sectors and stakeholder groups represented in the process, the greater the chance that critical interactions will not be overlooked, and the more likely that interactions will be fairly and realistically scored. Applying SDG Synergies can thus bring together actors and sectors that tend to operate in silos – thereby promoting mutual learning and understanding to support more coherent implementation. Crucially, this approach also increases the likelihood of broad acceptance and ownership of the results.

These learning outcomes can be just as valuable as the analytical outputs themselves (Weitz et al, 2019). SDG Synergies thus generates policy-relevant information on complex issues, based on existing knowledge of the actors who will be involved in implementation.

Applying the SDG Synergies approach in Sri Lanka

Objective

The project, "*Mapping interactions between SDG targets*", was initiated in 2017 by the Sri Lankan Ministry of Sustainable Development, Wildlife and Regional Development; the Sri Lankan Ministry of National Policies and Economic Affairs; UNDP Sri Lanka, the UNDP Regional Hub for the Asia Pacific; and Stockholm Environment Institute (SEI), with technical support from the Centre for Poverty Analysis (CEPA). The objective of the project is to provide a tailored analysis of SDG interactions at national level in Sri Lanka to inform policymaking and implementation of the SDGs.

In the following sections we describe how the SDG Synergies approach was carried out in three steps (Figure 1) to serve the project objective.

Figure 1. Overview of the three steps of the SDG Synergies approach

Step 1 – Selecting the targets

Because the assessment of interactions is done qualitatively, the SDG Synergies approach is best suited to analyse interactions between maximum 40 variables (goals or targets).[1] The selection of targets can be made in different ways depending on the purpose of the analysis (see, for example, Barquet et al., 2019). In this study, the selection process was government led to ensure that the targets reflected national policy priorities. The Ministry of Sustainable Development, Wildlife and Regional Development designed a process to shortlist a subset of nationally relevant targets for the medium term, and assigned an Expert Committee to undertake this task. The committee proposed that the targets be selected based on their performance on three criteria: *applicability* (relevance of the target to Sri Lanka), *implementability* (the feasibility to implement the target in the country context in the short term); and *transformational impact* (potential transformational impact of the target in the country).

The Expert Committee assessed all 169 SDG targets based on the three criteria, ranked them based on the highest average scores, and then adjusted the selection to ensure coverage across all 17 SDGs. The 36 shortlisted targets included in the project are displayed in Table 1.

Step 2 – Assessing the interactions

Direct interactions between pairs of the 36 targets were scored in relation to the guiding question: *In Sri Lanka, if there is progress on target X, how would this influence progress on target Y?*

Hence, the scoring was not done based on the status quo, but under the assumption of progress on targets. Evidently, there may be many different ways to achieve progress on a given goal or target. The scoring thus contains an element of personal judgement, and the results will reflect the participants who are involved, the information that is available about the context, and the policy options that are feasible. In January 2019, around 40 experts gathered for a national consultation to discuss interactions and to determine scores. The participants were representatives of government, civil society, UNDP and the UN Resident Coordinator's Office, and selected national experts and members of academia.

Figure 2. The seven-point scale used in interactions scoring

The scoring used a hybrid, quantitative-qualitative, seven-point scale (Figure 2) developed for cross-impact analysis. The scale ranged from strongly promoting influence (+3) on the positive side, to strongly restricting influence (-3) on the negative side (Weimer-Jehle, 2006), see Fig 2. A score of 0 means that there is no influence, or that progressing on both targets is *consistent*. As a shorthand, the positive interactions (scores of +1 to +3) are referred to in this report as "promoting", and the negative interactions (scores of -3 to -1) are labelled "restricting".

The scoring was done in pairs of experts. Each pair was assigned two targets (corresponding to two rows in the cross-impact matrix, see Figure 4) in line with their areas of expertise, and they set the score by estimating how progress on these two targets would impact all other targets.

The experts were supported by an online tool, which they used to enter scores for each of their assigned interactions. It is worth noting that interactions were scored separately in both directions (i.e., over 1200 interactions were scored in total); this is important because the influence that progress on target X has on target Y may be quite different to the influence that progress on target Y has on target X. The tool presented the guiding question and the seven-point scale. It asked experts to provide a brief explanation for their score, as well as to state whether the score was uncertain for any reason (e.g., due to a lack of information, or disagreement over what score to enter). All scores were automatically transferred to a master matrix that was displayed throughout the workshop, and scores and explanations were documented through the online tool.

1 This limit is due to the time involved in qualitatively assessing the individual interactions. With larger sets of goals/targets the analysis quickly becomes more complicated; if all 169 targets were included, almost 30 000 pairwise interactions would need to be assessed.

Table 1. Selected targets included in the analysis

Goal	Target
	1.3 Implement social protection systems
	2.1 Universal access to safe and nutritious food 2.2 End all forms of malnutrition 2.3 Double the productivity and incomes of small-scale food producers 2.4 Sustainable food production and resilient agricultural practices
	3.5 Prevent and treat substance abuse
	4.2 Equal access to quality pre-primary education 4.3 Equal access to affordable technical, vocational and higher education 4.4 Increase the number of people with relevant skills for financial success 4.A Build and upgrade inclusive and safe schools
	5.1 End discrimination against women and girls
	6.1 Safe and affordable drinking water 6.3 Improve water quality, wastewater treatment and safe reuse 6.4 Increase water use efficiency and ensure freshwater supplies 6.6 Protect and restore water-related ecosystems
	7.2 Increase global percentage of renewable energy
	8.2 Diversify, innovate and upgrade for economic productivity 8.3 Promote policies to support job creation and growing enterprises 8.9 Promote beneficial and sustainable tourism 8.10 Universal access to banking, insurance and financial services
	9.3 Increase access to financial services and markets
	10.3 Ensure equal opportunities and end discrimination 10.4 Adopt fiscal and social policies that promote equality
	11.1 Safe and affordable housing 11.2 Affordable and sustainable transport systems
	12.2 Sustainable management and use of natural resources
	13.2 Integrate climate change measures into policies and planning 13.3 Build knowledge and capacity to meet climate change
	14.1 Reduce marine pollution 14.4 Sustainable fishing
	15.1 Conserve and restore terrestrial and freshwater ecosystems 15.9 Integrate ecosystem and biodiversity in governmental planning
	16.5 Substantially reduce corruption and bribery 16.10 Ensure public access to information and protect fundamental freedoms
	17.14 Enhance policy coherence for sustainable development 17.19 Further develop measurements of progress

The choice of knowledge inputs to the scoring depends on the purpose of the exercise. It can be done based on secondary sources and scientific expert judgement alone. Or, as was the case in Sri Lanka, it can tap into the knowledge of key stakeholders with relevant expertise, supported by scientific input and secondary sources. In the scoring exercise, experts were supported by one-page descriptions of each target as it applies in Sri Lanka. The descriptions included key data on the current status of the target, current policies, current challenges, and existing gaps towards achieving the target. (See Appendix D for an example.) Prepared based on existing documented reports, these descriptions were available as reference material for the participants, who could use them as a starting point for discussions on how the targets interact with each other. The scoring, however, ultimately relied on the experts' own judgements. It is important to note that there is no scientific consensus on how *progress* on targets interact (ICSU, 2017). Also, circumstances (such as the political landscape, and technological options) change. So, even if there were to be scientific consensus in a given moment, target interactions are inevitably prone to change.

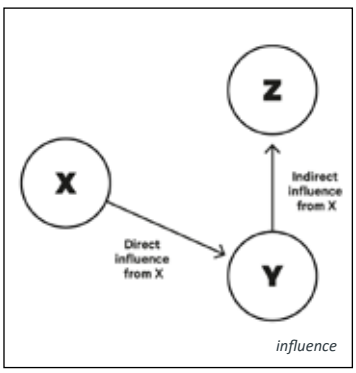
Verification of scores

Seeking to make the scoring as robust as possible, while accepting uncertainty, a verification exercise followed. This verification aimed to reduce biases, to identify errors in the scoring, and to increase the overall quality and reliability of results. In this exercise, each pair of experts was asked to verify the scores and the explanations that had been entered by another pair of experts on two different targets. In case of disagreement with the original score, the experts were once again asked to mark the score as uncertain. Finally, any scores that had been marked as uncertain during either the original scoring or the verification exercise were brought up for discussion in groups of six experts. For some of the targets, the verification and discussion took place during a follow-up expert meeting.

Step 3 – Analysing the results

Some useful information can be obtained directly from the cross-impact matrix shown in Figure 4. This shows, for example, how each target directly influences and is influenced by the other goals and targets, and whether progress on some targets implies many trade-offs.[2]

Figure 3. Example of direct and indirect influence. In this case, progress on target X has an indirect influence on target Z, mediated by target Y.



However, to gain a more systemic understanding of SDG interactions, the analysis also looked at indirect influences from progress on the targets. For example (as illustrated in Figure 3), target X may have a direct influence on target Y, which, in turn, has an influence on Z. Hence, progress on target X may have both a direct effect on Y and an indirect effect on Z. Both direct and indirect effects may affect the priority given to target X.

Network analysis, which captures both direct and indirect influences, was used to better understand how all the targets fit together. This analysis included ranking the targets based on their "synergistic potential" (i.e., the extent to which progress on a particular target promotes progress on all the other targets), and based on level of dependence on other targets (i.e., the extent to which progress on other targets promotes progress on a particular target). The methodological details of the network analysis can be found in Weitz et al. (2018) and Appendix C.

Initial results from the network analysis were presented to the Expert Committee, which provided feedback, and identified four areas (targets 1.3, 2.1-2.4, 6.1 and 11.1) for which further analysis was carried out.

Overall, the analysis helps to answer the following key questions:

- *What is the systemic effect from progress on each of the included targets?*
- *What are the key interactions within selected policy areas?*

2 In this report, the term "trade-off" is used interchangeably with "restricting influence". The term "synergy" is used interchangeably with "promoting influence".

2. Overall findings

Overview of SDG interactions in Sri Lanka

To gain a systemic overview of key patterns of direct interaction between SDG targets in the Sri Lankan context, the cross-impact matrix (Figure 4) resulting from the scoring process is a useful starting point. The matrix gives a quick overview of direct, pairwise interactions between the 36 selected targets, which are further explored in subsequent sections. The colour coding (see Figure 2) in the matrix visualizes the interactions between the SDG targets.

Figure 4. Cross-impact matrix with direct interactions across all the 36 included targets.

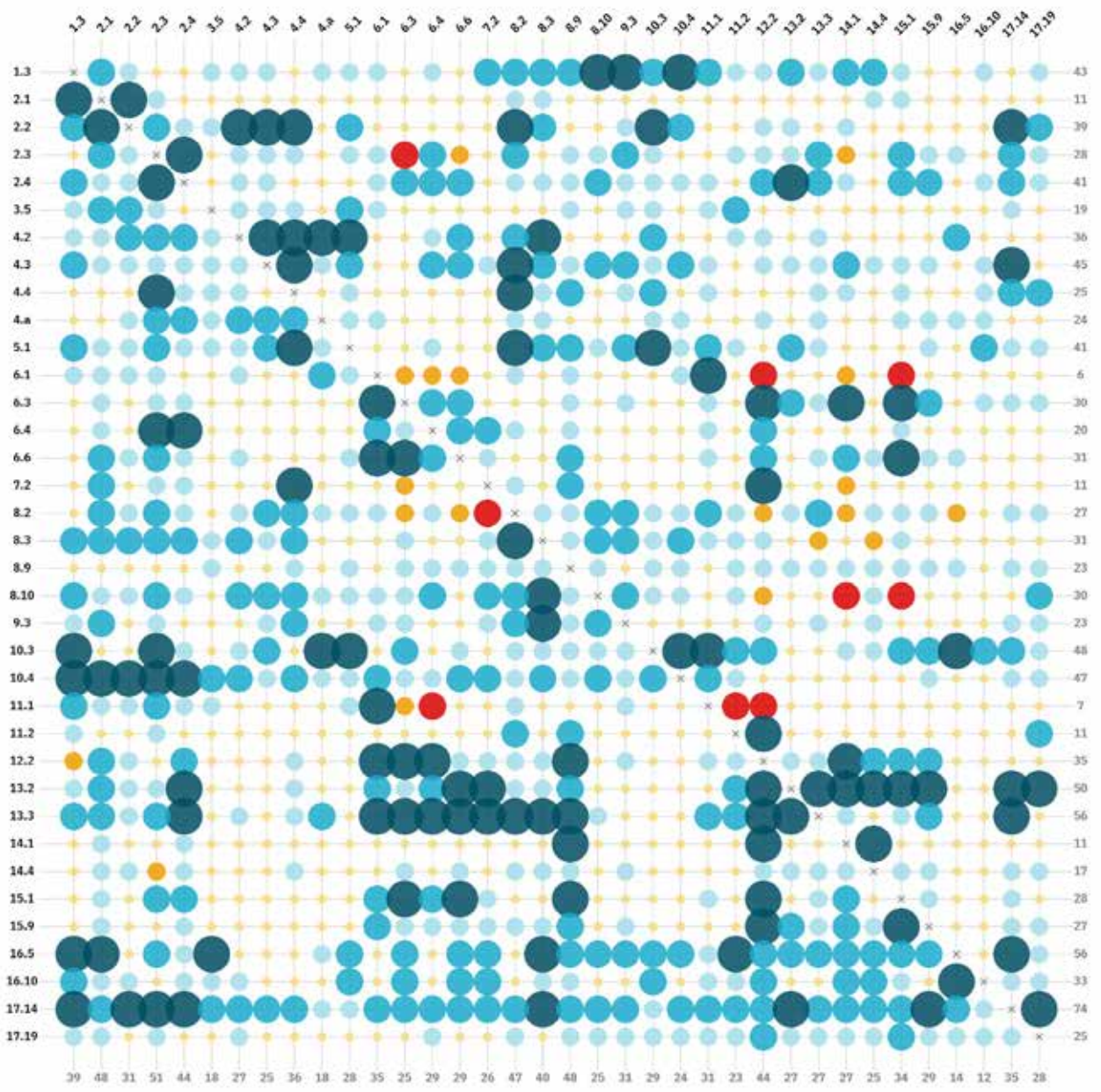
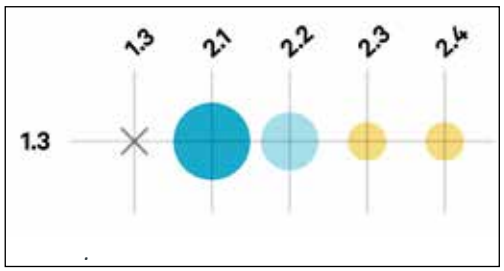


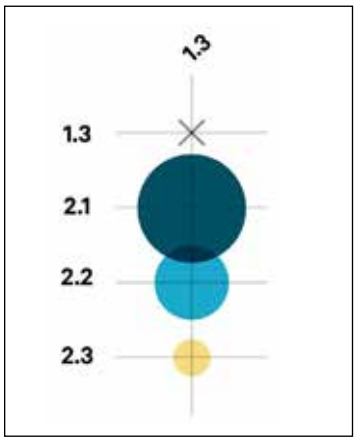
Figure 5. How progress on target 1.3 affects other targets. Excerpt from cross-impact matrix (Figure 4)



The horizontal rows of the matrix show how progress on a particular target influences all other targets. For example, looking along the row for target 1.3 (Figure 5) shows that progressing on social protection (target 1.3) was assessed as moderately promoting (+2) access to food (target 2.1); weakly promoting (+1) reduced malnutrition (target 2.2); and having no influence (0) on productivity and incomes of small-scale food producers (target 2.3), and sustainable food production and resilient agricultural practices (target 2.4).

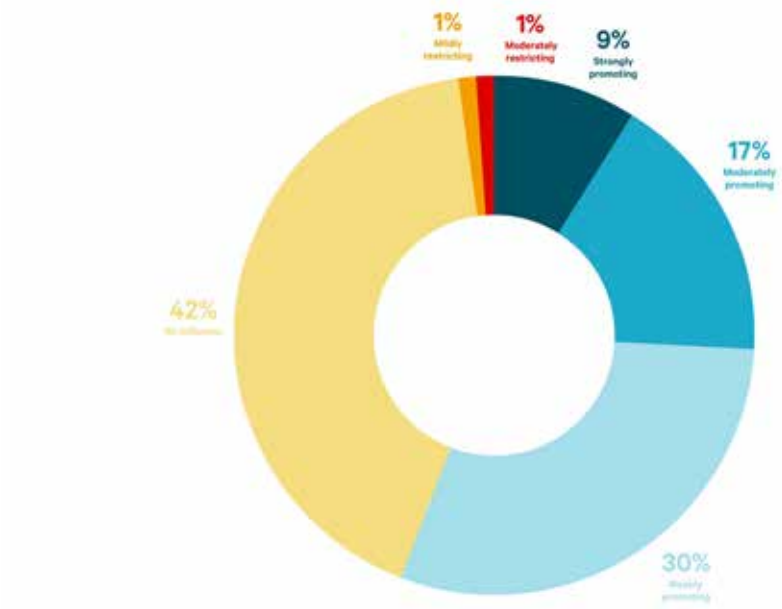
By contrast, the vertical columns of the matrix show how progress on a particular target is affected by progress on all other targets. For example, the column for target 1.3 (Figure 6) shows that it was assessed as being strongly promoted (+3) by progress on target 2.1; moderately promoted (+2) by progress in target 2.2; and not influenced (0) by progress in target 2.3.

Figure 6 How progress on target 1.3 is affected by progress on other targets. Excerpt from the cross-impact matrix shown in Figure 4.



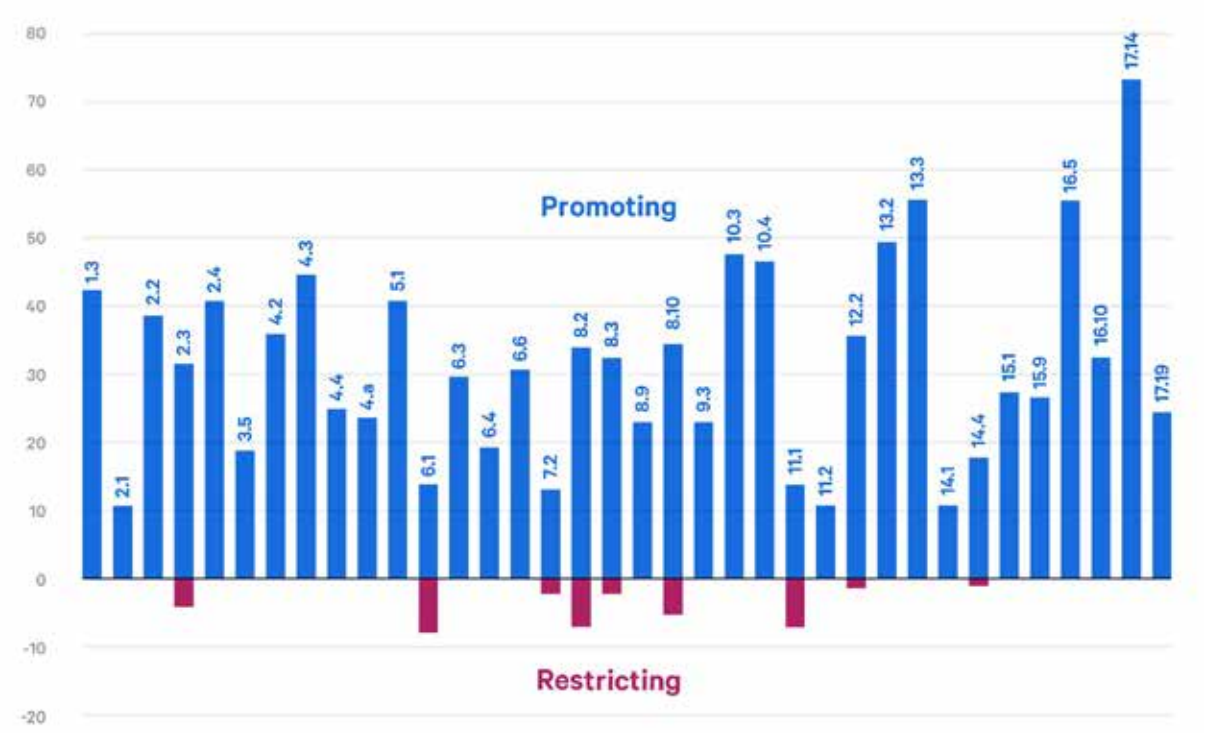
Summing the scores in each row (as presented at the right-hand side of the matrix) gives a quick indication of which targets have the most promoting (or restricting) direct influence on progress towards the other 35 targets. The same can be done for the columns (as presented at the bottom of the matrix) for an indication of how progress towards a given target is directly influenced by progress on the others. For example, policy coherence (target 17.14) has the highest row-sum (synergistic potential), suggesting that progress on this target would directly promote progress on the selected SDGs to a much larger extent than drinking water (target 6.1), which has the lowest row-sum. This is because progress on policy coherence has direct influences that are exclusively promoting for other targets, whereas progress on drinking water has direct influences that go in both directions, with some promoting (for example, on housing and basic services (target 11.1)) and some restricting (for example, on water quality (target 6.3), water use efficiency (target 6.4) and water-related ecosystems (target 6.6)).

Figure 7. Distribution of scores across all interactions in the cross-impact matrix shown in Figure 4.



Overall, the assessment found that in Sri Lanka only 2% of all direct interactions between the selected targets were restricting (see Figure 7). Achieving progress on the included 36 SDG targets that were part of this analysis is thus highly synergistic; targets generally support progress on other targets, and making progress in one area makes it easier to achieve other targets, too. This tilt to the positive side of the scale is a pattern that emerged in other cases where the method has been applied, e.g. in Sweden (Weitz et al., 2018), and Mongolia (Barquet et al., 2019).

Figure 8. Overview of the sum of promoting and restricting direct influences per target. A high blue bar indicates that a target has strongly promoting influences on many targets. A red bar indicates restricting influences.



As can be seen from Figure 8 and the matrix, despite the generally synergistic pattern, progress on nine targets (2.3, 6.1, 7.2, 8.2, 8.3, 8.10, 11.1, 12.2, 14.4) does have a certain restricting influence on other targets. Specifically, thirteen other targets (1.3, 2.3, 6.3, 6.4, 6.6, 7.2, 11.2, 12.2, 13.3, 14.1, 14.4, 15.1, 16.5) are hindered by progress on these targets. Such restricting interactions indicate potential trade-offs that may need to be addressed in policymaking. Economic productivity (target 8.2) and access to drinking water (target 6.1) restrict progress on the largest number of targets. For example, economic productivity (target 8.2) has a direct restricting influence on natural resources (target 12.2) since consumption is rising with per capita GDP growth, which results in a higher material footprint. There are no incidences of *strongly restricting* influence between the 36 targets.

The subsequent analyses are based on the same data that are presented in the cross-impact matrix. The qualitative explanations of the interactions are based on motivations provided by the scoring experts.

Ranking of targets for priority setting

Rankings help to highlight different types of systemic influence across the targets, and can therefore be a useful input into priority setting. Since the rankings take into account both direct and indirect influences, they can maximize the positive influence on prioritized targets, and help avoid interventions that contradict each other – which could result from a more narrow focus that does not consider systemic impacts.

In the following, we present two types of rankings. The first is based on each target's influence on other targets – its outward influence. The second is based on how each target is influenced by other targets – its inward influence. These rankings correspond to the row-sums (outward influence) and column-sums (inward influence) presented in the matrix, but they also take into account indirect influences.

The rankings are not in themselves priority lists of the importance of targets. Rather, they provide information about implications from prioritizing certain targets. All 36 targets included in the analysis have been selected since they themselves are, in some sense, priority targets. The rankings offer a way to identify priority areas that will best enable progress across all the 36 targets. In a prioritization process, both top- and bottom-ranking targets from both ranking lists may be considered.

Ranking based on outward influence

The first ranking, based on targets' outward influence, tells us how progress on a particular target affects the rest of the agenda. The full ranking list is found in Appendix A. At the top of the list (Table 2) we find targets that can be labelled "accelerators" – that is, if progress is made on these targets, they will have a large promoting influence on many other targets. Policy coherence (target 17.14) tops this list, followed by reduced corruption (target 16.5) and climate change capacity (target 13.3). Progressing on these targets will help the most with making progress on the entire set of included targets. Conversely, lack of progress or even regression in these areas can have a large negative influence on progress on the agenda as a whole.

Progress on policy coherence (target 17.14) is expected to contribute positively to all included targets, and, in particular, to improved targeting and coverage of social protection systems (target 1.3), improved food, nutrition and agriculture (targets 2.1-2.4), promotion of development-oriented policies (target 8.3) across sectors, and mainstreaming of climate (target 13.2) and biodiversity (target 15.9) in national and local planning. Reduced corruption (target 16.5) could accelerate progress on access and delivery of social protection (target 1.3) and food programmes (target 2.1), and could improve law enforcement related to substance abuse (target 3.5). As for strengthened climate change capacity (target 13.3), it could accelerate progress on sustainable and resilient food production systems (target 2.4), more efficient water management systems (targets 6.1, 6.3, 6.4, 6.6), and renewable energy (target 7.2), to name a few examples.

This information on the systemic effect of the targets is useful to complement information on the current performance and trends for the targets in question. Considering policy coherence (target 17.14), a mapping of the institutional structure for SDG implementation in Sri Lanka (Ministry of Sustainable Development, Wildlife and Regional Development, 2017) revealed a fragmented governance structure with, at the time, 51 ministries and 425 governmental departments, often with overlapping mandates; a recent SEI report (Shawoo et al., 2020) also shows that there is limited coordination between the institutional bodies responsible for SDG implementation, and the National Planning Department. In light of this, it appears that increased policy coherence and institutional coordination have potential for large systemic effects on the achievement of the 2030 Agenda.

Similarly, looking at the current status of corruption (target 16.5) in Sri Lanka, the corruption indicator (Corruption Perception Index) used in the Sustainable Development Report (Sachs et

al., 2019), reveals major corruption challenges and a stagnating trend, which can thus be expected to have a large systemic effect.

It is important to note that progress on targets at the top of the ranking list can still have a direct or indirect restricting influence on some targets. For example, productivity and income of small-scale food producers (target 2.3), which is ranked no. 13, has a direct restricting influence on water quality (target 6.3) and marine pollution (target 14.1) because it may cause an increase in the use of agro-chemicals, leading to deteriorating water quality and pollution of marine environments.

Table 2. Outward ranking, top 10 targets

Ranking	Target no.	Target description
1	17.14	Policy coherence
2	16.5	Corruption and bribery
3	13.3	Capacity on climate change mitigation, adaptation, impact reduction and early warning
4	10.3	Equal opportunity and reduce inequalities of outcome
5	4.3	Access to technical, vocational and tertiary education, including university
6	13.2	Integrate climate change measures into national policies, strategies and planning
7	2.2	End all forms of malnutrition
8	2.4	Sustainable food production systems and resilient agricultural practices
9	10.4	Policies, especially fiscal, wage and social protection policies, to achieve greater equality
10	5.1	Discrimination against women and girls

Table 3 shows the bottom of the outward ranking list. Progressing on these targets will have the least promoting or most restricting influence on the entire set of targets. Looking at this list together with the matrix with direct influence gives a sense of whether the targets are found at the bottom of the list because they have little promoting influence (which is the case for target 14.1 on marine pollution, and 11.2 on transport systems), or because they have a large restricting impact on other targets (which is the case for targets 6.1 on drinking water and 11.1 on housing). For example, the promoting influence from reducing marine pollution (target 14.1) is restricted to fisheries (targets 2.3 and 14.4), sustainable tourism (target 8.9), and sustainable natural resource management (target 12.2), but the target was assessed to have no impact on areas such as education (goal 4), sustainable cities and communities (goal 11). Drinking water and housing, on the other hand, have a range of restricting influences across other targets (see pages 43 and 49 for further details).

Targets that have a strong restricting influence on other targets may deserve attention in terms of their implementation. *Many of the trade-offs identified in the scoring can be overcome or mitigated with mindful implementation that takes the potential trade-offs into account. Large gains can be made if these trade-offs are overcome, and bottom-ranked targets may merit particular attention to ensure progress on the agenda as a whole. Targets at the bottom of this list should therefore not be seen as low-priority targets. Rather, if large progress on the targets is expected, their implementation may require mitigating interventions.*

Again, the list can be compared with progress indicators for the targets. For example, according to the Sustainable Development Report (Sachs et al., 2019), there are remaining challenges related to access to drinking water (measured as the proportion of the population using at least

basic drinking water services) in Sri Lanka, but the country displays a positive trend and is on track for SDG achievement. It may thus be important to monitor any side-effects of the expected progress for target 6.1 on drinking water.

Table 3. Outward ranking, bottom 10 targets

Ranking	Target no.	Target description
27	9.3	Access of small-scale industrial and other enterprises to financial services and their integration into value chains and markets
28	3.5	Prevention and treatment of substance abuse
29	14.4	Harvesting and overfishing, illegal, unreported and unregulated fishing and destructive fishing practices
30	6.4	Water-use efficiency and sustainable withdrawals
31	2.1	End hunger and ensure access by all people to safe, nutritious and sufficient food all year round[3]
32	11.2	Access to safe, affordable, accessible and sustainable transport systems
33	7.2	Share of renewable energy
34	14.1	Marine pollution
35	11.1	Access to adequate, safe and affordable housing and basic services
36	6.1	Access to safe and affordable drinking water

Ranking based on inward influence

The second ranking, based on targets' inward influence, reveals how progress on the entire set of targets affects a particular target. The full ranking list is found in Appendix B. At the top of this list (Table 4), are targets that receive a lot of support when progress is made on other targets. Progress on these targets can follow almost automatically from progress in other areas, and, as a result, these targets may not need as much directed policy support. On the other hand, lack of progress or even regression in other areas may also slow down or impede progress on these targets. That is, their progress depends on progress in other areas. Targets 2.3 (agricultural productivity) and 8.2 (economic productivity) receive the most support from progress on other targets. For example, progress on economic productivity (8.2) receives help from progress on targets 2.1 and 2.2 because ending hunger and reducing malnutrition are expected to increase labour productivity.

Looking at current status and trends for agricultural productivity (target 2.3), Sri Lanka's Voluntary National Review (GoSL, 2018b) shows progress. Food availability has risen; near self-sufficiency in rice production has been achieved; and the agricultural production index (between the 2007-2010 baseline and 2016) has trended upward. However, given the high dependency of the target on progress in other areas, *the results from this study highlight that such progress should not be taken for granted, and that developments in other parts of the agenda may need to be carefully monitored to ensure continued progress*. For example, agricultural productivity depends heavily on nearly a dozen other targets: sustainable and resilient food production systems (target 2.4); strengthened education, including improved access to knowledge, information and skills related to agriculture productivity and value addition (targets 4.3 and 4.4); women's access to land and financial resources (target 5.1); improved water management (targets 6.4 and 6.6); and broader economic development, including diversification, technological upgrading, innovation (targets 8.2 and 8.3); access to financial products, especially for small-scale businesses (target 8.10); and non-discriminatory (target 10.3) and coherent (target 17.14) policies.

3 It is worth noting that, despite the relatively similar content of ending hunger (target 2.1) and ending malnutrition (target 2.2), these two were ranked very differently in this exercise. Differences in the scoring stem from various issues. Ending malnutrition was scored as having a direct promoting influence on educational performance (goal 4), equality (goals 5 and 10), implementation capacity (targets 17.14 and 17.19), and, to some extent, environmental footprints from processed food (targets 12.2, 13.2, 14.1). By contrast, ending hunger (target 2.1) was assessed as having no influence on these areas.

Table 4 Inward ranking, top 10 targets

Ranking	Target no.	Target description
1	2.3	Double the agricultural productivity and incomes of small-scale food producers
2	8.2	Economic productivity through diversification, technological upgrading and innovation
3	2.1	End hunger and ensure access to safe, nutritious and sufficient food all year round
4	8.9	Policies to promote sustainable tourism that creates jobs and promotes local culture and products
5	2.4	Sustainable food production systems and resilient agricultural practices
6	12.2	Sustainable management and efficient use of natural resources
7	8.3	Development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and formalization and growth of micro-, small- and medium-sized enterprises
8	1.3	Social protection systems and measures
9	6.1	Access to safe and affordable drinking water for all
10	4.4	Youth and adults with relevant skills for employment, decent jobs and entrepreneurship

At the bottom of the list are targets that are least influenced by progress in other areas. These reflect policy areas that are, in a sense, independent of progress on the rest of the agenda, and, thus, may need to be addressed separately. The two targets from goal 16, (i.e. access to information (target 16.10) and reduced corruption (target 16.5)) are found at the bottom of the list. For example, progress in areas such as urban development (targets 11.1, 11.2), climate change measures (targets 13.2, 13.3) or ecosystem management (targets 12.2, 14.1, 14.4, 15.1) is expected to have no direct influence on corruption (target 16.5), and dealing with corruption may hence require more specific policy support. It is worth noting here that corruption (target 16.5) was also identified as an accelerator (ranked second in the outward ranking). The results also indicate that the policy areas of substance abuse (target 3.5), inclusive education facilities (target 4a), transport systems (target 11.2), and renewable energy (target 7.2) may require targeted policy support, since they also have few enablers among the other targets. In contrast with corruption, however, substance abuse (target 3.5), renewable energy (7.2), and transport systems (target 11.2) were found at the bottom of the outward ranking (Table 5), which indicates that these targets are not as closely interlinked with the other targets included in the analysis.

Table 5 Inward ranking, bottom 10 targets

Ranking	Target no.	Target description
27	6.6	Water-related ecosystems
28	10.4	Policies to progressively achieve greater equality
29	14.4	Harvesting and overfishing, illegal, unreported and unregulated fishing and destructive fishing practices
30	6.3	Water quality
31	7.2	Share of renewable energy
32	11.2	Access to safe, affordable, accessible and sustainable transport systems
33	4.a	Education facilities that are child, disability and gender sensitive and safe, non-violent, inclusive and effective learning environments
34	3.5	Prevention and treatment of substance abuse
35	16.5	Corruption and bribery
36	16.10	Public access to information fundamental freedoms

A network view on cross-sectoral collaboration

Systemic policymaking and implementation of the SDGs may require new collaborations that move beyond the siloed or sector-based approaches that typically dominate governments. Network analysis methods that draw on the assessment of target interactions can be used to identify cross-sectoral collaborations based on targets that are strongly interconnected.

SEI has carried out several such analyses to identify "clusters" of targets that could inform the creation of cross-sectoral collaboration. However, none of these analyses have generated significant results that are useful to support such an objective. That is, *it has not been possible to identify groups of targets that are more closely interlinked than others*. The reason for this, as can also be seen from the cross-impact matrix, is that *all the included targets are closely entwined in the Sri Lankan context, with a high level of interconnectedness*. Singling out subgroups among the targets may thus not be a useful approach. Rather, our findings suggest that systemic SDG implementation should strive to create collaborative processes that have representation from all the goals, at least over time.

For the implementation of specific targets or goals, the results presented elsewhere in this report can help identify the actors who should be a critical part of a coordinated effort to achieve progress. The cross-impact matrix can be looked at from the perspective of a particular target or goal, to see where there are important connections with other targets and sectors. In the following sections we also present results for some specific targets, that can also help identify key actors to involve in policymaking and implementation related to these sectors.

3. Findings for specific targets

The following sections present more in-depth analyses of interactions in relation to four selected areas: social protection (target 1.3); food, nutrition and agriculture (targets 2.1-2.4); drinking water (target 6.1); and housing (target 11.1). The results highlight critical trade-offs and synergies in relation to these targets – which, in turn, can support more coherent policymaking and implementation in these areas. The qualitative results are based entirely on explanations provided by the scoring experts.

Target 1.3 - Social protection

Current status of the target in Sri Lanka

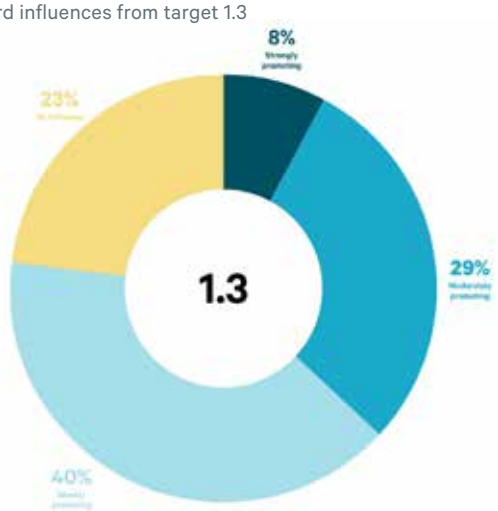
Improved social protection is recognized in Sri Lanka's Voluntary National Review as a critical area for ensuring that no one is left behind (GoSL, 2018b). Roughly one-third of the Sri Lankan population receives benefits from national social protection programmes such as Samurdhi (the main national poverty alleviation programme), which provide a range of support services (GoSL, 2018b). The Welfare Benefit Board (WBB), established in 2016, is tasked with the creation of an integrated social safety net with a unified social registry and appropriate selection criteria for each social protection programme. This initiative is expected to help minimize targeting errors, and provide social protection to the most vulnerable people in the country (GoSL, 2018b).
Key challenges of the current social protection system include issues in targeting, inadequate benefits, and lack of coordination among programmes, leading to high costs and overlaps of beneficiaries (GoSL, 2018b).

Nearly 45% of the elderly population (> 60 years) are covered by social protection (GoSL, 2018b). The combination of an aging population, which will increase the dependency rate over time, and a large informal sector without pension schemes is expected to increase the pressure on the social protection system (World Bank Group, 2015).

Interactions with other SDG targets

In the interactions assessment, social protection is identified as having an overall promoting influence on the targets included in the study, with a promoting influence of 77%, and no restricting influence on other targets (see Figure 9). It is ranked relatively high in terms of its promoting influence on other targets (ranked 12 out of 36). It is worth noting, however, that this influence is mainly weak (40% are +1), which indicates that social protection may work as a cushion; that is, the target has an effect across many SDGs, but it is not the main driver of change towards other SDGs. Social protection is also relatively supported by progress on other targets (ranked 9 out of 36).

Figure 9 Overview of outward influences from target 1.3

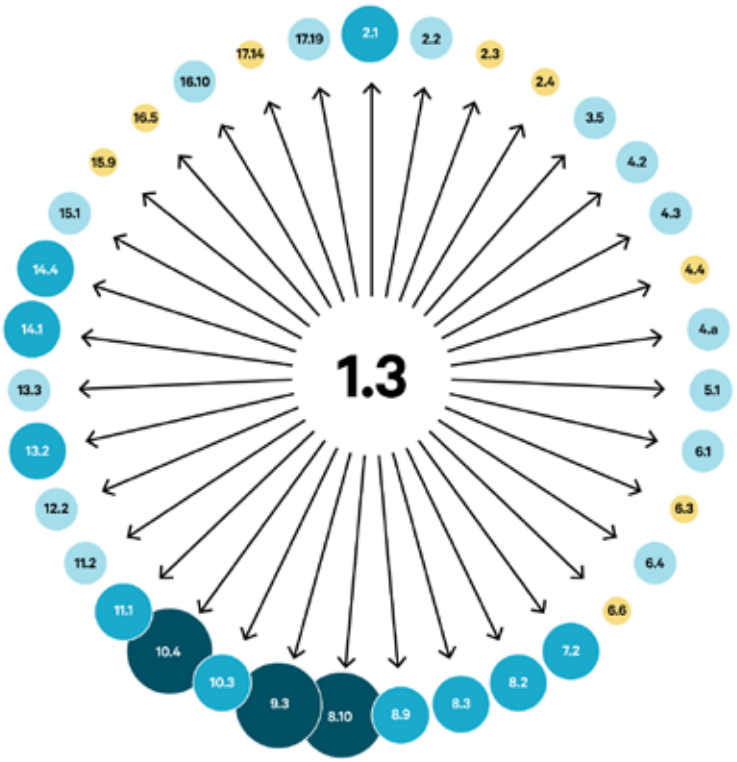


KEY FINDINGS FOR TARGET 1.3

- Progress on social protection systems promotes economic development, food and nutrition, equality, and the environment.
- Both short-term and long-term effects can be distinguished, with long-term effects mainly being driven by the effects on economic development.
- Social protection is enabled by progress on food and nutrition, equality, reduced corruption, and policy coherence. It is weakly restricted by sustainable resource management.
- Further attention is warranted regarding interactions between poverty reduction and economic growth, and between poverty reduction and sustainable behaviour.

What is the direct influence from progress on target 1.3?

Figure 10. All direct influences from progress on target 1.3. Target 1.3 has a promoting influence on all targets represented by blue circles, in line with the seven-point scale in Figure 2.



Social protection is not found to have any restricting influence on the targets included in this analysis (see Figure 10). The strongest promoting influence from progress on social protection is found in the areas of economic development (goal 8). There are also promoting influences on food and nutrition (targets 2.1, 2.2), equality (targets 5.1, 10.3, 10.4), and environmental targets (such as 13.2, 13.3, 14.1, 14.4, 15.1).

Overall, social protection is presumed to reduce poverty and increase incomes – which are identified as having a range of positive effects on economic development, including an increased ability to innovate and use new technologies (target 8.2), and invest in small and medium enterprises and productivity upgrades (target 8.3).

Social protection systems are seen as critical for reducing hunger (target 2.1), since they target poor and vulnerable people who are often also food insecure. The scorers note though, that social protection systems alone are not sufficient to address target 2.1; the target also concerns issues such as food quality and safety – which are not only concerns for the poor and vulnerable, but also for the entire population. Similarly, social protection could address issues such as stunting (as part of target 2.2 on malnutrition), but it will not address nutritional concerns for other groups, for which nutritional education might be more important.

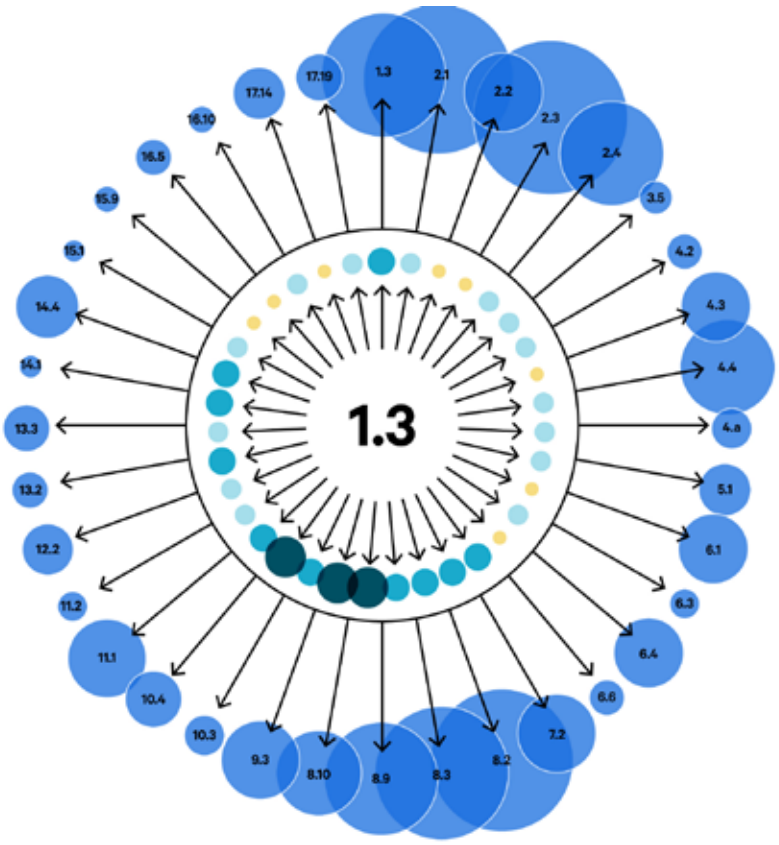
An expansion of the social protection system is seen as part and parcel of policies for greater equality (target 10.4), and is perceived to strengthen equal opportunities (target 10.3). Social protection is also identified as having a certain impact on gender equality (target 5.1) by increasing the economic independence of women and facilitating greater employment opportunities – thereby making women less dependent on a male partner, and less exposed to

violence. Similarly, scorers note that because violence against women tends to surface more frequently among women in lower socioeconomic groups, raising overall welfare among these groups may also reduce violence. The scorers also emphasize, however, that a wide range of policies and societal change across many areas would be needed to achieve gender equality, and that social protection could only make a relatively small contribution towards this goal.

Social protection is perceived to have a promoting influence on various targets related to natural resource management and climate. The primary motivation is that with reduced poverty as a consequence of improved social protection systems, people will be more likely to adopt more sustainable practices (target 12.2). For example, fishers might consider the more longer-term impacts of fishery (target 14.4); farming communities and other rural communities could engage in better land-use planning, avoid pesticide use, and prevent encroachment on forested lands and watersheds (target 15.1). Reduced poverty is also expected to increase general environmental awareness (thereby enabling target 15.9), and lead people to become more active citizens who participate in protecting common goods. This could specifically increase the support for climate-positive policies and actions (target 13.2), and build the social capital needed to manage climate change-related threats collectively (target 13.3).

What is the indirect influence from progress on target 1.3?

Figure 11. Overview of indirect influences from target 1.3. The circles in the outer circle correspond to indirect influences from target 1.3. The larger the circle, the larger the influence from target 1.3. The blue colour indicates a net positive indirect influence.

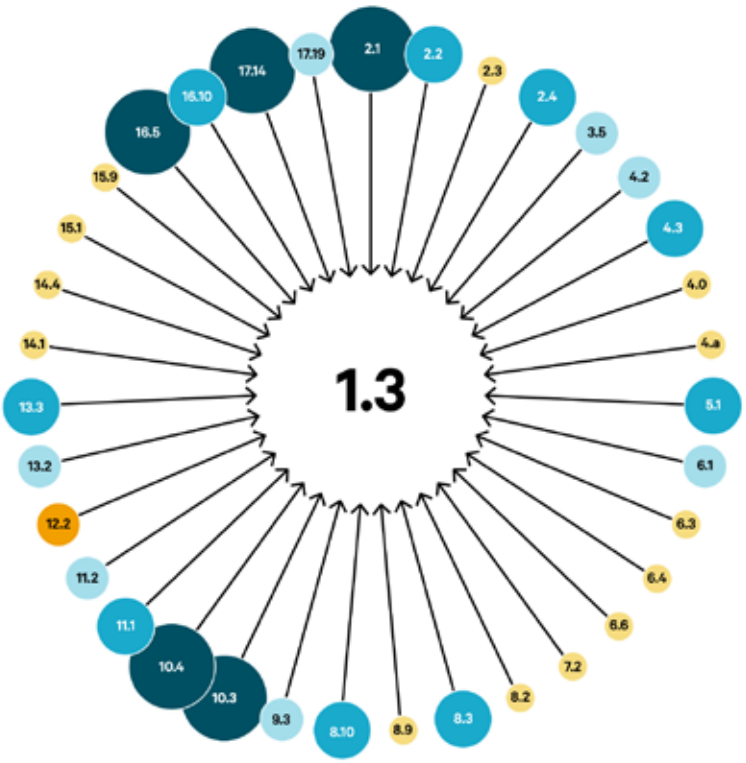


Moving on to indirect influence, Figure 11 summarizes aggregated indirect influences from progress on target 1.3. The strongest indirect influences from progress on social protection are found in the areas of food and agriculture, economic development, and, to a lesser extent, education. The indirect influences are primarily mediated through target 1.3's direct influence on economic development (goal 8) and, to some extent, reduced inequality (goal 10). For example, improved social protection systems have a direct influence on reducing hunger (target 2.1) since they directly target hungry people. But social protection systems also have an indirect, likely more long-term, influence on hunger by enhancing economic development (goal 8) including, for example, through employment creation. Similarly, in education (goal 4), social protection could have a direct promoting influence on early childhood development (target 4.2) by increasing the number of children completing primary education and higher education. But social protection systems may also contribute to economic development, which has additional benefits in terms of increasing parents' investment in early childhood development and education (target 4.2) as a result of increasing incomes (target 8.2), or by boosting sectors, such as information and communication technologies (ICT), providing opportunities for strengthening technical skills (target 4.4).

It is worth noting the social protection system has an indirect influence on itself. Although this may seem counter-intuitive, this is again due to the influence of social protection and poverty reduction on economic development (goal 8), which is, in turn, expected to have an impact on social protection by increasing tax revenues to the government, and allowing an improved coverage of social protection systems.

Which targets enable progress on target 1.3?

Figure 12. Overview of all targets that directly enable or hinder progress on social protection (target 1.3). The colour scheme and size of circles correspond to the seven-point scale in Figure 2.



The positive influence from target 1.3 on other targets is only set in motion if progress is made on social protection systems. Social protection and poverty reduction are relatively strongly affected by progress in other areas, as reflected by its position in the inward ranking (ranked as 9 out of 36). It is therefore important to understand which targets enable and restrict progress on target 1.3. Figure 12 shows all the targets that have been identified as having an influence on social protection systems (target 1.3). Note that this analysis only includes direct influence, and a wider range of targets are likely to have an indirect influence.

The strongest promoting influence is identified to come from the areas of food and nutrition (goal 2), equality (goal 10), reduced corruption (target 16.5), and policy coherence (target 17.14). Sustainable resource management (target 12.2) is found to have a potentially restricting influence.

Improving the availability of food all year-round (target 2.1) and reducing malnutrition (target 2.2) are identified to contribute to a reduction in poverty, which would reduce the pressure on social protection systems, and enable improved targeting and coverage of those in need. As noted above, equality (targets 10.3 and 10.4) is perceived to be closely interlinked with social protection, since social protection policies are considered a key part of policies for increased equality (targets 10.3 and 10.4). Scorers note that social protection measures can only be effective when there is no corruption (target 16.5) related to access and service delivery. They also note that policy coherence (target 17.14) could improve targeting. The only restricting influence identified stems from natural resource conservation (target 12.2); while this influence is weak, it could negatively impact poor people's access to livelihood resources, and may thus increase poverty.

Discussion

Two key assumptions appear to have guided the scoring of interactions related to social protection. They are i) that social protection and poverty reduction more broadly contribute to economic growth, and ii) that poverty reduction (through social protection) leads to more sustainable behaviour. These areas may merit further attention in policy and research.

Scorers noted that the official indicator focuses on increased coverage of social protection systems, whereas additional aspects such as level of support, targeting and depoliticization are also important to consider. This, together with the scoring results, resonates with findings from a review of Sri Lanka's social protection systems (ILO, 2016) that highlighted the need for improved targeting of those in need to ensure income redistribution; the review also underscored the need for reduced political interference and improved entry and exit procedures.

The results presented above illustrate the importance of distinguishing short-term and long-term impacts. Generally speaking, the direct impacts from social protection and poverty reduction identified in the scoring are short-term effects, such as improved nutrition and improved school performance among children, resulting from increased incomes among the poor. The indirect influences are more long-term and systemic in nature and are mediated primarily by the contribution of social protection systems and poverty reduction to economic development, which in turn has a range of influences on other sectors.

Targets 2.1-2.4 – Food, nutrition and agriculture

Current status of the targets in Sri Lanka

Food availability in Sri Lanka is on the rise nationally due to increased domestic food production. In 2014, the percentage of food-secure households (target 2.1) was 90%. Despite the growth in the availability of food, however, there are concerns over food quality and safety (GoSL, 2018b). Sri Lanka is currently not on track to achieving target 2.2 on ending all forms of malnutrition. Indicators show a stagnation in terms of progress. For example, over the past 10 years, the shares of children under age 5 who suffer from stunting (17%), wasting (15%) and underweight (21%) have remained largely the same (GoSL, 2018b). There are regional disparities in malnutrition, with higher levels of malnutrition in rural areas (GoSL, 2018b). Sri Lanka's Voluntary National Review highlights that improving the coverage and quality of the maternal and child health programmes and nutrition-specific essential actions is a priority. There are gaps in providing adequate nutrition counselling and education, primarily due to the lack of human resource capacities and the issue of compliance from the recipients (GoSL, 2018b).

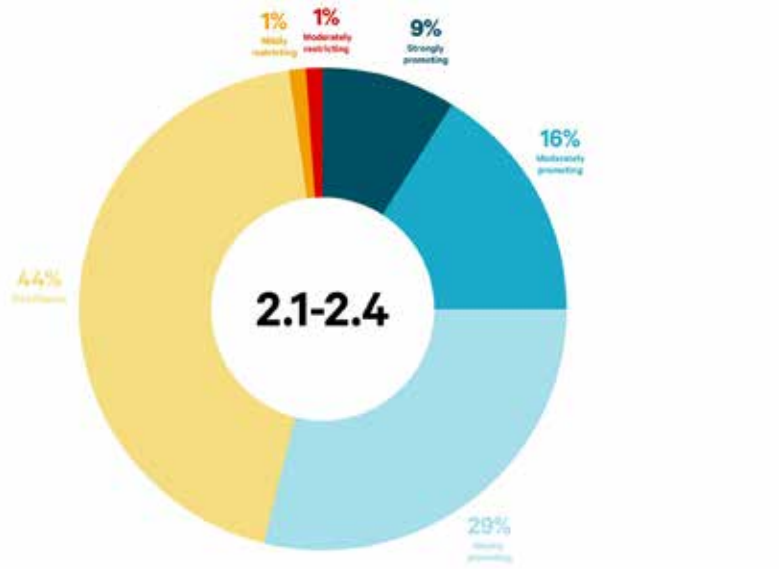
Sri Lanka's agricultural production displays a positive trend and is on track for achieving target 2.3 on agricultural productivity and incomes of small-scale food producers (GoSL, 2018b). Changing weather patterns, rainfall in particular, has emerged as the biggest risk for the entire agriculture sector, not least given the continuously high proportion of rain-fed agriculture (GoSL, 2018b). The Voluntary National Review also highlights the risk arising from the increasing reluctance of rural youth to engage in agriculture resulting in labour shortages. Additionally, the fragmentation of land holdings and continuing land degradation are long-term trends that threaten agricultural sustainability, productivity and livelihoods (GoSL, 2018b).

Interactions with other SDG targets

As seen in Figure 13, progress on food, nutrition and agriculture has mostly promoting or neutral influence on the other targets included in this study, with only a small number (2%) of weakly or moderately restricting influences. In the ranking based on the targets' outward influence, the targets are ranked quite differently, with malnutrition (target 2.2) and sustainable agriculture (target 2.4) being found among the top 10 accelerators, whereas ending hunger (target 2.1) appears to have a more limited promoting influence on other targets.

In the rankings based on inward influence, however, the four targets are all found at the top of the list (ranked 4 (target 2.1), 12 (target 2.2), 1 (target 2.3), and 5 (target 2.4)),which indicates that the targets are highly dependent on progress in other areas.

Figure 13. Overview of outward influences from targets 2.1-2.4



What is the direct influence from progress on targets 2.1-2.4?
Progress on food, nutrition and agriculture has a direct influence on almost all the included targets, as illustrated in figures 14a-e. These four targets mostly have promoting influence on other targets, except for agricultural productivity (target 2.3), which is found to have some potential trade-offs with other targets.

Progress on food, nutrition and agriculture has a large promoting influence within the areas of poverty reduction and social protection (target 1.3), food and agriculture (targets under goal 2), education (targets 4.2-4.4) and economic development (goal 8).

The scorers note that availability of food all year round (target 2.1) may directly reduce poverty. Similarly, more resilient and productive agricultural systems (target 2.4) could also reduce poverty since most people in Sri Lanka who are poor depend on agriculture as their main livelihood. Reducing all forms of malnutrition (target 2.2) could potentially decrease the pressure on the social protection system, thereby enabling better targeting of social protection to the most vulnerable (target 1.3).

Targets 2.1-2.4 are strongly interconnected, which is seen in Figure 14e from the strongly promoting influence the targets receive from progress on all four targets. There are only promoting influences between the four targets, indicating that they are strongly synergistic. For example, access to food (target 2.1) may lead to a reduction in malnutrition (target 2.2), and generate a healthy labour force, which, in turn, can increase agricultural productivity and incomes (target 2.3).

The promoting influence on education targets primarily stems from target 2.2 on reduced malnutrition, which is identified to improve the outcomes of early childhood development, primary education, learning and psycho-social well-being (target 4.2). Ending malnutrition could also increase the participation rate of youth and adults in formal and non-formal education and training (target 4.3), and improve the academic performance of youth and young adults (target 4.4). Increased agricultural productivity and income (target 2.3) have a promoting influence on the access to and ability to benefit from quality education for children of small-scale farmers. The scorers note, however, that increased income alone is not enough to ensure access to quality education – for instance, if there are no quality schools in the area.

All four targets are identified as having a promoting influence on economic development (targets 8.2 and 8.3). Specifically, ending hunger (target 2.1) and ending malnutrition (target 2.2) are identified to directly increase economic productivity by improving cognitive development, physical stature and strength, and labour productivity. Improved productivity for small-scale farmers (target 2.3) and sustainable agriculture (target 2.4) may contribute to economic productivity, as well as to economic diversification and technological upgrades (targets 8.2 and 8.3).

KEY FINDINGS FOR TARGETS 2.1-2.4

- The four targets are highly interconnected and synergistic.
- Progress on the targets has a direct influence on almost all the targets included in the analysis.
- The targets mostly have promoting effects on other targets, especially poverty reduction and social protection, education, economic development, climate and natural resource management.
- Increased agricultural productivity has potential trade-offs with environmental sustainability, including water pollution and deforestation.
- The targets are highly dependent on progress in other areas, and are enabled by improvements in education, water, economic development, climate and policy coherence.

Figure 14a. All direct influences from progress on target 2.1

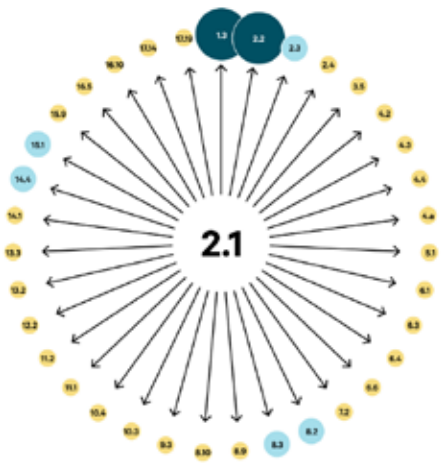


Figure 14b. All direct influences from progress on target 2.2

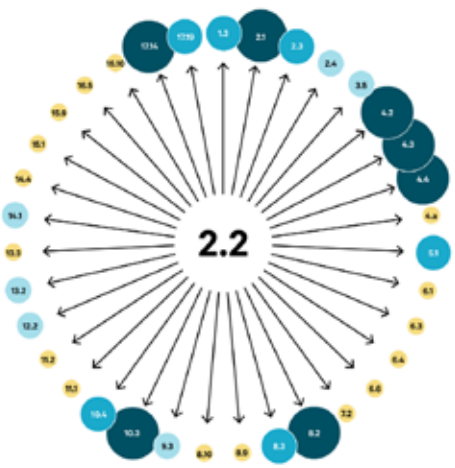


Figure 14c. All direct influences from progress on target 2.3

Figure 14d. All direct influences from progress on target 2.4

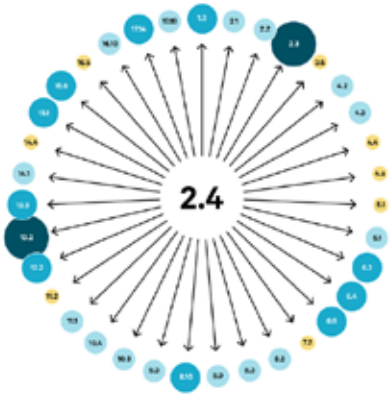
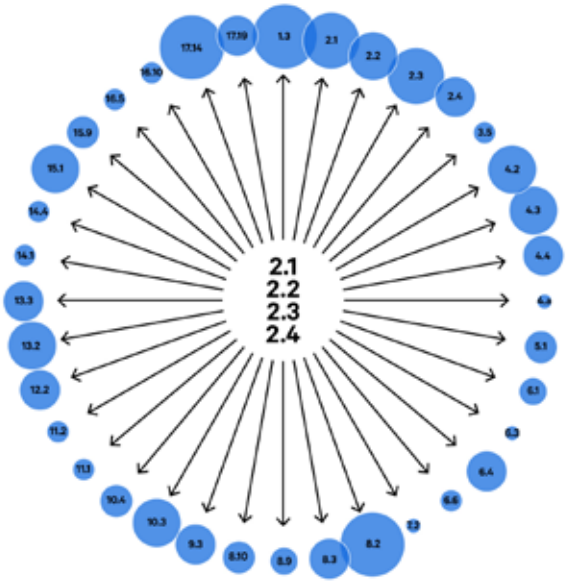


Figure 14e. All aggregated direct influences from progress on targets 2.1-2.4. The blue colour represents a net positive influence from targets 2.1-2.4. The larger the circle, the larger the influence from targets 2.1-2.4.



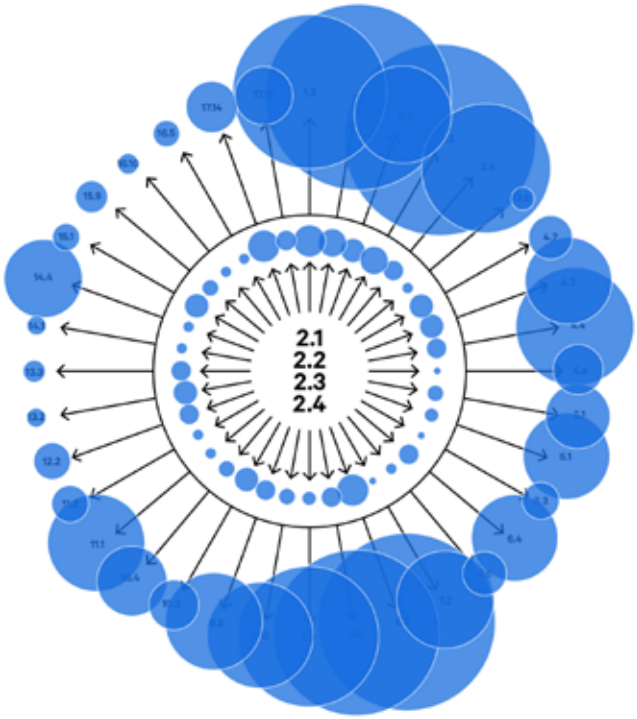
A few potential trade-offs can be identified that primarily relate to the connection between agricultural productivity and environmental sustainability. Specifically, increased agricultural productivity (target 2.3), driven by an increased use of improved seeds, mineral fertilizers, and pesticides, is identified to put pressure on water resources in terms of pollution (target 6.3). A similar effect could be seen if agricultural chemicals are disposed in the sea, causing marine pollution (target 14.1). It is worth noting, however, that the original scorers identified a potential promoting influence on water quality (target 6.3). This potential promoting influence was motivated by the prospect that improved agricultural and fishing incomes may lead to more sustainable methods and practices; however, this promoting influence was changed to a restricting influence in the verification round. An additional trade-off may result if larger productivity is achieved through the expansion of agricultural land, since that may lead to deforestation, including of the loss of mangroves (part of target 6.6). It is also worth noting that two interactions received restricting scores in the original round, but were changed to promoting scores in the verification round. The first relates to sustainable fishing (target 14.4), where the scorers noted that increased incomes of small-scale fishers (target 2.3) may lead to increased unregulated fishing, which could negatively affect fish stocks (target 14.4). The influence of

increased agricultural productivity (target 2.3) on terrestrial and inland freshwater ecosystems (target 15.1) was originally scored as restricting. The motivation for this view was that expanded farming might mean that forest land is replaced with farming land. The fact that these restricting influences originally scored were changed to promoting influences in the verification indicates that these potential trade-offs may be possible to mitigate with appropriate policy responses.

What is the indirect influence from progress on targets 2.1-2.4?

By and large, the pattern is the same for indirect interactions (Figure 15) as for direct interactions. There is a strong promoting indirect influence in areas of food and agriculture, education, water, and economic development. The indirect influence is spreading to additional targets related to economic development (targets 8.3, 8.9 and 8.10). This is driven by the influence of targets 2.1-2.4 in areas of education, poverty reduction and social protection, and climate change capacity. We also see an enhanced indirect influence on environmental targets under goals 12, 13, 14 and 15, driven primarily by the positive direct influence of sustainable agriculture (target 2.4) on areas such as water management (targets 6.3, 6.4, and 6.6), natural resource management (target 12.2), and climate (target 13.2).

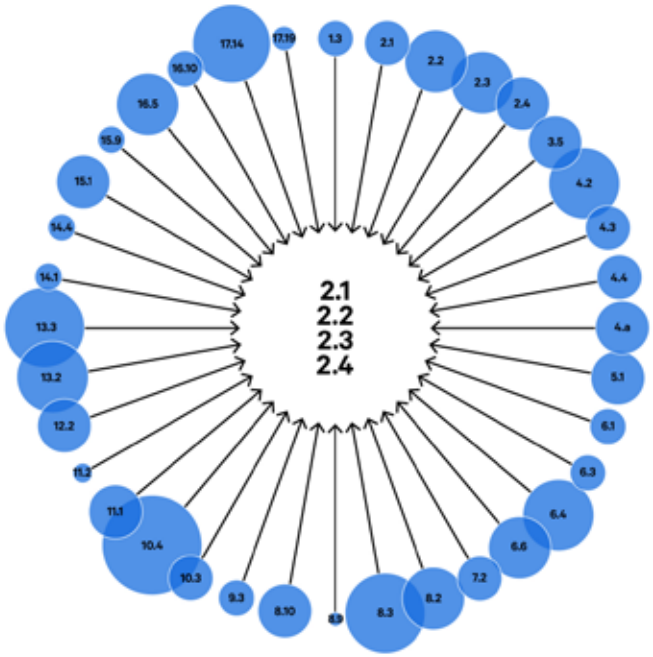
Figure 15. Overview of net indirect influences from targets 2.1-2.4. The circles in the outer circle correspond to indirect influences from targets 2.1-2.4. The larger the circle, the larger the influence from targets 2.1-2.4. The blue colour indicates a net positive indirect influence.



Which targets enable progress on targets 2.1-2.4?

Targets 2.1-2.4 are all highly affected by progress in other areas, as described above. This makes it important to understand which targets may enable or restrict their progress. Figure 16 shows all targets identified as directly enabling or hindering progress on targets 2.1-2.4. Almost only promoting influences are found, with one exception, which is masked in this aggregated view, which shows the influences from all four targets in a summed up fashion. The lone exception is progress on reduced overfishing (target 14.4). The introduction of sustainable fishing policies is identified to have a weakly restricting influence on agricultural productivity, including fishery (target 2.3). Other than that, targets 2.1-2.4 are identified as being promoted by progress in most other areas. In particular, the areas of education (targets 4.2-4a), water (targets 6.1-6.6), economic

Figure 16. Aggregated direct influences from other targets on food, nutrition and agriculture (targets 2.1-2.4). The blue colour represents a net positive influence on targets 2.1-2.4. The larger the circle, the larger the influence on targets 2.1-2.4.



development (targets 8.2-8.3), climate (targets 13.2-13.3) and policy coherence (target 17.14) stand out as potentially important enablers. We also see a relatively large positive influence from targets 2.1-2.4. This large influence reflects the fact that the targets are highly interconnected.

In the area of education, access to quality pre-primary education (target 4.2) stands out as a particularly important enabler, since welfare programmes connected to quality early childhood development, childcare, and pre-primary education provide nutritious food (target 2.1) and surveillance of the nutrition status (target 2.2).

Water use efficiency (target 6.4) and healthy water-related ecosystems (target 6.6) are identified as important enablers for increasing food availability (target 2.1), agricultural productivity (target 2.3), and resilient agricultural practices (target 2.4). This is due to the importance of a reliable water supply for food production. Scorers note that, with a growing population and impacts of climate change, the role of water for food and agriculture may increase in importance.

Better work and income-earning opportunities (target 8.3) are identified as important for reducing hunger and malnutrition (targets 2.1-2.2). Overall improvement of economic conditions and policies and interventions to support productive activities (target 8.3) may also enhance agricultural productivity (target 2.3) and sustainable food production systems (target 2.4). Similar contributions to agricultural productivity (target 2.3) may be made by diversification, technological upgrading, and innovation (target 8.2); and improved access to financial products for small-scale businesses, including in the farming and fishery sectors (target 8.10).

In the area of climate, effective climate change policies, strategies and plans (target 13.2) and increased capacity (target 13.3) may reduce the vulnerability of food systems and enhance food security (target 2.1), thereby reducing malnutrition (target 2.2). It may also create conditions for improving agriculture productivity (target 2.3),and improving sustainable food production (target 2.4) through the implementation of climate-resilient agricultural practices and technologies.

Scorers also note that enhancing policy coherence between ministries and departments (target 17.14), may more efficiently address many related matters – among them, food subsidies, price controls to avoid fluctuations in the price of essential and nutritious foods, better targeted nutritional supplementation, prevention of inappropriate promotion of unhealthy foods, and promotion of a holistic approach to a healthy lifestyle. Such efforts would also improve food security (target 2.1) and reduce malnutrition (target 2.2).

Discussion

The key potential trade-offs that may results from agricultural productivity relate to its impact on environmental sustainability. Three critical factors that steer whether these interactions are promoting or restricting appear to be related to: 1) the types of practices that are promoted to increase agricultural productivity (in particular the use of agrochemicals); 2) whether production increases take place on existing or new land; and 3) whether increased incomes among smallholder farmers and fishers lead them to adopt practices that are more sustainable or less sustainable. Policymaking that supports sustainable agriculture can directly influence agricultural practices, and land use matters. However, the question of whether farmers and fishers will adopt more sustainable practices relates to assumptions about people's behaviour and choices under different economic circumstances; though it may be possible to change behaviour with awareness-raising efforts, for example. These potential trade-offs may merit further attention.

Target 6.1 – Drinking water

Current status of the target in Sri Lanka

Sri Lanka has made good progress in terms of access to safe drinking water over the years. Around 89% of households have access to safe drinking water. There are however regional disparities; for example, Nuwara Eliya has an access rate of 54%. The quality of safe drinking water is also an issue in certain parts of the country. The availability of hard metals and agrochemical contaminations have largely caused water to be unsuitable for drinking in agricultural areas in the North Central and Northern Provinces. As a consequence, the prevalence of the Chronic Kidney Disease of Unknown etiology (CKDu) has become a significant issue (GoSL, 2018b).

The Voluntary National Review (GoSL, 2018b) identifies additional key challenges related to lack of institutional coordination in the water sector, with multiple national and subnational agencies involved in the supply of drinking water. There are also gaps in terms of the capacity to monitor water quality. Further, climate change is expected to lead to increasing water scarcity in dry areas (GoSL, 2018b).

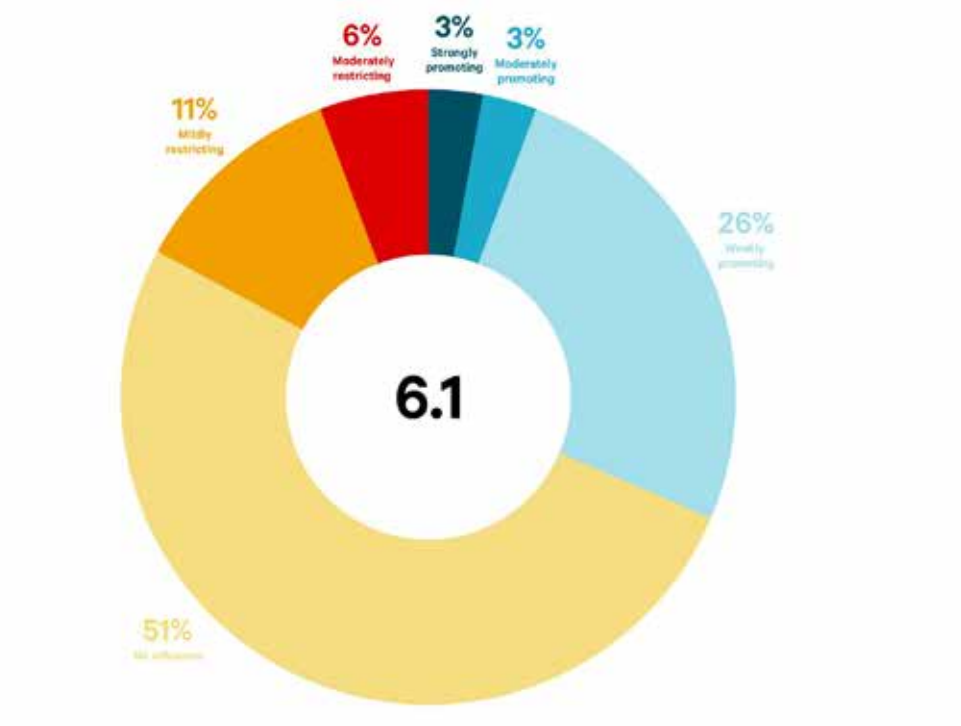
Current national-level targets aim to make sure that all citizens have access to safe drinking water by 2020. This includes the expansion of the pipe-borne water supply coverage, to reach up to 60% by 2020; provision of piped water to areas affected by kidney disease; and measures to ensure the efficiency of the institutional structure of drinking water facilities. Installation of Reverse Osmosis plants for provision of purified water for areas where CKDu is prevalent is an important intervention (GoSL, 2018b).

Interactions with other SDG targets

Access to drinking water is the target that receives the lowest ranking in terms of its synergistic influence on other targets. As can be seen in Figure 17, it has a weakly or moderately restricting influence on some targets (17%), but a promoting influence on a larger number of targets (32%).

Access to drinking water has a relatively high dependence on progress in other areas as it is ranked tenth in terms of the influence it receives from progress on other targets.

Figure 17. Overview of outward influences from target 6.1



KEY FINDINGS FOR TARGET 6.1

- Improved drinking water promotes progress in the areas of food, nutrition and agriculture, education, equality (in particular gender equality) and economic productivity.
- It is one of the targets that has the most restricting influence on other targets, including in other areas of water management, freshwater and marine ecosystems, and natural resources.
- The restricting influence relates to lack of monitoring and institutional coordination, and a risk for increased wastage of water. Effective technologies and monitoring systems, institutional coordination, and public awareness could mitigate the trade-offs.
- The water targets are closely interconnected.

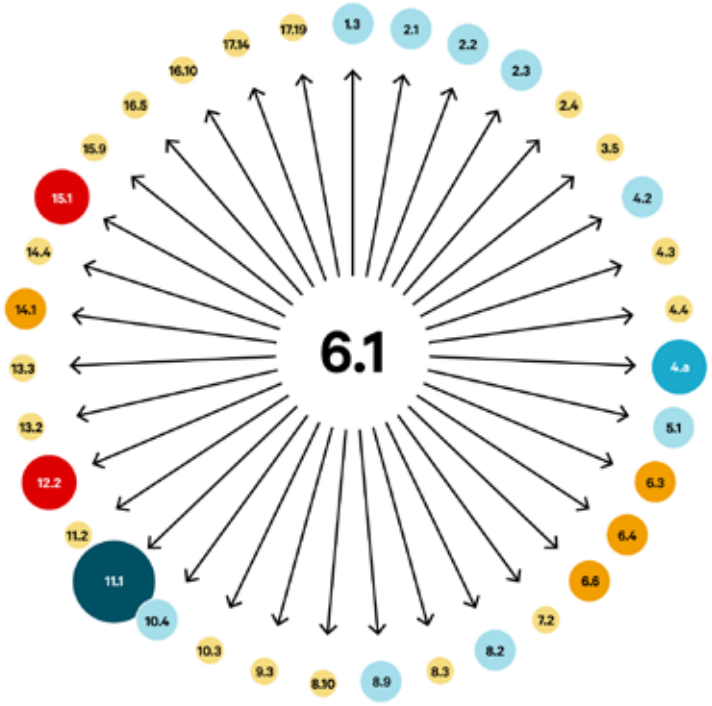
What is the direct influence from progress on target 6.1?
Figure 18 shows how progress on access to drinking water directly affects progress on the other targets included in the analysis. Improving access to drinking water has a mix of strong promoting and restricting effects on quite a wide range of other targets across most of the SDGs. The direct promoting effects are found in the areas of food, nutrition and agriculture (targets 2.1-2.3), education (targets 4.2 and 4a), gender equality (targets 5.1 and 10.4), labour productivity (targets 8.2 and 10.4), social protection (target 1.3), tourism (target 8.9), and housing (target 11.1).

Specifically, drinking water is identified as integral to safe and effective learning facilities (target 4a), and safe housing with basic amenities (target 11.1). Scorers identified that a reduction in water-borne diseases – such as CKDu – could contribute to improve the productivity of farmers and the productivity of other labourers. This could also contribute to a somewhat reduced spending on health care, thereby freeing up resources for other social protection measures (target 1.3).

Similarly, clean drinking water could reduce malnutrition (target 2.2), particularly among children under the age of 5, thereby improving their ability to participate in pre-primary education (target 4.2). Improved access to drinking water could also reduce the time spent, mostly by women, to fetch water, which would contribute positively to gender equality (target 5.1) and increase women's ability to participate in productive activities (target 10.4). Clean drinking water could also have a slightly promoting influence on increasing the attractiveness for tourists (target 8.9).

However, access to drinking water also stands out as one of the targets in the study that has the most direct restricting influences on other targets. It primarily appears to have a restricting influence on other aspects of water management (targets 6.3 and 6.4), water-related and freshwater ecosystems (targets 6.6 and 15.1), natural resources (target 12.2), and the marine environment (target 14.1). Key explanations provided by scorers relate to lack of monitoring, lack of coordination among agencies and sub-national agencies related to water management, and a risk for increased wastage of water.

Figure 18. All direct influences on other targets if progress is made on target 6.



Specifically, unsupervised disposal of effluent from water purification plants, including reverse osmosis plants, is perceived to have a restricting influence on water quality (target 6.3), and to contribute to the pollution of water-related and freshwater ecosystems, including wetlands (targets 6.6 and 15.1), and marine environments (target 14.1); it is also perceived to contribute to the degradation of natural resources (target 12.2).

The scorers mention that more sustainable systems for purification and efficient management could reduce the problem. It is worth noting that the original scorers gave lower scores (-2) for effects on water quality (target 6.3) and water-related ecosystems (target 6.6) based on current practices, whereas the scorers in the verification round agreed on slightly higher scores (-1) based on future, more sustainable practices. This indicates that there is space to mitigate some of the trade-offs through alternative technologies.

The scorers also note that an increased provision of piped water presents the potential risk of significantly increasing wastage of treated water in households, thereby negatively affecting water efficiency (target 6.4). Similarly, freshwater withdrawal with a lack of monitoring in rural water supply schemes may reduce the efficiency of water usage. Here, scorers note that awareness-raising efforts could reduce the problem of excessive water use.

What are the indirect effects from progress on target 6.1?
This section looks at the indirect effects of progress on access to drinking water. This provides a better understanding of its systemic effects. Figure 19 shows that many of the direct effects from target 6.1 are reinforced if indirect effects are also considered.

For instance, progress on target 6.1 has a weakly promoting *direct* influence on early childhood development, childcare and pre-primary education (target 4.2) since a lower rate of water-borne diseases will enable more children to attend pre-primary education. There is also a promoting *indirect* influence on pre-primary education (target 4.2), which is in part due to improved access to drinking water being considered part and parcel of improved education facilities (target 4a), which in turn enhance learning.

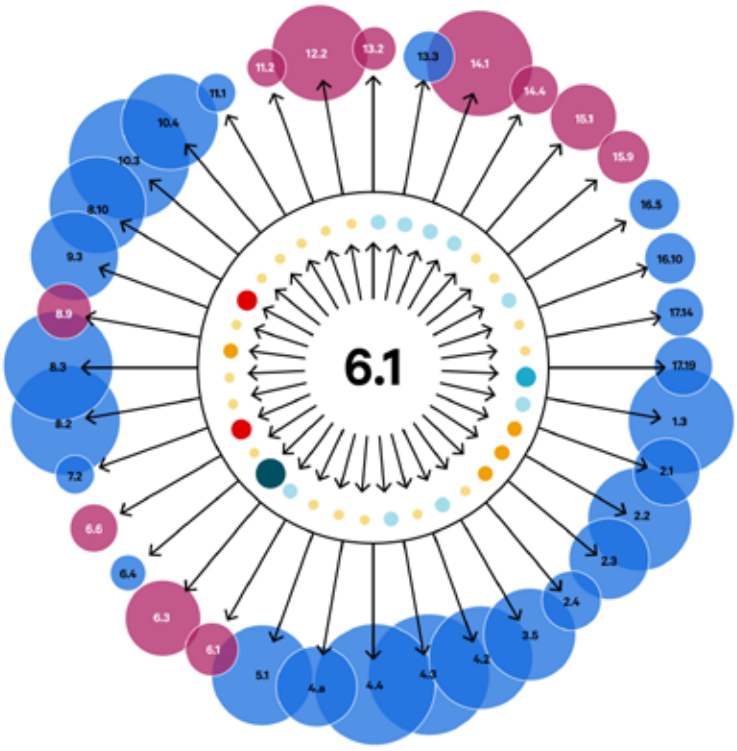
Further, we find that indirect effects from access to drinking water reach a range of additional targets that are not directly affected by access to drinking water. Among these are other aspects of education, such as such as technical, vocational and tertiary education (target 4.3); and relevant skills (target 4.4) – effects that are largely mediated by the direct promoting influence on targets 4.2 and 4a.

Almost all targets included in this study may be affected, to a greater or lesser extent, by the restricting direct influences from progress on drinking water. A lot of the direct restricting effects are reinforced by indirect effects. Examples include the influence on natural resources (target 12.2), marine pollution (target 14.1), and freshwater ecosystems (target 15.1). The restricting direct influence on water-related targets (goal 6) is reinforced when we look at indirect effects, which reflects the very strong interconnections between all water targets. (This can also be seen by looking at direct interactions between the water targets in the cross-impact matrix, see Figure 4.)

Some additional restricting effects are masked in the aggregated view in Figure 19, but there are, for instance, important restricting indirect effects on targets under goal 2. This is linked to the importance of the availability of non-contaminated water (target 6.3) for irrigation, which is perceived as a key limiting factor for agricultural productivity (target 2.3). Another factor is the importance of healthy water-related ecosystems for food security (target 2.1), including mangroves, which play an important role for fisheries. The indirect promoting influence on targets under goal 2 as shown in Figure 19 would thus be larger if the restricting direct effects on water quality (target 6.3) were mediated.

Further, we see potential restricting indirect effects on tourism (target 8.9). A polluted marine environment (target 14.1) is far less attractive to tourists. Also, forestry, biodiversity and forest-related products (target 15.1) are perceived to strongly support sustainable tourism in Sri Lanka.

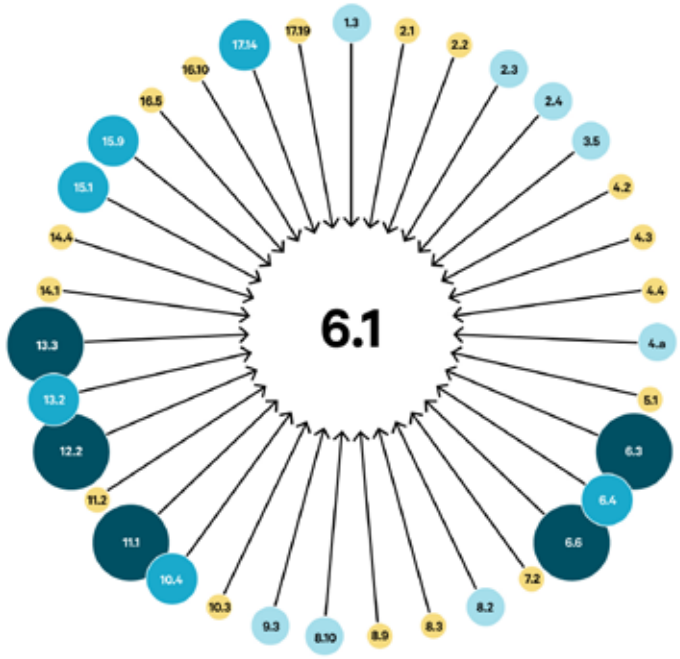
Figure 19. Overview of net indirect influences from target 6.1. The circles in the outer circle correspond to indirect influences from target 6.1. The larger the circle, the larger the influence from target 6.1. Blue colour indicates a net positive indirect influence, and purple colour indicates a net negative indirect influence. The larger the circle, the larger the influence from target 6.1.



Which targets enable progress on access target 6.1?

A wide range of targets has an enabling influence, and no target has a restricting influence on access to drinking water (target 6.1), as seen in Figure 20. Other water targets (6.3, 6.4 and 6.6) are important enablers for access to drinking water (target 6.1) which again illustrates that the water targets are closely interconnected. The climate targets (13.2 and 13.3) also stand out as important enablers, since effective climate change policies are perceived to contribute towards improving the availability of safe drinking water. There is also a promoting influence from housing and basic services (target 11.1) and natural resource management (targets 12.2, 15.1 and 15.9). Many of the enablers are targets that are influenced when progress is made on drinking water (target 6.1), meaning that the targets are mutually dependent.

Figure 20. All targets that directly enable or hinder progress on access to drinking water (target 6.1)



Discussion

Access to drinking water is one of the targets that has the most restricting influence on other targets, including in other areas of water management, freshwater and marine ecosystems, and natural resources. There are also restricting indirect effects on food and agriculture. The scorers identified this restricting influence as relating primarily to a lack of monitoring and institutional coordination, and a risk for increased wastage of water. Thus, none of the trade-offs appear to be inevitable; they are subject to choices of technology and monitoring systems, institutional coordination, and public awareness. The results also show that the water targets are all closely interconnected. Future studies could investigate the potential of more integrated approaches to water management.

Some of the restricting interactions were scored under the assumption that in the future, more sustainable technologies will be in place, which means that some of the restricting influences may be larger under current conditions than in those presented here.

It is worth noting that the restricting influences identified are only expected to materialize if further progress is made on access to drinking water. Significant progress has already been made, providing Sri Lanka with a relatively high coverage rate. On the one hand, additional progress and potentially restricting influences could therefore be limited in scope. On the other

hand, significant legacy effects could also be in place, particularly if older, less-sustainable technologies, were used to build current infrastructure.

Given the health-related mechanisms identified for many of the affected targets, it is likely that the progress on drinking water would have a promoting influence on targets under goal 3 (good health and wellbeing) that were not included in this study.

Target 11.1 – Housing

Current status of the target in Sri Lanka

Sri Lanka has made significant progress in terms of the percentage of population living in permanent houses. An estimated 81% of the population lives in permanent houses. The Colombo District has the highest number of temporary houses, and it has the greatest concentration of residents who are homeless and do not possess land. The Urban Development Authority started a major project in 2016 to provide 50,000 housing units to low- and middle-income groups within five years to cater to the growing demand for housing in urban areas. Less than 1% of the population is living in underserved settlements according to Sri Lanka's Voluntary National Review (GoSL, 2018b), although the Urban Development Authority claims that this number could be as high as 50% for Colombo (GoSL, 2018a).

The Voluntary National Review (GoSL, 2018b) emphasizes the need for an integrated approach to urban development, with important priority areas including the streamlining of the spatial and physical planning process; developing infrastructure and improving service quality in public transport; increasing disaster resilience; and enhancing municipal services, such as waste management.

A recent report (GoSL, 2018a) also highlights challenges with the currently predominant approach of relocating residents from underserved dwellings to new high-rise apartment blocks. The approach is motivated by the appeal of eliminating poor-quality housing and of freeing up high-value urban real estate, but raises concerns about the social consequences. These concerns include the effects on social networks, security, and livelihoods. There are also questions about the appropriateness of this one-size-fits-all approach, given the large scale of improved housing that may be needed in urban areas such as Colombo.

Interactions with other SDG targets

Housing is ranked very low – 35th of the 36 ranks – in the outward ranking, and it is one of the few targets for which negative interactions have been identified (see Figure 21). Housing has a restricting influence on 11% of the included targets, and has a relatively high number of neutral interactions (60%). This explains why the target stands at the bottom of the ranking list. In the inward ranking, housing and basic services is found around the middle, at place 14.

What are the direct effects from progress on target 11.1?

From Figure 22, we see that the largest promoting influence from progress on housing and basic services (target 11.1) is found on poverty reduction (target 1.3), income-generating activities (target 2.3), and drinking water (target 6.1). Specifically, improved access to adequate, safe and affordable housing is identified as promoting poverty reduction (target 1.3). Improved housing can increase the assets of households and provide space for home-based livelihoods and income-generating activities, which also contribute to target 2.3. Access for urban residents to basic services (target 11.1), which includes drinking water, is identified as intrisically interlinked with achieving target 6.1 on access to drinking water.

The restricting influences from progress on housing and basic services are found in the areas of water, transportation and natural resource management. To a large extent, the restricting influence on water targets is similar to the restricting influence identified from access to

KEY FINDINGS FOR TARGET 11.1

- Progress on housing is identified to have an influence on relatively few targets, and a restricting influence on some targets; this is why it is at the bottom of the outward ranking list.
- Progress on housing promotes poverty reduction, income-generating activities, and access to drinking water. It also promotes food, agriculture, education, economic development, and equality.
- The restricting influence from progress on housing is found in the areas of water, transportation, and natural resource management.
- Key factors that affect the potential restricting influences relate to i) water treatment practices and water consumption; ii) transportation needs in developed areas; iii) building materials; iv) the location of city expansion; v) energy sources for electricity generation; and vi) waste management.
- Progress on housing is enabled by drinking water, equality, and increased incomes.

Figure 21. Overview of outward influences from target 11.1

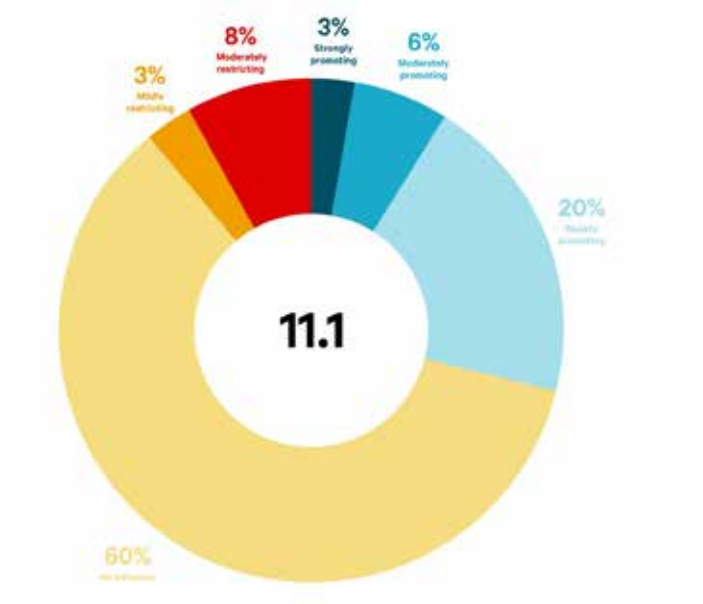
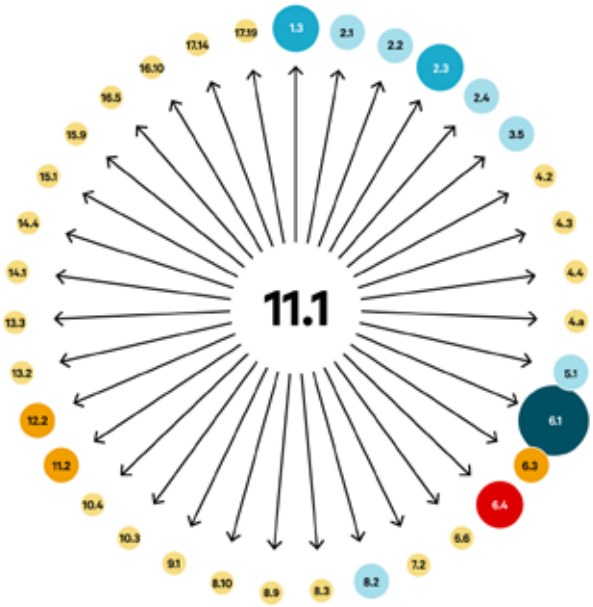


Figure 22. All targets that are affected by progress on housing (11.1)



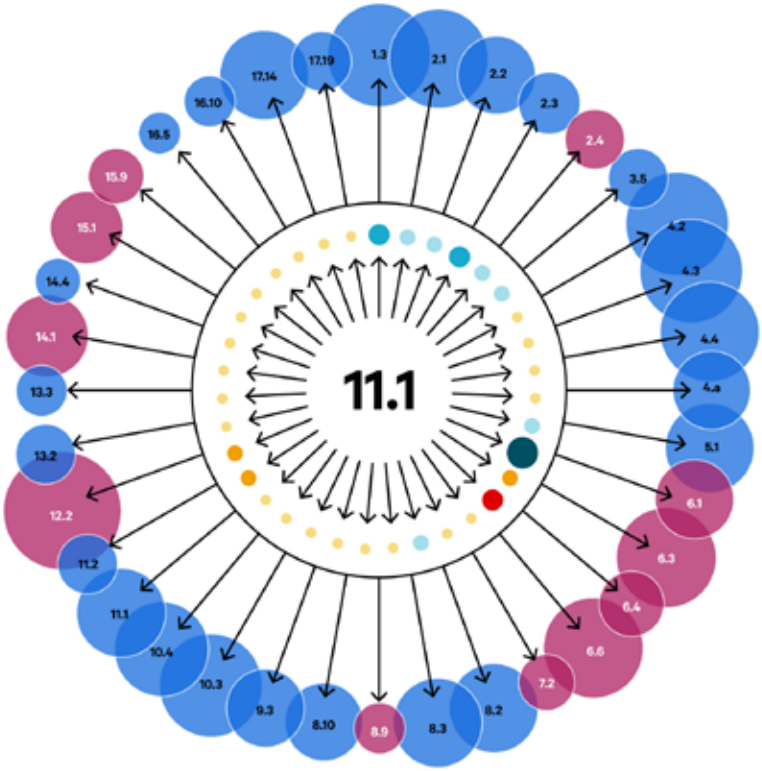
drinking water (target 6.1). That is, improvements in access to basic services and, specifically, increases in provision of treated water are identified as having a restricting influence on water quality (target 6.3). This is because current practices in extraction treatment and disposal of effluent water from water supply systems are identified to contribute to the depletion of water sources and the release of hazardous substances into water bodies. Scorers also noted that the sustainable upgrading of urban basic services, including safe management of drinking water production and effluents, could contribute positively to improved bodies of water. Provision of piped water is also identified as leading to an increase in domestic water consumption and wastage, thereby negatively affecting water use efficiency (target 6.4). Again, scorers identify that measures such as awareness creation and a comprehensive water-billing system could mitigate these effects.

In relation to transportation (target 11.2), unplanned housing and real estate developments that do not take into account the resulting increase in traffic flows and demand for transportation facilities are identified to negatively impact the transportation sector. Construction of new housing is also identified to have a substantial environmental footprint (target 12.2); key issues identified include unsustainable sand mining, timber harvesting, and depletion of water resources. Housing development could also increase challenges related to solid waste management, sewerage, and waste water management. Housing development could also increase the consumption of fossil fuels and, hence, greenhouse gas emissions.

It is worth noting that in the first scoring round a few additional restricting influences were idenfied, which were changed to neutral/no influence in the verification round. These trade-offs primarily relate to environmental and climate impacts from construction and housing development. In particular, they are associated with a potential trend of using fossil fuels for electricity generation (with electricity being considered a basic service), with impacts on the share of renewable energy (target 7.2) and on the levels of greenhouse gas emissions (target 13.2). City expansions (target 11.1) may encroach on forest reserves and other ecologically valuable and/or sensitive land (target 15.1). Solid waste, storm water disposal, and untreated sewage, particularly due to unplanned development, could negetively influence the marine environment (target 14.1) and freshwater ecosystems (target 15.1). Further, an increased demand for building material due to housing development may increase mining of sand and other minerals and harvesting of timber for construction, with negative impacts on terrestrial ecosystems (target 15.1) and greenhouse gas emissions (target 13.2). However, these interactions were changed to neutral in the verification round, which indicates that they may not materialize, or that they could be mitigated.

What are the indirect effects from progress on target 11.1?

Figure 23. Overview of net indirect influences from target 11.1. The circles in the outer circle correspond to indirect influences from target 11.1. The larger the circle, the larger the influence from target 11.1. Blue colour indicates a net positive indirect influence, and purple colour indicates a net negative indirect influence.



In terms of indirect effects from progress on housing and basic services (Figure 23), there are promoting influences primarily in the areas of poverty, food, agriculture, education, economic development, and equality. Restricting influences are found in relation to water, natural resources, the marine environment, and terrestrial and freshwater ecosystems.

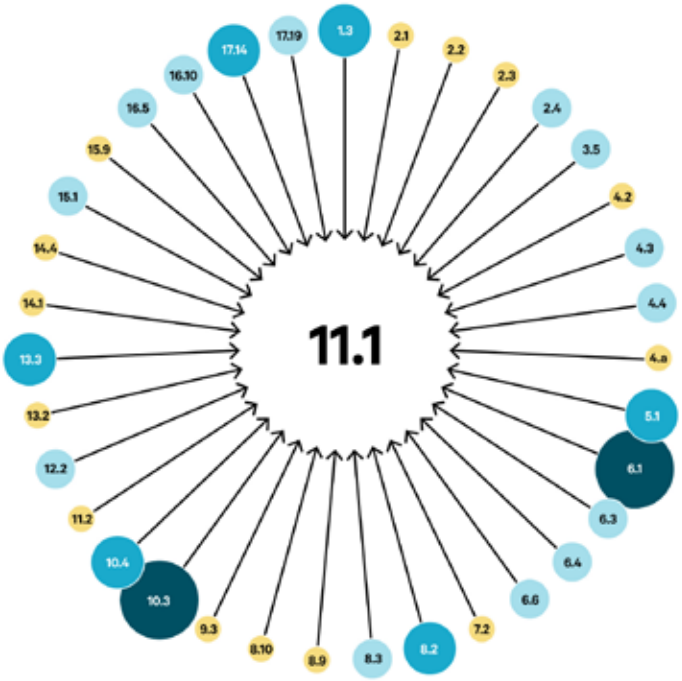
The promoting indirect influence on targets under goals 1 and 2 (poverty, food and agriculture) is largely due to the overall synergistic interactions among these targets. That is, the direct promoting influence from housing (target 11.1) on social protection systems (target 1.3) and income-generating activities (target 2.3) spreads and reinforces if we consider the indirect effects among these targets. For example, housing and basic services (target 11.1) promote income-generating activities (target 2.3), which in turn promote a reduction in hunger (target 2.1).

Similarly, the promoting indirect effects on education, economic development and equality are all primarily mediated through the direct effects on poverty reduction (target 1.3) and income-generating activities (target 2.3). For example, housing (target 11.1) has a direct promoting influence on income-generating activities (target 2.3), with increased incomes having a certain promoting effect on the pre-primary schooling rate (target 4.2).

The restricting effects in the areas of water, natural resources, the marine environment, and terrestrial and freshwater ecosystems can be understood primarily as indirect effects from the close interaction between housing and basic services and drinking water. Drinking water (target 6.1) has a range of restricting influences on various water and environmental targets (see also page 43), most of which are also described above in relation to the direct effects from 11.1.4

Which targets enable progress on target 11.1?

Figure 24. All targets that directly enable or hinder progress on housing (target 11.1)



4 Due to the overlap between targets 6.1 and 11.1 (where drinking water is considered part of basic services), the indirect effects from target 11.1 that are mediated through 6.1 are double counted in the overview, i.e. the same effect is illustrated both as a direct effect and an indirect effect.

No target is identified as having a restricting influence on housing (see Figure 24). The strongest promoting influences come from social protection and poverty reduction (target 1.3), drinking water (target 6.1), and equality (targets 10.3 and 10.4).

As noted above, drinking water is seen an indivisible from housing and basic services, with a strongly promoting influence in both directions. The promoting influence from equality (targets 10.3 and 10.4) is linked to reforms to ensure housing for all citizens, irrespective of matters such as socio-economic status or disabilities; this would promote access to housing and basic services for all (target 11.1). Targets associated with increased income (such as targets 4.4 and 8.3) also have a certain promoting influence because increased incomes allow households to invest in housing.

Discussion

Progress on housing has a range of promoting influences on poverty reduction, income-generating activities, and access to drinking water. However, housing is also one of the targets in this study that has most potential restricting influences on a range of issues, including water, transportation, and natural resource management. These influences are linked to the release of effluents from water treatment plants, water wastage, traffic increases, the environmental footprint from construction and city expansion, fossil fuel use in electricity generation, and increased pressure on systems for solid waste, waste water, and sewarage.

However, as indicated by the scorers, many of the potential trade-offs related to housing and basic services could likely be mediated with urban planning and associated policies that consider i) water treatment practices and water consumption; ii) transportation needs in newly developed or densified areas; iii) the choice of building materials (taking into consideration their environmental and climate impacts); iv) the location of city expansion; v) the choice of energy sources for electricity generation; and vi) waste management (including waste water, sewage and solid waste).

4. Reflections on findings

Robustness of results

The results of this report should be used primarily to gain an overview of broad patterns – rather than individual scoring of certain targets – to understand the synergies and trade-offs that emerge with implementing the SDGs in Sri Lanka. The results can be complemented with research examining particular interactions of interest, for instance, as indicated by the target-specific analyses provided in this report.

The scoring of interactions was done in pairs. The pairs were composed to complement general expertise with sectoral expertise, both being required for scoring the influence of progress on particular targets. While the sectoral expertise was crucial to gain deep insights into interactions, and to reduce the risk of missing important interactions, it also appears to have created a certain bias in the scoring. Specifically, we note a somewhat overly optimistic scoring for some targets, which can result from a tendency to overstate the importance of one's own sector and/or the positive influence of that sector on others. This should be kept in mind, particularly for the ranking lists, which are sensitive to these types of biases that can boost certain targets in the ranking. To reduce biases in the results, the scoring process included a verification round, in which two experts with different areas of expertise verified the scores originally provided by another pair of experts.

It should be acknowledged that the analysis is not comprehensive in the sense that it only covers 36 out of 169 SDG targets. A broader scope with a larger number of targets would provide a more complete picture of target interactions. The study does, however, include targets across all 17 goals – including across economic, social and environmental dimensions – and can therefore be expected to give an overview of key patterns of synergies and trade-offs. Further, the process included a procedure for selecting which targets to include (as outlined in Section 1). The limited representation of targets is, however, important to keep in mind – particularly when using the ranking lists. These lists only reflect interactions among the 36 targets included. If the exercise were conducted with other targets, rankings would likely look different. For the target-specific analyses, the implication of the target selection is also worth noting. There may be additional important interactions with targets that were not included. Adding other targets and interactions might have systemic implications, which this report has not covered.

It should also be acknowledged that the analysis relies on interpretation of SDG targets that are themselves quite broadly defined. The targets are open to interpretation, which affects the scoring of interactions – as the discussion over the following three targets amply illustrates. For example, target 1.3 on social protection systems was in some cases interpreted as poverty reduction in a broader sense (which corresponds to goal 1 – no poverty). This was primarily the case for the inward effects (how progress on other targets affects social protection). However, the most identified mechanism for promoting target 1.3 was to reduce the number of people in need of support from social protection systems, thereby freeing up resources and enabling a better targeting of the social protection system. Following this logic, a general contribution to poverty reduction could be expected to also contribute to improved social protection systems, and the scoring could be expected to be relatively similar if interpreted strictly as social protection, though the effect would arguably be scored as weaker. Similarly, target 5.1 on discrimination against women and girls was in some cases interpreted more broadly as gender equality (which corresponds to goal 5 – gender equality). This may have resulted in stronger inward effects for target 5.1 than would have been the case if the target had been interpreted as discrimination in a stricter sense. Target 10.4 on fiscal and social policies that promote equality was interpreted as government policy in a broad sense in the scoring of outward effects (i.e. how progress on target 10.4 affects all other targets), which may have overstated the positive outward influence of this particular target, compared to if interpreted specifically as relating to fiscal, wage and social protection policies. A document with target description and basic statistics for the target topic in

Sri Lanka supported the scoring exercise; nevertheless, this document did not fully eliminate the risk of different interpretations emerging throughout the process.

Against this backdrop and these limitations, we emphasize that the rankings should be seen as an indication of synergistic potential and dependency – not as providing an absolute placement of priorities.

Reflections on the results

The overall results of the exercise shows a clear synergistic pattern, with a heavy tilt towards promoting rather than restricting interaction. The same pattern has been found in other applications of the method in Sweden, Mongolia and Colombia (Weitz et al., 2018; Barquet et al., 2019; Lobos et al., 2020). The generally synergistic nature suggests that there is opportunity for virtuous cycles, and for good return on investment. The opportunity to draw on and optimize potential synergies is promising for successful SDG implementation in Sri Lanka. It may be even more important to address potential trade-offs. As this exercise has demonstrated, the trade-offs involved in SDG implementation are often not deterministic but typically depend on how progress is made – matters affected by choices that are under the control of governments and other actors that determine planning priorities, implementation practices, and technological investments. Awareness of potential trade-offs and mitigating efforts can thus go a long way for strengthening coherence in implementation of the 2030 Agenda.

The agenda is closely interconnected with a high number of strong interactions between targets. This was further illustrated by the inability of the analysis to identify any clusters of targets that were particularly closely connected. These results underscore the need for institutional coordination and cross-sectoral implementation of the agenda. They also underline the value of drawing on systemic assessments of SDG interactions in such processes.

Methodological lessons learned

This study constitutes one of the first applications of SDG Synergies that covers interactions across all 17 SDGs, and that has been government-led from the start. The experiences from this exercise can therefore provide valuable lessons for government representatives interested in applying a systemic approach to SDG implementation in a policymaking context, and for researchers and practitioners interested in the methodology.

A first lesson learned concerns the challenge of defining the boundaries of the exercise and selecting targets in the absence of a sectorial focus. Compared to previous experiences with the method, where there was a focus on water management in Mongolia and on environmental SDGs in Colombia, the Sri Lankan experience aimed at addressing the 2030 Agenda in its entirety. In this case, a group of government representatives ranked all 169 targets based on three criteria (applicability, implementability, and transformational impact). Future applications of the method with a similar scope could seek less time-consuming options that are less sensitive to subjective preferences. This could for example include drawing on available data on target progress, or basing the selection on existing policy priorities.

A second lesson learned relates to the need to contextualize the targets and analysis. To ensure consistent and meaningful results, the scoring should be as specific as possible, and based on a common understanding of what progress on a particular target means in a given context. To the extent possible, it should identify the relevant policy measures or interventions available for implementing the target.

Thirdly, there appears to be a tendency among scorers to down-play trade-offs. One can only speculate as to why this pattern appears, but it may in part be a consequence of the design of the scoring exercise conducted by sectoral experts. When it comes to their own sector, experts may have an interest in downplaying negative impacts, or they may be less likely to see negative impacts. A tendency to downplay trade-offs could also be a consequence of greater political sensitivity. Addressing trade-offs may require prioritizing progress on

one target at the expense of another. Regardless, the pattern is potentially problematic as important issues may remain unresolved or become obscured. Future applications of SDG interactions methods could explore alternative ways of framing and discussing potential trade-offs in a more nuaced and non-deterministic manner. They could also design applications with this potential bias in mind, for instance by including ways of verifying the scores that specifically seek to identify overlooked trade-offs.

Finally, depending on the intended use of the results, the subjectivity involved in the scoring may be perceived to affect the credibility of the results. The Sri Lankan exercise included a verification round and the use of target interpretations to address this issue. Future applications of the method could, for example, increase the use of evidence (where available) in the scoring, and further strengthen the verification to increase the robustness of results.

Future use of the results

The report provides systemic and context-specific analysis of key SDG interactions of relevance to national-level policymaking and implementation of the SDGs in Sri Lanka. The results support more coherent policymaking by identifying key synergies and trade-offs that should be considered in SDG implementation. The results also inform prioritization across the different parts of the agenda, by highlighting systemic effects and identifying targets with the most synergistic potential. The results on synergies and trade-offs related to four selected policy areas support national planning and budgeting related to these specific policy areas in Sri Lanka.

The results identify where cross-sectoral collaboration would be particularly beneficial to support overall progress on the 2030 Agenda – that is, where implementation of targets overlaps. Specifically, the results could be compared with current institutional arrangements in Sri Lanka, including how institutions are currently organized to address the cross-cutting issues of the 2030 Agenda, and to identify gaps or overlapping mandates. Similarly, the results could be related to national budgeting to bring into light the systemic effects of budget proposals, and to identify potential gaps in financing. This could help strengthening coherence as well as accountability and efficiency with regards to the implementation of particular targets.

Since the results should be used primarily to gain a systemic overview rather than for understanding specific interactions, the results can be followed up with more in-depth research on interesting interactions that have been flagged in this report. The results could also be used to evaluate potential consequences of specific policy proposals or interventions.

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Appendix A – Full ranking list based on targets' outward influence

Table 6 lists all included targets based on what effect progress on them has on all other targets. Progress on targets at the top of the list has a large promoting influence on other targets.

Table 6 Full outward ranking list

Ranking	Target no.	Target description
1	17.14	Enhance policy coherence for sustainable development
2	16.5	Substantially reduce corruption and bribery in all their forms
3	13.3	Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
4	10.3	Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard
5	4.3	By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
6	13.2	Integrate climate change measures into national policies, strategies and planning
7	2.2	By 2030, end all forms of malnutrition, including achieving, by 2025 the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
8	2.4	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
9	10.4	Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality
10	5.1	End all forms of discrimination against all women and girls everywhere
11	4.2	By 2030, ensure that all girls and boys have access to quality early childhood development, care and preprimary education so that they are ready for primary education
12	1.3	Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable
13	16.10	Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements
14	2.3	By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.
15	8.3	Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
16	8.10	Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all
17	8.2	Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors
18	4.a	Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all
19	4.4	By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship
20	6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
21	12.2	By 2030, achieve the sustainable management and efficient use of natural resources
22	17.19	By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries
23	6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
24	15.9	By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

25	15.1	By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
26	8.9	By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products
27	9.3	Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets
28	3.5	Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.
29	14.4	By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
30	6.4	By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
31	2.1	By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants to safe, nutritious and sufficient food all year round
32	11.2	By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
33	7.2	By 2030, increase substantially the share of renewable energy in the global energy mix
34	14.1	By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
35	11.1	By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
36	6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all

Appendix B – Full ranking list based on targets' inward influence

Table 7 lists all included targets based on how progress on other targets affect them. Targets at the top of the list are highly affected by progress in other areas.

Table 7 Full inward ranking list

Ranking	Target no.	Target description
1	2.3	By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.
2	8.2	Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors
3	2.1	By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants to safe, nutritious and sufficient food all year round
4	8.9	By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products
5	2.4	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
6	12.2	By 2030, achieve the sustainable management and efficient use of natural resources
7	8.3	Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
8	1.3	Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable
9	6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all
10	4.4	By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship
11	15.1	By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
12	17.14	Enhance policy coherence for sustainable development
13	9.3	Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets
14	2.2	By 2030, end all forms of malnutrition, including achieving, by 2025 the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
15	6.4	By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
16	11.1	By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
17	15.9	By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts
18	13.3	Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
19	13.2	Integrate climate change measures into national policies, strategies and planning
20	10.3	Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard
21	17.19	By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries
22	8.10	Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all

23	4.2	By 2030, ensure that all girls and boys have access to quality early childhood development, care and preprimary education so that they are ready for primary education
24	5.1	End all forms of discrimination against all women and girls everywhere
25	4.3	By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
26	14.1	By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
27	6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
28	10.4	Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality
29	14.4	By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
30	6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
31	7.2	By 2030, increase substantially the share of renewable energy in the global energy mix
32	11.2	By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
33	4.a	Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all
34	3.5	Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.
35	16.5	Substantially reduce corruption and bribery in all their forms
36	16.10	Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements

Appendix C – Additional methodological descriptions

Rankings

As discussed Section 2 of this report, network analysis was used to rank targets with regards to their synergistic potential. The "naïve" approach is to simply calculate each target's effect as the row sum (also called out-degree) and column sum (also called in-degree) in the matrix in Figure 4. However, this analysis only includes direct effects – also called first-order effects. To generate information that can guide prioritization of action we need to account for how influence ripples through the network. If a target reinforces another target, which in turn has many and/or strong positive connections, its systemic impact can be very significant. If the other target has few and/or weak positive connections, however, the positive effect wears out quickly without having much systemic impact. Also, many strong positive connections to other targets with the same characteristics give a high and positive multiplier effect. Conversely, a strong positive connection to a target that in turn exerts much negative influence on other targets makes a negative systemic impact, and should be avoided. A negative connection to a target that in turn has strong positive connections may be a reason for caution as negative impact can spread.

In this report we confine the analysis to include so-called second-order effects, as illustrated in the figure below (adapted from Weitz et al. (2018)).

In Figure 25, only +1 (green arrows) and -1 (red arrows) are used for simplicity. The extension to the -3, ..., +3 scale is trivial. To calculate the total first-order influence of A we simply sum up the arrows in the inner circle: 3(+1) + 1(-1) = 2. To calculate the influence of A on second-order interactions we consider the full chain of influence (e.g. from A to F and G via C). Here, A's influence on F is not equal to the sum of the two links between A and C and C and F for two reasons: first, because the A to C link is negative it makes progress in C more difficult and the positive influence that C would exert on F if progress was made less likely. Secondly, because influence weakens the further away from target A it is exerted. Calculating A's influence on F we account for these effects by reducing the weight of the second-order links by 0.5 before multiplying the second-order links with the first-order link and adding this to the first-order influence. The equation is presented in the figure. Adding up the total influence from the four chains of influence in the figure, the total influence from target A on the second-order network is 1.5

Mathematically, the total influence (I) from target (i), including both first- and second-order effects, is calculated as

$$I_i^{Total} = I_i^{1st} + \frac{1}{2}\sum I^{2nd} = D_i^{Out} + \frac{1}{2}\sum_{j \neq i} I_{ij} D_j^{Out} \quad \text{(A1)}$$

where Ii1st is the first order influence of target i, I2nd is the second order influence of i weighted by a factor ½, DiOut is the out-degree of target i, Iij is the strengths of link from target i to target j, and DjOut is the out-degree of target j . The equation can also be used to calculated second order influences on targets, i.e. how a selected target is influenced by its neighbours and its neighbours' neighbours. To do this, simply replace DOut with DIn. Equation (A1) has been used to calculate the rankings presented in appendices A and B.

Indirect effects

To gain a more systemic overview of impacts, it is useful to look beyond direct (or first-order) influence and also include indirect (or second-order) influence. However, with a large number of targets included in a study, the network of interactions quickly becomes very complex. To be able to visualize second-order effects, we aggregated the second order impacts stemming from progress on a particular target.

In the example shown in Figure 26A, target A has a strongly promoting influence (+3) on target B. Target B in turn has a strongly promoting influence (+3) on target D. The indirect influence from target A on target D, mediated via target B, is thus 9. However, target A also has a weakly promoting influence (+1) on target C. Target C in turn has a weakly restricting influence (-1) on target D. The indirect influence from target A on target D, mediated via target C, is thus -1. The aggregated influence from target A on target D, mediated via both target B and target C, is thus 8. This total influence is illustrated in Figure 26b.

Mathematically, the aggregated second order influence (Ind) on target D from target A is calculated as

$$I_{A\to D}^{Ind} = \sum_i w_{Ai} w_{iD}\,, \quad \text{(A2)}$$

where i runs over all targets connecting A and D, and wij is the weight on the link between target i and target j.

Figure 25. Illustration of the difference between first-order and second-order influence, and how second-order influence is calculated in this report.

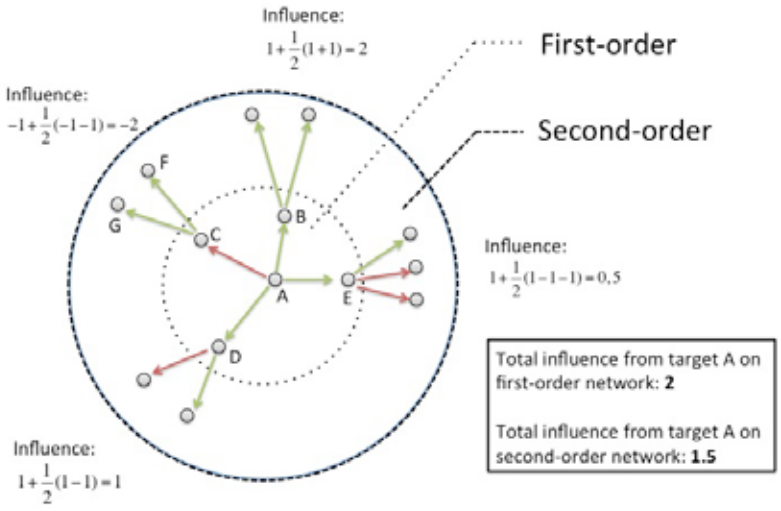


Figure 26a. Example of second-order influence

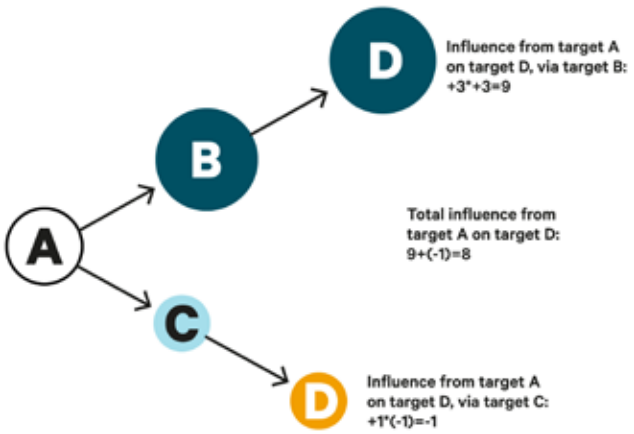
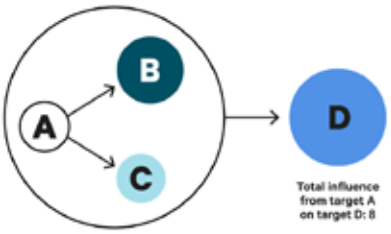


Figure 26b. Visualization of aggregated second-order influence



Appendix D – Example of target interpretation used for National Consultation

A target interpretations booklet with a one-page description and key data for each target was prepared as supporting material for participants at the National Consultation workshop in January 2019, where interactions were scored. An example of the type of information provided in the booklet is presented below, for target 1.3.

The target interpretations were prepared by the Centre for Poverty Analysis (CEPA).

TARGET 1.3: Implement nationally appropriate **social protection systems and measures for all**, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable.

INDICATOR 1.3.1: Proportion of population covered by social protection floors/systems, by sex, distinguishing children, unemployed persons, older persons, persons with disabilities, pregnant women, new-borns, work-injury victims and the poor and the vulnerable.

As it applies to Sri Lanka:

- **34% of the Sri Lankan population** received benefits from national social protection programs like Samurdhi, that provide a range of support services.[1]
- **Gaps** are observed, which include: issues in targeting, inadequate benefits and lack of coordination among programmes leading to high costs and overlaps of beneficiaries.[1]
- Social protection currently is unable to customize packages to cover people with disabilities or mental trauma who need long term care or those who may need more targeted support (i.e female-headed households)[3].
- Nearly 45% of the elderly population (> 60 years) are covered by social protection. With an aging population, with largely informal sector, with no pensions, the need for more elderly care will become more significant.[1]
- Spending levels on education, health, and social protection have failed to keep up with GDP growth. In 2015, public expenditure on **education and health was 2.07% and 1.30% of GDP**, **respectively**, far below the stipulated 6% and 3% of GDP, respectively.[2]

SDG indicator data:

SDG indicator	Baseline (2012-2013)
Sex	Total 34.8%; Male 34.1%; Female 35.4%
Older persons (age>60 years)	Total 44.7%; Male 41.9%; Female 46.4%

Source: HIES, DCS 2012/2013

Conceptual definition:

Social protection/ social security - the set of policies and programmes **designed to reduce and prevent poverty and vulnerability**.

- Includes child and family benefits, maternity protection, unemployment support, employment injury benefits, sickness benefits, disability and old-age pensions.
- Address a mix of contributory schemes (social insurance) and non-contributory tax-financed benefits, including social assistance.

Appendix D References

1. Voluntary National Review on the Status of Implementing the Sustainable Development Goals, Ministry of Sustainable Development, Wildlife and Regional Development, Sri Lanka, June 2018.

2. Sri Lanka Voluntary Peoples Review on the Implementation of the 2030 Agenda for Sustainable Development, Sri Lanka Stakeholder SDG Platform. June 2018.

3 Vision 2030 Sustainable Sri Lanka: Vision and Strategic Path – Draft Document. Government of Sri Lanka.

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