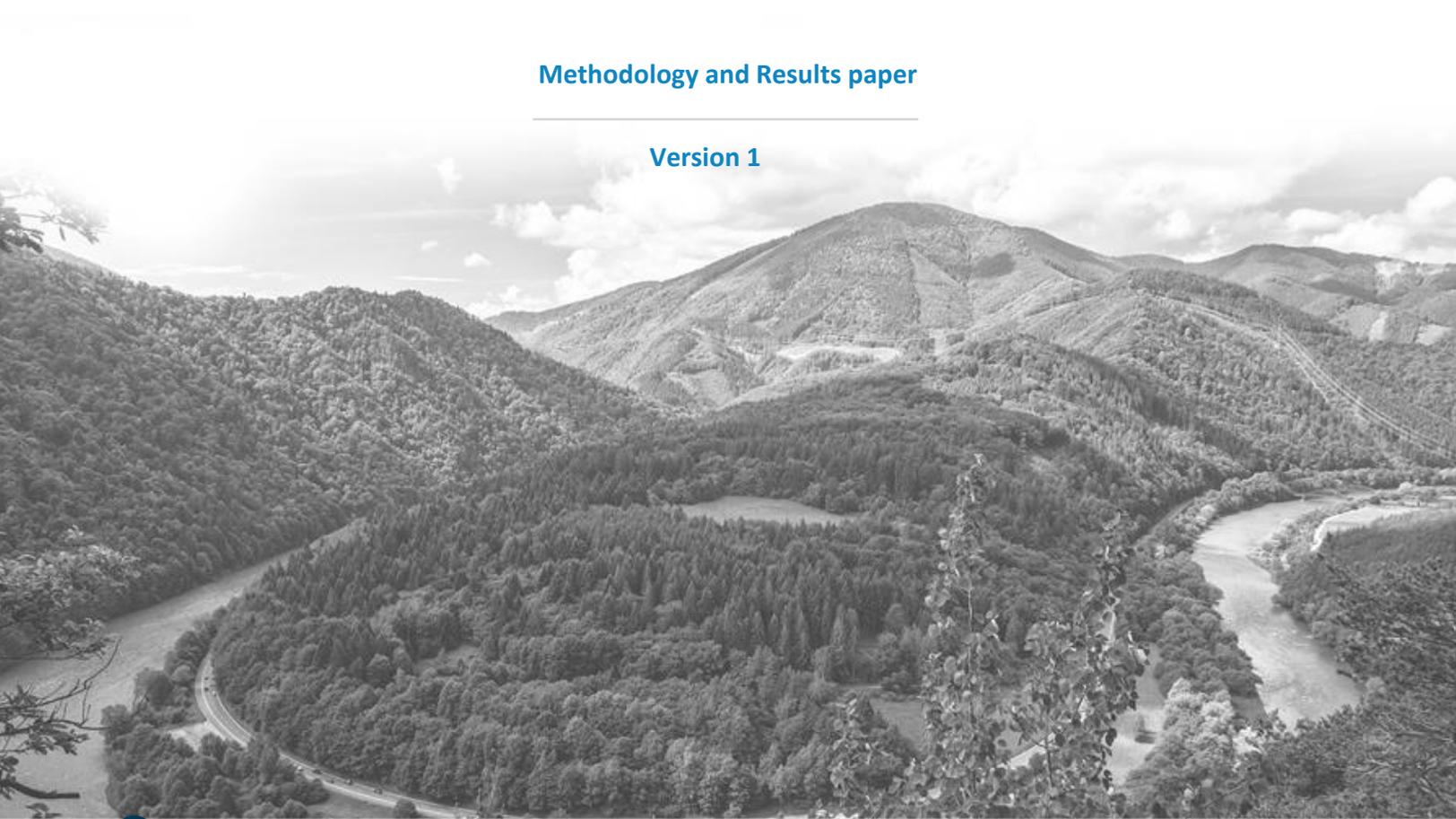


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SCAN (SDG & Climate Action Nexus) tool: Linking Climate Action and the Sustainable Development Goals

Methodology and Results paper

Version 1



Linking Climate Action and SDGS

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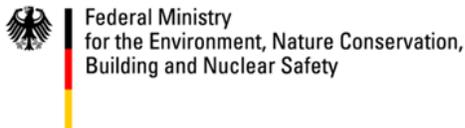
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1. Introduction

Background

In 2015, leaders from the member states of the United Nations agreed on objectives to shift all economies and societies toward sustainable and decarbonised development through the adoption of the Agenda 2030 on the Sustainable Development Goals (New York, September 2015) and the Paris Agreement on limiting climate warming to well below 2°C (Paris, December 2015). Both frameworks, although negotiated under different multilateral processes, promote the participation of all countries and are highly interlinked: the Paris Agreement emphasizes the need for sustainable development considerations in low-carbon transitions; at the same time avoiding dangerous climate change is one of the 17 Sustainable Development Goals (SDGs) defined in the 2030 Agenda on Sustainable Development. Thus, failure in one process could undermine the success of the other. The implementation of Nationally Determined Contributions (NDCs) –countries’ emissions reduction commitments– requires huge investments, which are more likely to be financed if embedded in and benefiting national development plans. While, vice versa, prospects for sustainable development depend on a limitation of global warming.

This interdependency can be seen as an opportunity to move away from the discourse of two different agendas that are often perceived to be in competition; and instead pursue their implementation in a way to maximise mutual benefits. A deeper understanding of the points of intersection between the two agendas is needed to unlock further ambition and to avoid potential conflicts (WRI, 2016). In some cases, interactions between the two may be mutually reinforcing, while in other cases action in one may undermine the achievement of the targets in the other. Policy makers may be faced with strategic choices where insights into climate-development interactions are key for successful development and implementation of policies and targets that serve both agendas. Such understanding can enable coherent policy planning and increase implementation efficiency, in particular when considering limited institutional capacities.

Objectives

The objective of the study was to develop a tool that helps stakeholders identify links (both synergies and trade-offs) between mitigation and adaptation actions and the SDGs. In this context, we developed the **SDG Climate Action Nexus** tool (hereafter referred to as the **‘SCAN-tool’**). The SCAN-tool aims to be user-friendly and practical and it is meant to support policy makers across different departments and state levels, to achieve greater policy coherence, to enable the achievability of multiple goals and to improve the efficiency of implementation by providing them with an initial indication of which climate actions may impact -positively or negatively- specific SDG targets. It may also serve the international community, for example in the role of funders, to identify areas where dual or multiple benefits may be achieved. In a second phase, ‘deep dive’ analysis into specific sectors will be undertaken to map potential linkages in greater detail, starting with the energy supply sector, but it is not featured in this paper.

In addition, the SCAN-tool can inform the process of putting forward increasingly ambitious pledges of climate action, required every five years under the ambition mechanism of the Paris Agreement¹. A better understanding of how climate action can reinforce the achievement of SDG targets may increase countries' confidence to put forward more ambitious NDCs and improve political buy-in.

The study has been developed under the umbrella of the NDC Cluster funded by the German Ministry of Environment, pooling resources from the GIZ Support project for the implementation of the Paris Agreement (SPA), the Climate Change Mitigation Working Group under the GIZ TUEWAS sector network² and ECN / NewClimate Institute's Ambition to Action (A2A) project³. The first step of the research aims to develop tools for mitigation and adaptation that link climate actions across all sectors with the SDGs at the goal and target level. Given the complexities involved, this has been done at a high level. In a second step, deep dives into specific sectors will be undertaken to map potential linkages in greater detail, starting with mitigation actions in the energy supply sector.

This methodology and results paper accompanies the two Excel-based tools (SCAN-tool for mitigation actions and SCAN-tool for adaptation actions) and describes our rationale and approach and presents key initial findings. Section 2 starts with a review existing tools and analyses in the area of SDG and NDC linkages; while Sections 3 and 4 describe the approach taken to assess the linkages and the key findings of this exercise, for mitigation and adaptation respectively. Conclusions of the analysis, highlighting the next steps to further develop this assessment, are provided in Section 5.

2. Existing tools and initiatives

The integration of climate policy and development objectives has long been a topic of discussion in the international arena (WWF & CARE, 2015; UNEP, 2016; Von Stechow *et al.*, 2016). The NDC process and Paris Agreement ambition cycle have added to the need to provide better guidance and insights into how the two policy agendas can be better aligned. Several studies and initiatives have been undertaken to map the interrelationships, synergies and trade-offs of the Agenda 2030 and the Paris Agreement (or more concretely, countries' NDCs). A number of tools to communicate those interrelations have been developed by different institutions or are currently under development.

¹ The Paris Agreement established an ongoing, regular process to increase action by all countries - dubbed the "ratchet" or "ambition mechanism" under which, countries must come together every 5 years to take stock of progress and submit a climate action plan that is progressively more ambitious than the last.

² The GIZ internal sector network TUEWAS (Transport, Environment, Energy and Water in Asia) was established in Bonn, Germany in 2002, as a platform for regional professional exchange and cooperation between GIZ experts in Asia and at head office. Currently, TUEWAS connects over 50 projects across 16 Asian countries in the field of transport, environment, energy and water.

³ The SPA project supports cross-cutting capacity building and knowledge management measures for developing and implementing NDCs, Low Emissions Development Strategies (LEDS), Nationally Appropriate Mitigation Actions (NAMAs), Climate Finance, and systems for Measurement, Reporting and Verification (MRV) at the global, regional and national level. The A2A project supports the implementation of the Paris Agreement on climate change in four partner countries (Argentina, Kenya, Indonesia and Thailand) through the development of sector roadmaps, drawing together evidence on the wider benefits of ambitious mitigation action and the comparison of different sector pathways to identify priority mitigation actions.

In order to avoid duplication and to maximise synergies, the study started with a review of existing initiatives which address linkages between NDCs and SDGs. The review found that most of the tools take the current submitted NDCs as a starting point, to identify potential linkages with SDGs based on the actual text in the NDCs (i.e. searching for explicit mention and recognition of key words related to the SDGs and its targets in the NDCs).

Whilst this mapping provides insights into the degree to which the formulation of the NDCs reflects the SDGs, it does not provide guidance on whether climate actions taken to achieve NDC targets are likely to reinforce or undermine the SDGs and is highly unlikely to capture all potential linkages. For example, a country may have presented an economy-wide NDC target without describing sector context or activities in greater detail. The absence of reference to activities relevant to the SDGs does not mean that there may not be synergies or trade-offs associated with those activities. Conversely, a country may have included text describing specific co-benefits, suggesting linkages to SDGs which may not actually occur in practice, or where the linkage is very indirect.

In essence, the existing tools serve a mapping purpose and provide an assessment of the status quo, without indicating the existence or type of causal relationships. These tools do not give practical guidance to policymakers on potential synergies or conflicts in a comprehensive way that can be used to inform the development of implementation strategies for the NDCs (or SDGs) or future NDC cycles with SDGs in mind.

3. The SCAN-tool for mitigation

From the review of existing tools, we concluded that there is a gap for a tool that goes beyond a descriptive approach and that is rather based on the analysis of potential interactions based on scientific criteria, which would allow users to understand linkages between mitigation and adaptation activities and SDGs to inform policy formulation and implementation and future NDC cycles. To fill this gap, we developed the SCAN-tool which takes mitigation and adaptation actions (rather than the text of a specific country NDC) as a starting point, thus ensuring that all potential activities and sectors are covered. Separate tools were developed for mitigation and adaptation.

Given the range of possible mitigation actions and the breadth of the SDG targets, comprehensively identifying linkages between the two is a complex and time-consuming task. The SCAN-tool is intended to provide an initial, high-level indication of which SDGs and targets may be impacted by specific mitigation actions. In reality, the linkages are highly context-specific; national circumstances and other factors will greatly influence the magnitude and direction of any linkage. Policymakers and other users will, therefore, need to undertake further research to understand which linkages apply and are most relevant to their situation. The SCAN-tool can be thought of as an initial step on such a journey. Ultimately, it is intended to help improve policy coherence and integration of the NDCs with national sustainable development goals.

The following section describes the approach taken to develop the SCAN-tool for mitigation and its main features. Section 4 discusses the methodology and key findings of the adaptation tool.

Methodology and approach

The SCAN-tool for mitigation covers actions across seven sectors: energy supply, transport, buildings, industry, waste, agriculture, and forestry. These sectors do not relate to economic activity but to activities that produce emissions, and the actions that can be implemented to reduce those emissions. So, a farmer buying a more energy efficient tractor would be counted as an action in the transport sector, not the agriculture sector.

Across all the sectors, mitigation actions are grouped into three broad categories of mitigation action. These are ‘Changing activity’ (actions which reduce the underlying demand for an emissions intensive activity), ‘Reduce emissions intensity’ (actions that reduce the emissions produced per unit of activity), and ‘Increase energy efficiency’ (actions to reduce the amount of energy required per unit of activity).

For transport, buildings, industry and waste sectors, all three categories are relevant but for the energy supply only the emissions intensity and energy efficiency categories are relevant given that a reduction in the demand of the activity (i.e. electricity generation and heat) would refer to a reduction in energy demand which is captured in the energy efficiency categories of all other relevant sectors. In the case of agriculture, we do not include the energy efficiency category as the energy required by the agro-industry is assumed to be included either under the industry, buildings or transport sector. For the forestry sector, only the changing activity category is relevant. For each sector, each category then contains one or more mitigation actions that are specific to that sector.

Table 1 below lists the categories and mitigation actions for the main seven sectors and gives examples of the mitigation actions that would be included.

Table 1: Categories, mitigation actions and examples (sector specific)

Sector	Category	Mitigation Action	Examples
Energy supply	Reduce emissions intensity	Renewable energy in power generation	Solar, wind, hydro, geothermal, RE mini-grids
		Nuclear or CCS power generation	Nuclear power and fossil plants fitted with CCS
	Increase energy efficiency	Increase energy efficiency in power generation	Increasing efficiency of power generation and transmission
Transport	Changing activity	Reducing transport demand	Sustainable urban planning to reduce need to travel; behaviour change to avoid travel
		Modal share shift	Improved public transport (metro, bus rapid transit etc); cycling infrastructure
	Reduce emissions intensity	Fuel switch to low carbon vehicles	Electric vehicles; fuel cell vehicles; hydrogen; biofuels
		Increase energy efficiency	Increase energy efficiency

Buildings	Changing activity	Urban planning for energy efficiency	Urban planning to enable efficiency; community and district scale heating / cooling
	Reduce emissions intensity	Fuel switch away from fossil fuels	Moving from gas / oil boiler to biomass boiler; solar thermal
	Increase energy efficiency	Increase energy efficiency	Improved building fabric; more efficient systems and appliances
		Improved cookstoves	More efficient cookstoves that consume less fuel
Waste	Changing activity	Reduce, Reuse, Recycle	Behaviour change to reduce, reuse and recycle waste
	Reduce emissions intensity	Sustainable waste management systems	Landfill gas capture and utilisation
	Increase energy efficiency	Increase energy efficiency	More efficient waste management processes and systems
Industries	Changing activity	Changing activity	Material efficiency in design and production; longer lasting products;
	Reduce emissions intensity	Fuel switch away from fossil fuels	Moving from gas to biomass for process heat
		Non-energy	Reducing process and fugitive emissions e.g. clinker substitution in cement sector; reduced coolant leakage
	Increase energy efficiency	Increase energy efficiency	More efficient processes, systems and appliances
Agriculture	Changing activity	Sustainable consumption practices	Reducing demand for agricultural products; less consumer wastage; reduced meat consumption
	Reduce emissions intensity	Climate smart agriculture	Reduced fertiliser use; better irrigation; soil conservation; manure management
Forestry	Changing activity	Smart cities and green urban planning	Creation of green spaces (positive land use change); vertical gardens; green roofs; green-blue corridors
		Sustainable forest management	Agroforestry; reforestation

The core of the tool is the seven sector sheets where information about the linkages between actions and the SDGs is entered. We do not include Goal 17 in the assessment as it refers to the partnerships and resources that must be implemented in order to achieve the goals rather than to a specific development goal at the national level and is thus not relevant to NDC actions in the same way as the other 16 SDGs⁴. As the tool covers all sectors, the assessment of linkages remains at a relatively high level and does not cover individual sub sectors,

⁴Similarly, we do not look into links between mitigation actions and targets ending in letters (e.g. 2.a, 2.b) as these targets relate to the number of resources that need to be in place for achieving the specific goal (similar to Goal 17).

technologies or mitigation options at a detailed level. This will be the purpose of the sector deep dives, aiming to provide for much greater granularity of potential synergies and conflicts of mitigation actions with SDG targets.

The tool was populated using existing literature that maps the climate-development links and collects data from several studies on the nexus between climate action and specific development areas (Iacobuta and Höhne, 2017; Fuso Nerini *et al.*, 2017; Pradhan *et al.*, 2017; IPCC, 2014). The literature-based population of the matrix was complemented by an expert review and inputs from the project team as well as additional reviewers.

The description of the links is detailed on the sector sheets of the tool and show the relationship between a mitigation action (from the list in Table 1) relevant to that sector and an SDG at the SDG target level (so the linkages are between an action and for example SDG target 3.x rather than SDG 3 at the goal level).

The linkages were classified as either positive (cell marked in green and showing a ‘1’) – where the mitigation action is likely to reinforce the SDG target, or negative (cell marked in red, showing a ‘-1’) – where there may be a negative impact on the SDG target. The score attributed to a linkage is only indicative of whether it is likely to be positive or negative. The tool does not assess the magnitude of the linkage. Where both positive and negative linkages were identified between the same mitigation action and the same SDG target, these are separately detailed in the tool (e.g. renewable energy can lead to job creation in renewable energy industries and job losses in fossil fuel industries).

Moreover, the scope of this study was limited to direct impacts, i.e. excluding secondary or indirect impacts which may arise from the implementation of the mitigation action, as a result of the direct impacts. For example, there may be a direct linkage

sheet.

Table 2: Categories, interventions and examples (general)

Sector	Category	Intervention	Examples
General	Awareness	Awareness raising programmes	Awareness raising campaigns in various media channels; awareness programmes in schools, companies, cities & districts
	Capacity	Institutional capacity building	Capacity building in government departments, agencies, companies
		Training programmes	Training programmes for installers; dedicated university degrees; vocational training
	Finance	Dedicated financial products and credit	Dedicated low cost credit / soft loans for renewables and EE investments; guarantee schemes; pay as you go schemes; green bonds
	Pricing	Carbon and energy pricing interventions	Carbon taxes; carbon trading; energy taxes; reduction of fossil fuel subsidies
	Innovation	Innovation / R&D programmes	R&D grants; testing centres; demonstration programmes

For policy makers it is important to understand both the potential interactions between the mitigation actions that reduce emissions, and also the interventions they may put in place in order to support implementation of those mitigation actions by consumers and the private sector. Pricing interventions, if not carefully designed and implemented, carry a high risk of negative impacts relating in particular to affordability. Conversely, awareness raising, and capacity building interventions are likely to be positive in most cases, even if sub-optimally designed and implemented.

The SCAN-tool includes an overview sheet which summarises the identified linkages at the level of the SDG target and the category of mitigation action or intervention (see Figure 1). Where there is no colour shading in a particular cell, no linkages were identified between the corresponding SDG target and mitigation action category. Green shading indicates that one or more positive potential linkages were identified, and red indicates one or more negative potential linkages. Where both positive and negative linkages were found, the cell is marked in yellow (0).

Figure 1: SCAN-tool for mitigation – Overview sheet (excerpt)

	SDG 1					SDG 2					SDG 3									SDG 4						
	No poverty					Zero hunger					Good health and well-being									Quality education						
Mitigation actions: sectors & categories	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.1	4.2	4.3	4.4	4.5	4.6	4.7
General																										
Awareness																										1
Capacity																							1			
Finance				1																						
Pricing	-1	-1		-1	-1	-1																				
Innovation																										
Energy supply																										
Reduce emissions intensity				0		-1		0	1					0					0	1						
Increase energy efficiency														1					1							
Transport																										
Changing activity														1		1			1							
Reduce emissions intensity						-1		1						0		-1			0							
Increase energy efficiency														1					1							
Buildings																										
Changing activity														1					1							
Reduce emissions intensity				1										-1					-1							
Increase energy efficiency		1												1					1							
Waste																										
Changing activity	-1																									
Reduce emissions intensity	-1													1					1							
Increase energy efficiency																										
Industries																										
Changing activity														1					1							
Reduce emissions intensity														0					0							
Increase energy efficiency														1					1							
Agriculture																										
Changing activity						-1																				
Reduce emissions intensity				1		1		1	1					1					1							
Forestry																										
Changing activity	-1	1		0		0		0	1					1					1							

As described above, more detailed information about the identified links is shown in the sector sheets, including a brief description that explains the linkage. An example for the energy sector and SDG 1 and SDG 2 is shown in Figure 2.

Figure 2: SCAN-tool for mitigation – Energy sector sheet (example)

Energy supply sector: Mitigation actions which reduce emissions from energy supply and heat					
Goal	Targ	Category	Mitigation action	Link	Description of link
1. No poverty	1.1				
	1.2				
	1.3				
	1.4	Reduce emissions intensity	Renewable energy in power generation	-1	Potential conflicts with land access (specially for large hydro)
	1.4	Reduce emissions intensity	Renewable energy in power	1	Increase in energy access (focus on off-grid energy)
2. Zero hunger	2.1	Reduce emissions intensity	Renewable energy in power generation	-1	Decrease in food access due to land requirements for biofuels (competition for land available for food production increases food prices)
	2.2				
	2.3	Reduce emissions intensity	Renewable energy in power generation	1	Increase energy access and refrigeration can help reduce food waste
	2.3	Reduce emissions intensity	Renewable energy in power generation	-1	Potential conflicts with land access (specially for large hydro)
	2.4	Reduce emissions intensity	Renewable energy in power generation	1	Increase energy access and refrigeration can help reduce food waste
	2.5				

Key findings

Some general findings from the analysis of linkages between mitigation actions and SDGs and observations that have resulted from the development of the tool so far are as follows (sector-specific findings are discussed later):

- There are many linkages between mitigation actions and the SDGs, across all sectors. This highlights the opportunity and need to approach implementation in an integrated manner (see also Iacobuta and Höhne, 2017). For some SDGs, the links are more pronounced, and certain SDGs show few or no linkages (specific sector findings are presented in the following sub-section). In total, 494 linkages were identified between sector-specific actions and SDG targets, with a further 32 identified between general interventions and SDG targets.
- Where few or no linkages to SDGs have been identified, this can generally be attributed to the transversal nature of the SDGs (and targets). For example, SDGs related to education, gender equality, reducing inequality, peace and justice are difficult to attribute to individual sectors but are relevant to consider across all sectors when designing or implementing mitigation actions.
- A seemingly odd result of the SCAN-tool is that very few linkages were identified between mitigation actions and SDG 13 ('Climate action'). This is because the 3 targets that make up SDG 13 focus on adaptation, national strategy and policy, and education and capacity building. There is no target relating to actual implementation of actions that reduce emissions, or to the outcome of reduced emissions. As

most of the mitigation actions included in the tool do not directly impact the achievement of targets 13.1-13.3, linkages are not included in the tool. However, in reality all the mitigation actions positively support the goal of climate action, as that is their core objective.

- Although generally synergies are likely to outweigh trade-offs for most of the SDGs (indeed the majority (83%) of linkages identified in the tool are positive – see also the number of green cells in Figure 3 below), some goals are fundamentally at odds with each other (Pradhan *et al.*, 2017).
- The SDG agenda in itself is extensive and complex, comprising a total of 167 targets under the 17 goal dimensions. In many cases the targets overlap or even duplicate, thus complicating their attribution to individual subsectors and mitigation actions. Potential benefits or trade-offs in some SDGs may therefore also impact the achievement of other SDG targets (Pradhan *et al.*, 2017). This complexity and inter-relatedness within the SDG agenda is difficult to capture in a simplified tool.
- Of the three categories of sector specific mitigation action, ‘reduce emissions intensity’ showed by far the most negative linkages to SDG targets. Indeed 88% of all negative linkages came from this category of action. In contrast less than 1% of the linkages in the ‘increase energy efficiency’ category are negative. Similarly, the ‘changing activity’ category showed very few negative linkages. The obvious explanation for this is that the actions that reduce emissions intensity involve introducing new technologies such as renewables, nuclear and CCS, which have a range of potentially negative impacts on the environment, human health and may involve job losses in displaced sectors, whereas the other two categories mainly lead to a reduction in current activities that have harmful impacts (such as pollution from fossil fuel use in power, heating and transport).
- In addition to the impacts a mitigation action may have on the SDGs, the interventions used by government to stimulate those mitigation actions may also impact the SDGs. Policy makers should thus consider the impacts at two levels: the impacts of the final action taken by the target audience (e.g. the adoption of electric vehicles) and the impacts of any interventions they may put in place to encourage that action (e.g. taxes on liquid fossil fuels; innovation / demonstration programmes).
- The way these interventions are used by government (for example, the choice of policy instrument and its particular design) determines whether the impact on the SDG target may be negative, positive or neutral. Interventions can be chosen that minimise negative impacts or they can be designed to protect specific groups (e.g. poorer or more vulnerable groups) from being disproportionately affected by e.g. pricing measures.
- Many or perhaps all of the linkages are ultimately very context specific. The precise conditions in a country or sub-national region may mean that a linkage that is very important in one location could be far less important in another. It is not possible to capture these subtleties in a general tool. To understand and manage the synergies and trade-offs, countries will need to undertake a systematic review of

individual mitigation actions in their specific context. The tool helps indicate where to start with that exercise.

Figure 3 presents a summary of the number and balance of positive or negative potential linkages detailed in the SCAN-tool for mitigation, across the different sectors.

Figure 3: Summary of linkages between sector mitigation actions and SDGs

	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 8	SDG 9	SDG 10	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15	SDG 16
General	Red	Red	White	Green	Green	Red	Red	Light Green	Light Green	Red	Light Green	Green	Green	White	White	Green
Energy	Yellow	Light Green	Light Green	Green	Green	Light Green										
Transp.	White	Light Green	Light Green	White	White	Light Green										
Buildings	Green	Light Green	Light Green	White	White	Light Green										
Waste	Red	White	Light Green	White	White	Light Green										
Industr.	White	Light Green	Light Green	White	White	Light Green										
Agric.	Green	Light Green	Light Green	White	White	Light Green										
Forestry	Yellow	Light Green	Light Green	White	White	Light Green										

Key	Green	Light Green	Yellow	Red	Dark Red	White
	Only positive linkages	Contingent			Only negative linkages	No linkages identified
		More positive linkages	Equal positive and negative	More negative linkages		

From the analysis of sector specific linkages of mitigation actions to the SDG agenda the following key findings are highlighted:

- The **energy supply sector** presents linkages (synergies or trade-offs) with all 16 of the SDG goals covered by the tool. Most linkages are found in the goal dimensions on Clean water and sanitation (SDG 6), Decent work and economic growth (SDG 8), Industry innovation and infrastructure (SDG 9), Sustainable cities and communities (SDG 11) and Life on land (SDG 15). At the mitigation action level, energy efficiency shows the highest number of positive links. Conversely the nuclear and CCS mitigation action shows the largest number of trade-offs. For renewable energy the picture is mixed as here the impact often depends on the choice of technology.
- Mitigation actions in the **transport sector** link to 11 of the SDGs, with most linkages shown in the targets related to Decent work and economic growth (SDG 8), Industry innovation and infrastructure (SDG 9) and Sustainable cities and communities (SDG 11). Overall both the subsector “changing activity” as well as “increased efficiency” show mainly positive synergies. Reducing emissions intensity in transport includes adoption of electric vehicles and biofuels in transport, both of which show some negative linkages (for example biofuel production threatens food security and can lead to other environmental impacts).
- Similar to the transport sector the **building sector** links mostly to the goals Decent work and economic growth (SDG 8), Industry innovation and infrastructure (SDG 9) and Sustainable cities and communities

(SDG 11). In particular “increased efficiency” presents significant potential synergies. There are comparatively few negative linkages to actions to reduce emissions from buildings.

- The **waste sector** is less well covered in the consulted literature although our expert review identified a number of potential linkages to 10 of the SDG goals. Most linkages were identified in the goal dimension on Decent work and economic growth (SDG 8), Reduced inequalities (SDG 10) and Sustainable cities and communities (SDG 11).
- Mitigation actions in the **industry sector** show mostly potential synergies across the 9 SDGs where linkages were identified. Again, efficiency shows a high number of synergies as also noted in the efficiency related activities in the other sectors, and non-energy mitigation actions (e.g. actions to reduce process or fugitive emissions) showed only positive linkages.
- The land use sectors, both **agriculture and forestry**, link to 12 SDG goals each. Most of the mainly positive synergies were identified in the goal dimension Life on land (SDG 15). Overall only five potential trade-offs were identified.

4. The SCAN-tool for adaptation

Methodology and approach

The SCAN-tool for adaptation was developed alongside the SCAN-tool for mitigation and uses the same general approach and structure, although the sectors, categories and actions are of course different. Additionally, because the starting evidence base was quite different for adaptation, a slightly different process was used to populate the adaptation tool.

Using the World Bank’s adaptation NDC platform, a list of adaptation actions was compiled per sector⁵; covering the set of realistic and intended actions proposed by countries. These sectors were then collapsed into the sectors shown in [Table 3](#). As with the SCAN-tool for mitigation, a ‘General’ sector was created to capture options and instruments that cut across different sectors or are not sector-specific.

Drawing on the IPCC AR5, each of the adaptations actions were classified into two broad categories of risks that could be minimized by adaptation actions: vulnerability, and exposure; and further classified into four broad types of adaptation action, with two actions corresponding to a reduction in vulnerability and the other two to a reduction in exposure. The full list of sectors and examples of actions are shown in Table 3. Example excerpts of the SCAN-tool for adaptation are shown in Figure 4 and Figure 5.

⁵The World Bank classifies the NDCs into 16 sectors: Agriculture, Building, Coastal Zone, Cross-cutting areas, Disaster Risk Management, Economy-wide, Education, Energy, Environment, Health, LULUCF/Forestry, Social Development, Tourism, Transport, Urban, and Water.

Table 3: Definition and list of sectors, categories, and adaptation actions

Sector	Category	Adaptation Action	Examples
Agriculture (includes crops, livestock)	Reduction in vulnerability	Technological improvement to increase resilience	Developing crop varieties resilient to CC (i.e., drought-resistant, high temperature-tolerant and short-maturity crops); improved soil management by increasing water retention; vaccination/intervention that minimize livestock disease; Post-processing of raw food to prolong shelf life (e.g., drying, smoking)
		Increase resource efficiency	Developing agroecological fish-farming techniques; integrated agroforestry; sustainable aquaculture practices to improve water efficiency; vertical integration into the supply chain
	Reduction in exposure	Change activity/product	Diversification/change in product/livelihood (e.g., shift to crops that naturally require less water); change in traditional agricultural practices to resilient and sustainable techniques;
		Physical protection	Building of irrigation facilities; construction of reservoirs for micro-irrigation and livestock watering; restoration of vegetation cover to avoid erosion; construction of micro watersheds
Coastal Zone (includes coastal industries such as tourism and fisheries)	Reduction in vulnerability	Technological improvement to make products CC-resilient	Post-processing of raw fish (drying, smoking) that help in reducing dependency of fish resource fluctuation; improve design of existing structures (e.g., floating hotels to reduce impact of sea-level rise)
		Increase resource efficiency	Management of coastal and fisheries resources through non-destructive fishing techniques;
	Reduction in exposure	Change activity/product	Change in livelihood. (e.g., fishing to tourism); relocation of households away from coastal areas
		Physical protection	Construction of cyclone shelters in coastal areas; climate-proofing infrastructure to strengthen coastal protection against erosion; building of active protection structures (groynes, breakwaters and passive recovery e.g. barriers against strong winds, replanting/protection of mangroves); improvement in housing and living conditions to withstand severe climate impacts
Forestry (LULUCF)	Reduction in vulnerability	Technological/design improvement to make products CC-resilient	Planting of climate-resilient trees; creating fire corridors (against forest fires)
		Increase resource efficiency	Expansion of conservation areas; migration corridors
	Reduction in exposure	Change activity/product	Increase in eco-tourism; better manage slash-and-burn practices
		Physical protection	Enhance afforestation, particularly reforestation of degraded landscapes to fight against floods, violent winds, soil erosion
Ecosystem management	Reduction in vulnerability	Technological improvement to make products CC-resilient	Prevention of illnesses and diseases in animals (e.g., through vaccination)
		Increase resource efficiency	Reduce, reuse, recycle
	Reduction in exposure	Change activity/product	Development of waste-management techniques and facilities; assisted migration of valued species
		Physical protection	Establish water points for wildlife in protected areas; building of water basins to reduce risk of landslides and soil erosion

Energy	Reduction in vulnerability	Technological improvement to make products CC-resilient	Increase energy access; rural electrification; Installation of micro-hydro power units in river systems, solar PV parks, waste-to-energy technology, wind turbines; multi-hazard-resistant infrastructure
		Increase resource efficiency	Implementation of energy-saving strategies; construction of multi-purpose hydropower to expand water storage
	Reduction in exposure	Change activity/product	Decentralize power generation (e.g., less reliance on hydro power in anticipation of drought risk); use of alternative sources of energy to reduce deforestation and consequent loss of livelihood options
		Physical protection	Physical infrastructure to protect power plants from flooding, earthquakes, etc
Health	Reduction in vulnerability	Technological improvement to make products CC-resilient	Increase vaccination/ prevention against water and vector-borne diseases
		Increase resource efficiency	-
	Reduction in exposure	Change activity/product	Change in livelihood (e.g., from field to office work)
		Physical protection	Increase access to clean drinking water; increase health facilities; building of infrastructure that protects against heat (ventilation or shaded areas)
Transport	Reduction in vulnerability	Technological improvement to make products CC-resilient	Making existing infrastructure heat-resistant/flood-resistant; design improvement in modes of transport (more ventilation, less sensitivity to flooding)
		Increase resource efficiency	-
	Reduction in exposure	Change activity/product	Travel less
		Physical protection	Repair and rehabilitation of road infrastructure; building infrastructure against flooding (e.g., for subway stations)
Urban	Reduction in vulnerability	Technological improvement to make products CC-resilient	Reduction of heat-island effect through smart city design
		Increase resource efficiency	Increase efficiency in water distribution systems; Increase in water usage efficiency;
	Reduction in exposure	Change activity/product	Relocation of human settlements away from hazard-prone areas; strengthening of rural settlements to prevent excessive urban migration
		Physical protection	Building/rehabilitation of drainage systems, dykes; building of water treatment plants; development of modern solid waste management plants; building of decentralized infrastructure for rain water collection and usage; building of water reservoirs

General	Awareness	Awareness raising programmes	Awareness raising campaigns in various media channels; awareness programmes in schools, companies, cities & districts; awareness campaigns for water, sanitation and hygiene practices
	Capacity	Institutional capacity building	Capacity building in government departments, agencies, companies; mainstreaming of CCA to development plans; development of sector-specific plans; improvement in data acquisition/processing/analysis of impacts and risks for vulnerability mapping, forecasting, revision of building codes, strengthening of multi-hazard early warning systems, flood monitoring; capacity building for the preparation of eligibility for GCF
		Training programmes	Training programmes for sustainable production and consumption methods and techniques
	Finance	Dedicated financial products and credit; insurance schemes; subsidies	Dedicated low cost credit / soft loans; insurance schemes; increasing north-south and south-south financial support and cooperation
	Social Services	Basic Services, Disaster Risk Management, Early Warning Systems	Increasing access to basic services (e.g., health care, shelter); Creation/improvement of early warning systems and emergency response mechanisms (e.g., in the absence or failure of physical protection)
	Innovation	Innovation / R&D programmes	R&D grants; testing centres; demonstration programmes

Figure 4: SCAN-tool for adaptation – Overview sheet (excerpt)

Sectors and their categories	1. No poverty						2. Zero hunger						3. Good health and well-being																
	1.1	1.2	1.3	1.4	1.5	1.a	1.b	2.1	2.2	2.3	2.4	2.5	2.a	2.b	2.c	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.a	3.b	3.c	3.d	
General																													
Awareness					1										1				1						1				1
Capacity		1		1		1	1	1	1	1		1	1	1	1			1	1										1
Finance	1	1		0	0			1	1	1																			
Social services				1	1		1								1													1	
Innovation	1	1									1		1						1	1								1	
Agriculture																													
Technological improvement to increase resilience		1			1			1	1	1	1							0	1	0					0				
Increase resource efficiency		1			1			1	1	1	1																		
Change activity/product		0			0			0	0	1																			
Physical protection		1			1					1	1																		
Coastal Zone																													
Technological improvement to increase resilience	1	1			1			1	1										1	0									
Increase resource efficiency	0	0			0			0	0									0											
Change activity/product	0	0			0			0																					
Physical protection	0	0			0			0	0		1							1	1						1				
Forestry																													
Technological improvement to increase resilience	1	1			1			1	1									1		1					1				
Increase resource efficiency																													
Change activity/product	1	1			1			1	1																				
Physical protection	1	1			1			0	0										1						1				

Figure 5: SCAN-tool for adaptation – Agriculture sector sheet (example)

Agriculture		Adaptation actions to address climate change impacts on crops and livestock			
Goal	Targ.	Category	Adaptation Action	Li	Description of link
1. No poverty	1.1.	Vulnerability	Technological improvement to increase resilience	1	Protecting income of poor households and resiliency of livelihood through drought-tolerant crop varieties
	1.1.	Vulnerability	Increase resource efficiency	1	Improving resiliency of the poor engaged in climate sensitive livelihoods through reduction in use of inputs through efficiency measures (e.g., water efficiency and recycling, better soil management)
	1.1.	Exposure	Change activity/product	1	Protecting income of poor agricultural households through shifting of products to higher value added, naturally more CC resilient agricultural produce
	1.1.	Exposure	Change activity/product	-1	Relocation of households away from coastal areas will, at least in the shortrun, disrupt livelihoods and can cause a loss of sense of place and cultural identity; erosion of kinship and familial ties
	1.1.	Exposure	Change activity/product	1	Relocation of households that may cause a loss sense of cultural identity may be beneficial to alleviating poverty. Culture sometimes acts as a major barrier to embracing four of the most successful livelihood strategies: labour migration, working for development projects, gardening, and the engagement of women in economic activities.
	1.1.	Exposure	Physical protection	1	Protecting households from asset loss, crop loss, and potential food price shocks through building of infrastructures, such as irrigation facilities; reservoirs for micro-irrigation and livestock watering; restoration of vegetation cover to avoid erosion
	1.2.	Vulnerability	Technological improvement to increase resilience	1	Protecting income of poor households and resiliency of livelihood through drought-tolerant crop varieties
	1.2.	Vulnerability	Increase resource efficiency	1	Improving resiliency of the poor engaged in climate sensitive livelihoods through reduction in use of inputs through efficiency measures (e.g., water efficiency and recycling, better soil management)
	1.2.	Exposure	Change activity/product	1	Protecting income of poor agricultural households through shifting of products to higher value added, naturally more CC resilient agricultural produce
	1.2.	Exposure	Change activity/product	-1	Relocation of households away from coastal areas will, at least in the shortrun, disrupt livelihoods and can cause a loss of sense of place and cultural identity; erosion of kinship and familial ties
	1.2.	Exposure	Change activity/product	1	Relocation of households that may cause a loss sense of cultural identity may be beneficial to alleviating poverty. Culture sometimes acts as a major barrier to embracing four of the most successful livelihood strategies: labour migration, working for development projects, gardening, and the engagement of women in economic activities.
	1.2.	Exposure	Physical protection	1	Protecting households from asset loss, crop loss, and potential food price shocks through building of infrastructures, such as irrigation facilities; reservoirs for micro-irrigation and livestock watering; restoration of vegetation cover to avoid erosion
	1.3.				
	1.4.				
	1.4.				
	1.5.	Vulnerability	Technological improvement to increase resilience	1	Protecting income of poor households and resiliency of livelihood through drought-tolerant crop varieties
	1.5.	Vulnerability	Increase resource efficiency	1	Improving resiliency of the poor engaged in climate sensitive livelihoods through reduction in use of inputs through efficiency measures (e.g., water efficiency and recycling, better soil management)
	1.5.	Exposure	Change activity/product	1	Protecting income of poor agricultural households through shifting of products to higher value added, naturally more CC resilient agricultural produce
	1.5.	Exposure	Change activity/product	-1	Relocation of households away from coastal areas will, at least in the shortrun, disrupt livelihoods and can cause a loss of sense of place and cultural identity; erosion of kinship and familial ties
	1.5.	Exposure	Change activity/product	1	Relocation of households that may cause a loss sense of cultural identity may be beneficial to alleviating poverty. Culture sometimes acts as a major barrier to embracing four of the most successful livelihood strategies: labour migration, working for development projects, gardening, and the engagement of women in economic activities.
1.5.	Exposure	Physical protection	1	Protecting households from asset loss, crop loss, and potential food price shocks through building of infrastructures, such as irrigation facilities; reservoirs for micro-irrigation and livestock watering; restoration of vegetation cover to avoid erosion	

Key findings

Based on the linkages identified, several key observations are presented below:

- Strong positive linkages were found between all the adaptation sectors and SDG 1 on poverty. Poverty is affected by a wide range of sources, from food production, access to social services, and productivity – all of which are threatened by worsening climate change. As Hallegatte et al. (2016, p.2) aptly wrote: *“climate change represents a significant obstacle to the sustained eradication of poverty, but future impacts on poverty are determined by policy choices: rapid, inclusive, and climate- informed development*

can prevent most short-term impacts whereas immediate pro-poor, emissions-reduction policies can drastically limit long-term ones”.

- SDG 4 on education relies heavily on the provision of other services such as energy access (energy sector) and infrastructure (transport sector).
- Gender-inclusivity is a choice. SDG 5 benefits from a well-designed policy that deliberately targets inclusivity of women in the productive space, and the recognition that women are vulnerable to climate change impacts.
- Adaptation actions, particularly on physical protection, can take two forms: adaptation through natural means or artificial means. Policy makers will benefit from further study on the costs and benefits of these in relation to ecosystem management. For instance, in coastal zone protection, adaptation to sea-level rise could be in the form of planting mangroves or creating a sea wall. While both help shield against rising levels of sea water, they each have different impacts in terms of supporting biodiversity.
- While the SCAN-tool for adaptation identifies positive and negative linkages between adaptation actions and the SDG targets, it should not be used as a qualifying or disqualifying factor in implementing adaptation actions. As is the case for the mitigation tool, it can help policy makers develop an initial understanding of how actions they are considering could link to the SDGs. They will benefit from further support on the following:
 - o Assessing if the linkages identified are relevant in their country context and whether they are likely to be strong or weak;
 - o Assessing which adaptation actions, whether they show positive or negative linkages, are appropriate for their country-specific needs and institutional capacity
 - o Effective design and implementation of actions to maximise the positive linkages identified and minimise trade-offs

5. Summary and next steps

In 2015, two separate agendas agreed to shift all economies and societies toward sustainable and decarbonised development: the Paris Agreement and the Agenda 2030. Although they were set individually, there are a large number of interconnections between them, highlighting the need for an integrated implementation of both agendas. The SCAN-tool helps users identify potential links (both synergies and trade-offs) between mitigation and adaptation actions and the SDGs in a practical way and is well suited to helping them develop an initial understanding of how the climate agenda and the SDGs are connected at the action level. Fully understanding the linkages remains challenging as the SDG agenda is extensive and complex. Many of the goals and respective

targets are not independent from each other and can lead to negative feedbacks where progress in one of the goals may limit the achievement of others. This complexity and inter-relatedness within the SDG agenda complicates the attribution of each target to individual sectors and mitigation or adaptation actions and increases the difficulty of capturing these links in a simplified tool.

Generally, the number of synergies found for most of the SDGs outweighs the trade-offs and our results show mitigation and adaptation actions can directly impact 16 out of 17 SDGs, although with a more significant number of links across sectors in 12 of them, suggesting a high potential for tackling both agendas simultaneously at the action level. It is important to emphasize that the way a mitigation or adaptation action is implemented has a strong influence on whether this will create synergies or undermine the achievement of the SDGs. The scope of this study also included only direct impacts, however, indirect impacts which may arise from the implementation of the climate actions can also contribute to achieving those SDGs which are difficult to attribute to individual sectors (such as education, gender equality, reducing inequality and peace and justice). These (indirect) interactions should be kept in mind when designing and implementing climate actions.

The SCAN-tool provides users with an initial, high-level 'scan' of the links between mitigation and adaptation actions and the SDGs. It is a first step in a journey that policy makers at the national and sectoral level will need to take to maximize sustainable development benefits while minimizing trade-offs as they design and implement mitigation and adaptation activities. Further country-specific analyses will be necessary to fully understand the linkages and to provide robust information on their magnitude, before countries can exploit synergies and manage potential trade-offs in a comprehensive way. Ultimately, better understanding of where mitigation actions can reinforce the achievement of SDG targets can increase countries' confidence to put forward more ambitious NDCs.

Given the complexities involved, further research is needed for a more in-depth understanding of the interactions between climate action and development within each sector to provide greater insights on the direction and magnitude of the potential impacts. The SCAN-tool is designed to give countries a platform from which to begin this. In a following stage, sector deep dives will be undertaken to map these linkages in greater detail, starting with mitigation actions in the energy supply sector.

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Annex: Relevant reviewed tools on SDG and NDC linkages

We provide an overview of the most relevant tools available in the field of SDG and NDC linkages and their main features.

Examining the alignment between the Intended Nationally Determined Contributions and Sustainable Development Goals (WRI, September 2016)

WRI published a working paper on the degree of alignment between (I)NDCs and SDGs. The paper identifies examples of alignment in 92 (I)NDCs based on key word searches and their relevance to specific SDG targets. The paper features an extensive and transparent Annex including a global mapping of the (I)NDCs' links to the SDGs. By using text analysis, the paper informs on linkages to SDGs that were explicitly mentioned by those developing the (I)NDCs.

Further studies have been developed on the basis of this working paper, such as for example "Connecting the dots: elements for a joined-up implementation of 2030 Agenda and the Paris Agreement." (WRI/GIZ forthcoming).

For more information, see: https://www.wri.org/sites/default/files/WRI_INDCs_v5.pdf and http://www.wri.org/sites/default/files/annex-1-global-analysis_0.pdf

SDG footprint of Asian NDCs: Exploring synergies between domestic policies and international goals (TERI, July 2017)

TERI carried out a study to explore the linkages between NDCs of Asian countries and the SDGs. The analysis was done using a content-textual approach, i.e. keywords were identified and searched for in the text of each NDC. The findings were further analysed for the strength of the match, i.e. whether they were direct matches (explicitly referenced in the NDC goals) or indirect matches (referenced in the background information on NDC goals). The report and several country profiles provide details regarding the country's key development indicators and GHG emissions; along with a snapshot of its commitment to combat climate change; and an analysis of the SDG footprint on its NDC. Overall, it informs on linkages to SDGs that were explicitly mentioned in the NDCs and provides some concrete country examples of the links.

For more information, see: <http://www.ndcfootprints.org/index.php>

UNDP Climate action impact tool: Assessing climate action contributions to the Sustainable Development Goals (UNDP, October 2017)

The bottom-up tool enables stakeholders to identify and quantify direct impacts, define indicators, set targets and track the progress of actions towards the SDGs. The tool is separated into various impact categories that are linked to the relevant SDGs allowing policy makers to track the impact of NDC mitigation actions on the SDGs. The tool can be applied to various types of climate actions defined under an NDC that are either national, regional, sectoral or local. The outcome of the tool is a very detailed and comprehensive assessment of each mitigation action. The robustness of the output depends on the quality and extent of quantitative and qualitative data provided by the user. This tool enables users to undertake their own detailed assessments, and could be quite complementary to the more generic initial guidance provided by the SCAN-tool developed by this project.

For more information, please see: <https://climateimpact.undp.org/#!/>

Climate Watch: Data on climate action (WRI, November 2017)

Climate Watch is an online platform managed by WRI in collaboration with several partners under the NDC Partnership. It brings together several datasets to enable users to analyse and compare the NDCs under the Paris Agreement, among other features. A section on sustainable development objectives identifies actual alignment between countries' NDCs and the SDGs. This assessment is based on findings of WRI's (2016) working paper described above.

For more information, please see: <https://www.climatewatchdata.org/ndcs-sdg>

NDC-SDG Connections: Connecting climate action to the Sustainable Development Goals (SEI, November 2017)

NDC-SDG Connections is a joint initiative of the German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) and Stockholm Environment Institute (SEI) to highlight synergies between the 2030 Agenda and the Paris Agreement, and thus to identify potential entry points for more coherent policy-making and action. The database is based on the identification of "activities" in the (I)NDCs, meaning statements on future (conditional or unconditional) activities under the NDC. From a total of 161 (I)NDCs, 7080 climate activities were derived. The NDC-SDG Connections initiative uses mainly text analysis, counting the frequency of key words as well as the volume of committed activities of a country in a certain policy sector. The analysis informs about potential linkages to SDGs that were explicitly mentioned in the NDCs in a visualised online format allowing also for country comparisons.

For more information, see: <https://klimalog.die-gdi.de/ndc-sdg/>

Other guidance documents that do not map or directly identify linkages between NDCs and SDG but are also available and we list some of them below. This is not an exhaustive list, but rather a compilation of tools and documents that have been made available recently, following the adoption of both agendas.

Aligning NDCs & SDGs Lesson learned and practical guide (UNDP, November 2017)

For more information, see: <http://www.undp.org/content/undp/en/home/librarypage/climate-and-disaster-resilience-/ndcs-and-sdgs.html>

Planning for NDCs implementation – A quick start guide and reference manual, Appendix 1: NDCs & SDGs

For more information, see: <https://www.cdkn.org/ndc-guide/book/planning-for-ndc-implementation-a-quick-start-guide/ndcs-and-the-sustainable-development-goals>