

Connections between the Paris Agreement and the 2030 Agenda

The case for policy coherence

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Abstract

Finalized in 2015, the Paris Agreement and the United Nations 2030 Agenda for Sustainable Development both represent universally approved policy visions that signal a paradigm shift: from a “top-down” approach of set, international mandates to a “bottom-up”, country-driven implementation process. Limited interaction between the processes of the two agendas at both global and national levels, however, threatens to impede effective implementation. Furthermore, aggregate analyses are lacking to enhance understanding of potential overlaps, gaps and conflicts between the two agreement’s key implementation instruments: the Nationally Determined Contributions (NDCs) and the Sustainable Development Goals (SDGs). Such analyses are essential to increase policy coherence of plans and strategies, and to improve effectiveness of implementation of the two agendas. This paper aims to fill this gap. It provides a global analysis that explores how the climate actions contained in countries’ NDCs connect to the 17 SDGs. The paper, which builds on the findings of the NDC-SDG Connections tool, demonstrates that NDC actions to various extents foster synergies with national development priorities that reflect the 2030 Agenda. The research further reveals those sustainable development-related issues that are directly addressed through climate action, and those issues that are currently absent from NDC activities. The paper demonstrates that the actions outlined in the NDCs to various extents foster synergies with national development priorities that reflect the 2030 Agenda. We find that a large number of climate activities support, for example, SDG 7 (affordable and clean energy), SDG 15 (life on land) and SDG 2 (zero hunger), but that significant gaps exist in relation to SDGs such as SDG 5 (gender equality), SDG 1 (no poverty) and SDG 16 (peace and justice). Increasing the transparency and understanding of these possible connections, gaps and conflicts can facilitate policy coherence and leverage buy-in for ambitious implementation of the two agendas.

1. Introduction

The Paris Agreement and 2030 Agenda both represent internationally agreed, universal visions. Their implementation is based on a “bottom-up” process, meaning that countries identify and subsequently act and report on their own priorities, needs and ambitions (Mbeva and Pauw 2016; Carraro 2016). This paradigm shift towards governance by goals, targets and contributions set by individual countries, as opposed to a “top-down” approach of set international mandates has created a debate in academia as well as in policy-making circles about how to coherently implement both agendas (Biermann et al. 2017, Bouyé et al. 2018, Janteschek et al. 2019; Roy et al. 2018). Horizontal policy coherence thus represents a key challenge. How can national climate policy be truly ambitious over the medium and long terms while also cohering with other important policy targets and objectives adopted by a government? At present, two processes are taking place in parallel with limited, if any, communication on the interfaces between them (UNDP 2017). Policy agendas are being set through two distinct channels: 1) National Sustainable Development Strategies (NSDS’s) intended to achieve the Sustainable Development Goals (SDGs) of the 2030 Agenda, and 2) the Nationally Determined Contributions (NDCs) intended to achieve the aims of the Paris Agreement

This situation raises issues related to the crafting and implementing of policies that can achieve the ambitious objectives of sustainability and climate change missions. These aims require knowledge about thematic alignments and potential goal conflicts, not only within but also between the two agendas (Lyer et al. 2018; Von Stechow et al. 2015). For example, can energy access for all be secured without relying on fossil fuels? Can climate adaptation be pursued in an inclusive way in unequal societies? Research on both the conceptual and empirical connections between the two agendas is emerging (see e.g. Pahuja and Raj 2017; UNFCCC 2017; Iacobuta et al. 2018; Huang 2018; GIZ 2018; Nguyen et al. 2018; Janteschek et al. 2019; Northrop et al. 2016). However, aggregate analysis is lacking to enhance understanding of overlaps and gaps between NDCs and SDGs that can increase policy coherence of plans and strategies, and to improve effectiveness of the implementation of both the Paris Agreement and the Agenda 2030. This paper aims to fill this gap.

In light of the multiple overlaps, the assessed NDCs can be regarded not only as climate plans but also as de facto sustainable development plans because they include many priorities that reflect the 2030 Agenda.

It provides a global analysis of countries' NDCs, and explores how climate actions connect with the broader sustainable development agenda. The paper uses NDC-SDG Connections,¹ an interactive online tool that highlights thematic contributions of NDCs to the 2030 Agenda (Brandi et al. 2017), and reveals areas related to sustainable development that are not included in countries' climate action plans.

Section 2 of this study explores the two historical processes that led to the Paris Agreement and the 2030 Agenda. Section 3 discusses our methodology. Section 4 presents the results of the analysis of possible NDC-SDG connections, and differentiates SDGs according to whether they have high, medium or low levels of connections with climate action. This section shows which climate actions are most relevant to the broader sustainability agenda, and it identifies themes that should be made more complementary to climate action through more adequately designed NSDS's. Section 5 then discusses the ways forward to meaningfully align the thematic implementation of both agendas (the 2030 Agenda and the Paris Agreement). Section 6 concludes by setting out next steps for research and analysis.

2. Connecting two separate global processes through coherent national implementation

2.1 The Paris Agreement and the Agenda 2030

In 2013, the Parties to the UN Framework Convention on Climate Change (UNFCCC) decided that each member state would submit a national climate plan, so called Intended Nationally Determined Contributions (INDCs), as the core mechanism for increasing climate ambition. This decision, representing a shift from the Kyoto Protocol process, created a bottom-up approach for the Paris Agreement. Countries are free to determine their own climate targets and instruments, expressed in nationally determined contributions (NDCs). Once a country ratifies the Paris Agreement, its INDC converts into an NDC. Many countries have already formally joined the Paris Agreement and converted their INDCs to NDCs, while a few countries have chosen to revise their INDC in the conversion process.² Under the provisions of the Paris Agreement, each country submits an updated every five years, with the aim of ratcheting up ambition compared with the previous NDC.³ The success of the Paris Agreement can be attributed to – and will depend on – these strategic documents. While initially intended to be documents outlining commitments to greenhouse gas reduction, the 165 submitted NDCs representing 192 Parties go far beyond the proposal to reduce emissions to mitigate climate change; they also mention numerous adaptation measures as well as other activities that promote sustainable development (Pauw et al. 2016).

The 2030 Agenda encompasses 17 SDGs (Figure 1), 169 targets and a declaration text articulating the principles of integration, universality, transformation and a global partnership. The agenda came into being through a unique global process of an open working group, which jointly developed the 17 SDGs that were subsequently agreed on by all UN member states (Beisheim 2015). The SDGs include the social, environmental and economic dimensions of development. They aim to provide a social foundation for humanity while ensuring that human development takes place within earth's biophysical boundaries (Rockström 2009). At national levels, implementation of the 2030 Agenda varies from country to country, and is based on national needs and ambitions. At the international level, the High-Level Political Forum (HLPF) meets annually under the auspices of the UN Economic and Social Council (ECOSOC) to discuss Voluntary National Reviews (VNRs) as part of the official follow-up and review mechanism of the 2030 Agenda (Beisheim 2018). However, individual countries are left to set-up an institutional architecture for implementing the SDGs at national and subnational levels through National Sustainable Development Strategies (NSDS's)⁴. Countries can also work in partnership with other countries to learn from each other's experiences on challenges in implementation.

¹ <http://ndc-sdg.info/>

² http://unfccc.int/focus/ndc_registry/items/9433.php

³ From here on, for consistency, we only use the term "NDC".

⁴ Subsequently, we use the abbreviation "NSDS's" to encompass all types of national and subnational strategies to implement the SDGs.

Figure 1: The 17 Sustainable Development Goals



Source: United Nations

The Paris Agreement and the 2030 Agenda rest on an architecture which can be described as “hybrid multilateralism” as it splices together state and non-state actions both in the state-defined contributions to the agreements as well as in the efforts initiated by UN organizations to orchestrate actions to reach the goals of the agreements (Bäckstrand et al. 2017). Their implementation is based on countries identifying, and subsequently acting and reporting on their own priorities, while non-state actors are formally expected to participate in overseeing and facilitating the implementation (Bäckstrand et al. 2017). However, different institutional, policy and administrative processes, different actors, and different datasets have been utilized to translate the global commitments of the 2030 Agenda and the Paris Agreement into national frameworks, institutions and actions (UNDP 2017). There is institutional fragmentation (Biermann et al. 2017) in the governance of climate change and sustainable development (Gupta and van der Grijp 2010), both at the global and the national level that impose an extra obstacle to coherent implementation processes.

To increase coherence in the implementation of these two agendas, more knowledge is needed, both at the global level and in national contexts. One approach to this end is to investigate the links between the NDCs and the SDGs. While NDCs are primarily a mechanism for climate action, many countries have used them to indicate other priorities and ambitions for sustainable development (Pauw et al. 2016). Individual NDCs are very different in scope and content to SDGs, and the SDGs were still being negotiated when countries were developing their NDCs; thus, the thematic areas through which NDCs address various SDGs are not clearly indicated, and further analysis is needed.

2.2 Connecting the two agendas through policy coherence

Understanding the connections between climate change and sustainable development is a first step needed to foster coherency of implementation of both agendas. The concept of policy coherence is commonly defined as matching of policies, processes and institutions at all government and governance levels to avoid contradictions and goal conflicts in policy making. Policy coherence in sustainable development addresses the systematic integration of policies, processes and institutions towards coherent implementation of sustainable development (OECD, 2018: 83; OECD 2001; ICSU 2017). Its importance is reflected in SDG 17.14 (enhance policy coherence for sustainable development), making it a key objective of the 2030 Agenda.

Policy coherence means that the combined policies addressing an area are compatible, mutually reinforcing or even synergistic, while incoherence means that they are conflicting or contradictory (May et al. 2006). For example, in the case of energy, policy coherence is a useful concept for understanding to what extent energy policy goals and other policy goals (economic, environmental, social) mutually support or undermine one another (Meuleman 2019; Tosun et al. 2017). Policies promoting electrification in rural areas (as one type of energy policy) can also help to improve rural infrastructure and therefore help to further SDG 4 that calls for inclusive and equitable education. On the other hand, if electrification is achieved through scaling-up of fossil fuels, trade-offs can arise with other goals or targets. Thus, evaluation of policy measures related to energy systems would need to consider their effects both on SDG 7 (affordable and clean energy) as well as on sustainable development more broadly (McCollum et al. 2018).

There have been calls to expose and mediate goal conflicts at an early stage for coherent implementation within political and socio-economic contexts in the short and long terms, at all levels of implementation, and across regions (OECD 2016; Kanter et al. 2016). For example, the use of biofuels for energy production would likely reduce greenhouse gas emissions, but could also negatively affect food prices through competition over land resources used for food production. Biofuels could harm ecosystems and biodiversity through increased expansion of monocultures. Biofuels would also likely affect soil and water through use of fertilizers and pesticides if these risks are not adequately addressed in the policy design (see e.g. Hasegawa et al. 2018; Bonsch et al. 2016). Thus, in this case, progress towards achieving SDG 7 could negatively harm progress towards achieving SDGs 2 (end hunger/promote sustainable agriculture), 6 (clean water and sanitation) and 15 (life on land/restore and protect ecosystems).

Analysing the potential impact of NDCs on SDGs allows insights into overlaps and gaps between the implementation of the Paris Agreement and the 2030 Agenda. This relationship is difficult to trace, however, because trade-offs are most often not mentioned in policy documents, and they are not formulated as direct actions. For a coherent implementation of the two agendas, adequate methods to identify trade-offs need to be developed, and an improved understanding of such interactions is required to manage potential goal conflicts and inconsistencies among economic, social and environmental policy objectives.

3. Methodology

The analysis in this paper focuses on understanding how NDCs address various SDGs beyond climate action. To do so, we use the NDC-SDG Connections tool (Brandi et al. 2017) to identify how NDC activities and targets relate to SDGs. The analysis behind the NDC-SDG connections presented here is based on a textual analysis of all NDCs or INDCs that were available in 2016.⁵ To create the database, the textual content of each NDC was examined to identify concrete “activities” – statements presenting a strand of future activity, conditional or unconditional, under the NDC. These disaggregated activities served as data points for the analysis. These activities were subsequently matched with one of the 17 SDGs. An activity description usually ranges between a minimum of one sentence and a maximum of three sentences. Where a statement applies to multiple SDG targets (as was the case for only a very limited number of activities, it was added to the database multiple times. In cases, where SDG targets overlap in their definition, we assigned an activity to only one of them (e.g. education in SDG 4.7 and SDG 13.3). We started by counting the frequency of key words as well as the volume of committed activities of a country in a certain policy sector. Coding stuck very much to the exact wording of the activity, but hand coding also was used to define close synonyms of certain activities (e.g. “water storage capacities” were coded as “infrastructure”). We coded the data points (NDC activities) for all 17 SDGs and their 169 targets in four broad categories:

At present, two processes are taking place in parallel with limited, if any, communication on the interfaces between them.

⁵ The lone exception is the Iraqi NDC, which was published in Arabic only. The 27 member states of the European Union all share one NDC, despite being individual parties to the Paris Agreement. This means that the same data will be presented for these countries.

1. Interpretation: Assessment of NDC activities according to their radius of influence (national, regional, local); type of climate action (adaptation, mitigation, both, or none); whether the activities imply capacity-building measures; whether the activities imply technological improvements (and if so, the type of technology); whether the activity mentions a quantifiable target to be reached; and whether the activity relates to a policy plan or strategy (and if so at what level).
2. SDG targets: Here we assessed whether a climate activity can be linked to specific SDG targets in their wording. For this purpose, we created a codebook that includes the wording of each SDG and its targets and also includes the official global indicators that follow each target.
3. Climate actions: We derived, inductively from the NDC activities, a set of the most frequently mentioned categories of action that could be attributed to the SDGs and SDG targets. This set of so-called climate actions varies for each SDG.
4. SDG themes/Cross-cutting themes: We also looked for broader socio-economic sectoral categories. Some themes closely relate to a particular SDG, but they can also be broader than one SDG, and may encompass two or even more SDGs (e.g. agriculture as a theme encompasses SDG 2 [zero hunger] and SDG 15 [life on land]). This approach helped reveal co-benefits indicated in the climate activities that go beyond a specific SDG. For example, if an activity targeted improvement in the agricultural sector it was coded as relevant for SDG 2.4 (maintain diversity of seeds, plants, animals), but if it also mentioned co-benefits for water efficiency (SDG 6.4) and forest management (SDG 15.2) it was coded as providing co-benefits on these respective SDG targets. In total, we identified 42 cross-sectoral categories, which we analysed across all 17 SDGs.

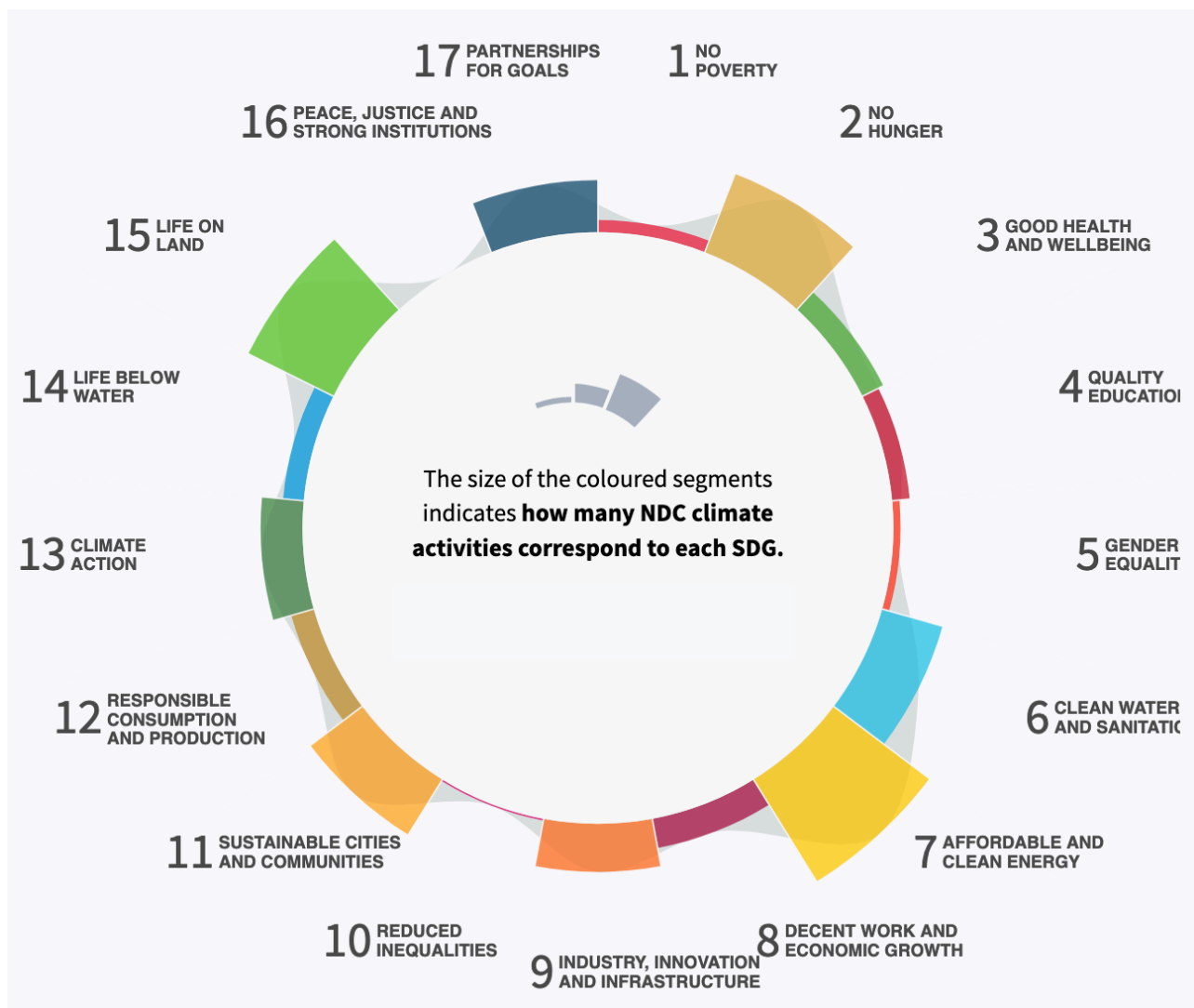
Overall, from 164 NDCs, we derived more than 7,100 activities. These activities were then used as data inputs for constructing the tool. To guarantee the reliability of our analysis we applied inter-coder reliability, meaning that always at least two independent coders went through the data material while a third final approval of the decisions taken was guaranteed for all the activities in the analysis.

One limitation of our analysis is that it does not address co-benefits and trade-offs that cannot be directly linked to the wording of the NDC climate activity alone. In that sense, a single climate activity would likely have a multitude of direct and indirect co-impacts on other SDGs, but we indicate only the SDG most directly addressed. Hence, we analyse only direct links, not indirect co-impacts. While this approach is powerful in identifying the strongest links and highlighting the sustainable development dimension of the NDCs and overlaps and gaps between the two agendas, it has the limitation of showing only positive interlinkages. More analysis is required to tackle this dimension to complement the focus and capacity of the tool. Moreover, there is a need to complement the current analysis of countries' NDCs through the SDG-lens with an analysis of their Voluntary National Reviews (VNRs), in which they report on their progress regarding the 2030 Agenda for Sustainable Development, and their links to the NDCs.

4. 2030 Agenda through a climate lens – main findings for how climate action complements the SDGs

This chapter presents results from NDC-SDG Connections. The analysis of 164 NDCs reveals strong connections between climate ambition and the broader sustainable development agenda (Figure 1). It shows, however, that not all SDGs are equally addressed by climate action. This chapter is structured as follows: Chapter 4.1 presents SDGs that have strong connections with climate activities ; Chapter 4.2 presents SDGs that have medium connections, and Chapter 4.3 presents SDGs that have hardly any overlap with climate activities.

Figure 2: Distribution of NDC activities in relation to the 17 SDGs



Source: ndc-sdg.info

4.1 The top tier: SDGs with the strongest connections to NDC activities

Analysis from the NDC-SDG Connections reveals that proposed activities in countries' NDCs most prominently cover six SDGs. Many climate activities commit to increase renewable energy sources and provide for more efficient energy technologies. Our research shows that six SDGs have the strongest connection to NDC activities. Ordered from those with the strongest to the weakest links, these six SDGs are:

- **Affordable and clean energy (SDG 7) links access to energy and energy efficiency measures to the key climate change objective to reduce greenhouse gas emissions.**
- **Life on land (SDG 15) reflects the role of ecosystems, forest management and land use in climate change mitigation and adaptation.**
- **No hunger (SDG 2) makes clear that sustainable and climate-smart agriculture is seen as a key solution in the fight to limit average temperature increase to below 2°C.**
- **Sustainable cities and communities (SDG 11) relates to climate activities focused on urban planning and public transport.**
- **Clean water and sanitation (SDG 6) relates to climate activities focusing on water efficiency and water ecosystem management.**
- **Partnerships for goals (SDG 17) highlights the importance of providing financial support, technology transfer, and capacity building for those countries that need it the most - particularly the Least Developed Countries (LDCs) and the Small-Island Developing States (SIDS).**

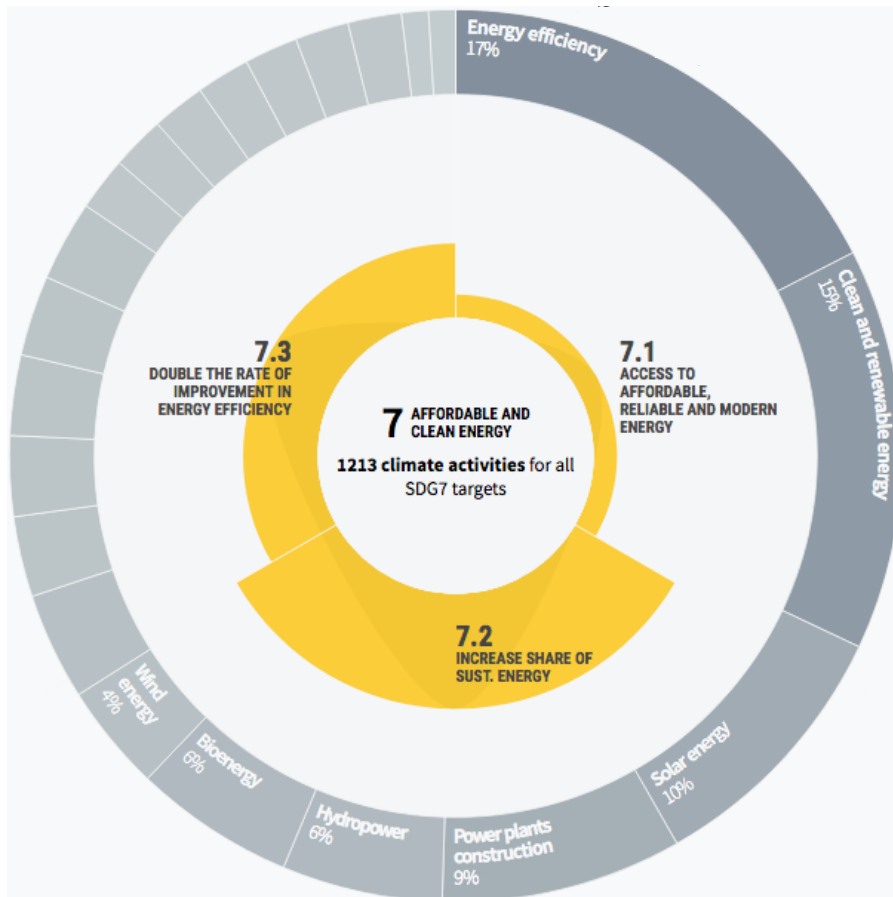
Strongest links to NDC activities: affordable and clean energy (SDG 7)

As dependence on fossil fuels for energy production is a key driver of climate change (IPCC 2014), changing energy systems is at the center of mitigation activities of NDCs and hence these activities contribute most prominently to SDG 7 (affordable and clean energy). Most countries flag renewable energy and energy efficiency as key climate actions in their NDCs, making SDG 7 the strongest point of connection with national climate plans. In that regard, SDG 7 connects with the highest share of NDC activities, 16% of the total.

Figure 2 shows how NDC activities connect with SDG 7. The inner circle of the figure displays how NDC activities connect with the respective targets of SDG 7. At the level of targets, more than 50% of NDC activities relate to SDG 7.2 (increase substantially the share of sustainable energy in the global energy mix), while 34% contribute to SDG 7.3 (double the global rate of improvement in energy efficiency). In the outer circle of the figure, we show the frequency (signified by the size of the segment) of specific climate actions attributed to that goal. In terms of specific climate actions, they correspond well with the SDG targets. Energy efficiency and clean and renewable energy are most important climate actions. In terms of specific energy sources, solar energy is the most popular renewable source of energy, followed by hydropower and bioenergy. Another key climate action is increasing energy efficiency measures (Figure 2).

For many low-income countries, however, the issue of high costs of renewable energy often has to be balanced with the need for increased energy access. Achieving the global goal of

Figure 3: Links between NDC activities and SDG 7 (affordable and clean energy)



Source: ndc-sdg.info

universal access to energy by 2030 in the Least Developed Countries (LDCs) will require a 350% increase in their annual rate of electrification. While on average 10% of people in other developing countries lack access to electricity, in LDCs this remains the case for more than 60% of the population (UNCTAD 2017). Thus, for the LDCs, implementing SDG 7 is mainly about energy access, and less about how to mitigate emission levels. While most renewable energy sources have historically been more expensive than fossil fuels, the price gap has narrowed rapidly in recent year and in some cases, it has even reversed (IRENA, 2018).

Dependence on fossil fuels for energy generation is a major driver of climate change and one of the biggest climate-related challenges (Rogelj et al. 2015). However, energy is central to multiple aspects of sustainable development (McCollum et al. 2018). For example, increased energy efficiency has the potential to create multiple co-benefits for social progress, and to enhance economic productivity (SDG 8). Moreover, the expansion of renewable energy production could help jointly fulfil SDG 7 and tackle climate change (SDG 13), but also improve health (SDG 3) through reduced air pollution (Braspenning Radu et al. 2016) and create new decent jobs (SDG 8) (Fankhauser et al. 2008). However, there are also important trade-offs – as evidenced, for example, by the role of wood as both an energy source and carbon sink (Cannell 2003), and by the potential competition over whether to use land to produce biofuels for energy or for food (central to the SDG 2 to achieve zero hunger) (Hasegawa et al. 2018). Moreover, hydropower may enhance achieving increase access to energy (SDG 7.1), and, at the same time, risks increasing competition for water resources (SDG 6) and, through the building of dams, hurting informal land title holders and marginalized people (SDG 1) (Winemiller et al. 2016.).

Figure 4: Links between NDC activities and SDG 15 (life on land)



Source: ndc-sdg.info

Given the important role of the energy sector in tackling GHG emissions, it is not surprising that most (97%) NDC activities addressing SDG 7 are climate change mitigation activities. However, the essential role of increased energy access for climate adaptation and the potential of off-grid renewable sources to provide such access should not be ignored in countries with low energy access and high risk of climate change impacts. Beyond this, only 31% of the climate activities we identified provide for quantifiable mitigation targets. In future updates of NDCs, we see room for improvement to raise the bar for quantifiable targets.

Second-strongest links to NDC activities: life on land (SDG 15)

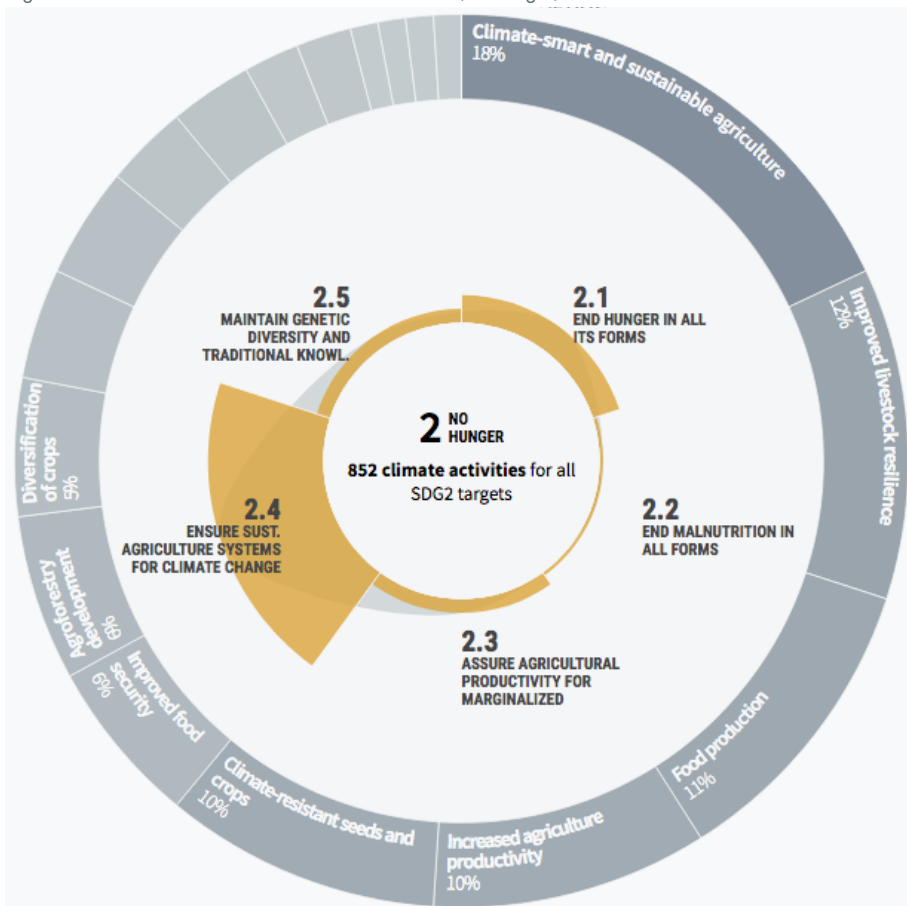
SDG 15 (life on land) ranks second in terms of links to NDC activities. It calls for protecting, restoring and promoting the sustainable use of terrestrial ecosystems. Climate change is a major driver of terrestrial ecosystem degradation, particularly desertification and biodiversity loss; at the same time, deforestation, unsustainable land use activities, and biodiversity loss, in turn, drive climate change. Forests and soils are major carbon sinks and can be used as powerful tools for climate change mitigation and integrated land-use activities to foster land degradation neutrality (UNCCD 2017). Activities in countries' NDCs have a strong focus on issues related to SDG 15, with 13% of the total number of activities related to this SDG. The most important climate actions for SDG 15 are forest management, ecosystem conservation and biodiversity, and afforestation. Several countries also highlight the importance of reducing emissions from deforestation and forest degradation (REDD+) activities for forest management. Beyond actions concerning forests and biodiversity, countries are also proposing softer measures, such as development of national parks and prevention of wildfires and land erosion (Figure 3).

However, climate mitigation activities that can be attributed to SDG 15 do not automatically foster sustainable development. Large-scale infrastructure projects, for example, can create severe trade-offs between climate change and sustainable development. With regards to REDD+, there is a lack of coherence between political goals and their translation into institutional structures and administrative processes. Whereas all mitigation approaches support sustainable development, there are few related global regulations or requirements, and those that exist are largely voluntary (Horstmann and Hein 2017).

In terms of SDG targets, more than half of the activities relate to SDG 15.2 (sustainable forest management, and halting deforestation). In addition, SDG 15.1 (conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems) and SDG 15.3 (restoring degraded land and combating desertification) are related to significant numbers of activities. In the context of SDG 15, there are thus many potential synergies between the implementation of the Paris Agreement and the 2030 Agenda. However, there are also gaps. Intended climate action fail to address issues surrounding species protection, invasive species and genetic resources, which are all important for achieving this goal. Furthermore, SDG 15 allows for opportunities to reach out to the United Nations Convention on Biological Diversity (CBD) in order to complement its work on ecosystem restoration (Bridgewater et al. 2015). This has largely been ignored in the NDCs.

In addition to the direct climate connections, several issues such as combating deforestation and land erosion, which are prominent in the NDC activities for this goal, have important connections with other SDGs, particularly SDG 2 (no hunger), SDG 14 (life below water), and SDG 6 (water and sanitation), in which the protection of mangroves and ecosystem resilience are synergetic

Figure 5: Links between NDC activities and SDG 2 (no hunger)



Source: ndc-sdg.info

elements. This indicates that systems of soil, water and biodiversity are intrinsically linked, and need to be balanced with water, energy and food security to achieve an integrated low-carbon and climate-resilient sustainable development pathway (Leininger et al. 2018, Müller et al. 2015a).

NDC activities under SDG 15 address climate change mitigation and adaptation in almost equal numbers (adaptation, 35%; mitigation, 29%; adaptation and mitigation, 22%). Resilient forests and natural ecosystems are critical to climate change adaptation of communities who benefit from their ecosystem services. Moreover, while forests and natural ecosystems play the role of carbon sinks, regulating the concentration of greenhouse gases in the atmosphere, they could also become a source of emissions when land-use change takes place. Beyond this, only 15% of the climate activities that can be attributed to SDG 15 contain quantifiable measures. This illustrates once more the room for improvement in the process of updating NDCs to enhance quantification of what can be achieved in the forest and land-use sector to contribute to halting climate change (Minasny et al. 2017, Lal 2016).

Third-strongest links to NDCs activities: no hunger (SDG 2)

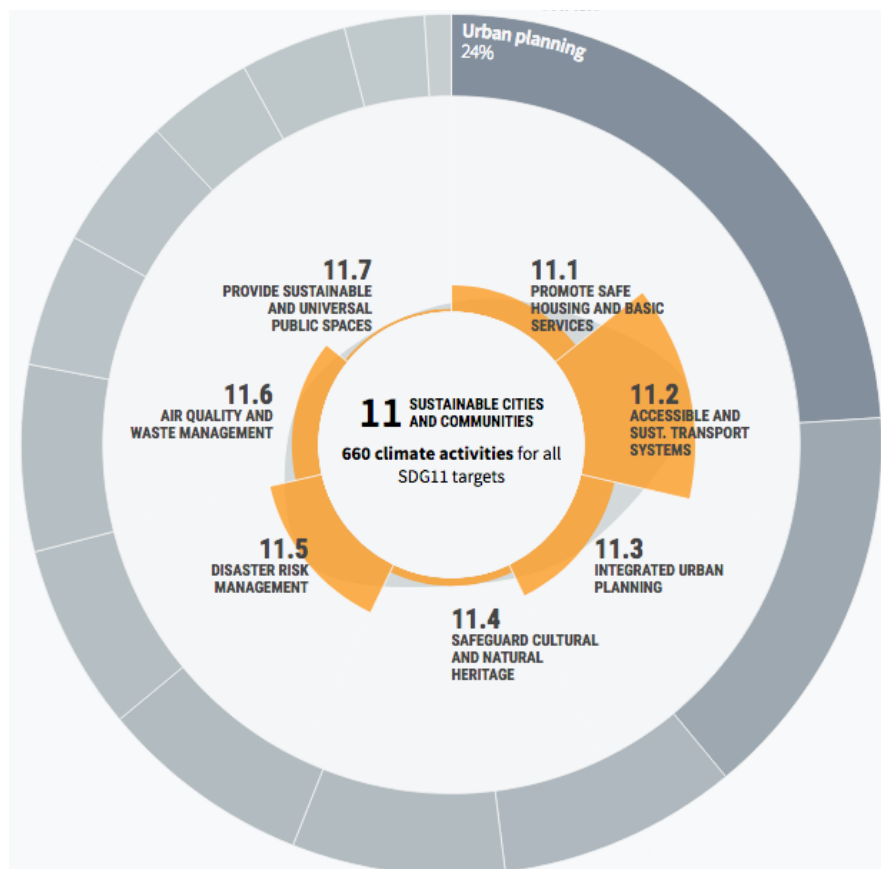
SDG 2 (no hunger) ranks third in terms of the number of connections with NDCs. SDG 2 is connected to the third-largest share (13% of the total) of NDC activities. Ending hunger, achieving food security, improving nutrition, and promoting sustainable agriculture lie at the core of this SDG. But most of the activities for SDG 2 center on climate-smart agriculture: developing the technical, policy and investment conditions to increase food security and agricultural incomes through climate-resilient, low-emission agriculture (Figure 4). Climate-smart agriculture is at the core of countries' climate ambitions to end hunger; this makes it both a prominent climate action and at prominent matter for sustainable development, as evidenced by SDG 2.4 (ensuring sustainable agriculture systems for climate change (Lan et al. 2018, FAO 2016)). However, while climate-smart agriculture is being championed by the UN's Food and Agriculture Organization (FAO) as the main pathway to reducing emissions and building resilience in agriculture (FAO 2016), it is also a contested area in which civil society, international organizations and transnational corporations aim to control the discourse over production, finance and technology (Newell and Taylor 2018; Clapp et al. 2018).

Effects of climate change can have severe impacts on agricultural production and, hence, on food production and food security. This is evident in countries' NDCs, which signal the importance of climate actions related to food production and improved food security, livestock resilience, and climate-resistant seeds and crops. On the other hand, few activities relate to SDG 2.2 (end malnutrition), SDG 2.3 (assuring productivity for the marginalized) or SDG 2.5 (maintaining genetic diversity and traditional knowledge). These issues, together with land rights and livelihoods for farmers, need to complement SDG 2 ambitions, illustrating the need for countries' climate ambitions to be complemented with other national development plans and strategies to meaningfully integrate both agendas in implementation at the national level.

Climate actions that focus on making agricultural production more sustainable also create co-benefits for improved water management (SDG 6), raising the need for irrigation; drought-resistant seeds and integrated water resource management; land-use management and forestry (SDG 15) through soil management, livestock and agroforestry; and economic growth (SDG 8) through improved livelihoods.

NDC activities that address SDG 2 mostly tackle climate change mitigation (60%), reflecting the large share of global greenhouse gas emissions attributed to this sector. However, as the impacts of climate change begin to be felt more strongly, resilience of agricultural systems becomes a critical element in ensuring food security around the world. Only 10% of NDC activities assigned to SDG 2 address climate change adaptation, and just 21% address both adaptation and mitigation. Moreover, only 7% of the climate activities provide for quantifiable emission reduction targets. Given the immense attention that was brought to the role of

Figure 6: Links between NDC activities and SDG 11 (sustainable cities and communities)



Source: ndc-sdg.info

agriculture through the “4 per 1000” Initiative⁶ to halt climate change in 2015, there may be opportunities to learn how to best increase the number of commitments that can be quantified.

Fourth-strongest links to NDCs activities: sustainable cities and communities (SDG 11)

SDG 11 (sustainable cities and communities) ranks fourth in terms of the number of links with NDCs. SDG 11 calls for making cities and other human settlements inclusive, safe, resilient and sustainable, and aims at improving access for all to housing, public spaces and basic services, while improving urban planning to guarantee a more sustainable urbanization process. This reflects and underscores the importance of cities and communities when it comes to halting climate change (WBGU 2016). More than 70% of all greenhouse gas emissions are generated by cities (Seto et al. 2014). Moreover, cities are often highly vulnerable to the impacts of climate change and natural disasters more generally. Cities – and the global urbanization trend – play a central role in achieving sustainable development worldwide and are of particular relevance to the prospective success of both the Paris Agreement and the 2030 Agenda (Brandt 2018).

SDG 11-related issues are present in 9% of total NDC activities and 82% of all NDCs include urbanization-related climate activities. At least one NDC activity relates to each of the targets under this SDG, but the most prominent targets are SDGs 11.2 (accessible and sustainable transport systems), 11.5 (disaster risk management) and 11.3 (integrated urban planning). Commitments to clean fuels, public transport, electric vehicles as well as focus on low carbon intensive transport via ship and railway are at the core of climate actions that pay into SDGs

⁶ See <https://www.4p1000.org/> for further information.

11.2 and 11.3, while early warning systems emphasize climate action towards SDG 11.5 (Figure 5). NSDS's to implement the SDGs could meaningfully complement this transport supply commitment with transfer schemes to increase access and willingness to use public transport systems and reduce the number of private vehicles which in return has valuable repercussions for achieving other SDGs at the same time.

If current urban construction trends continue, limiting global warming to 2°C will be nearly impossible. Hence, it is not surprising that climate activities have a major focus on cities, and on issues such as clean transport and air quality. However, given the ongoing trend of emerging megacities and urbanization of small- to medium-size cities, climate activities could improve by focusing more on planning that anticipates (informal) settlements and community-based development issues. If NDCs make integrated urban planning the focus of their commitments, a more planned process could replace processes that instead adjusting to continuously worsening situations in emerging medium-size and mega-cities. Transformative urbanization policies can help to implement both the Paris Agreement and the 2030 Agenda (WBGU 2016). SDG 11-related issues such as transport, infrastructure and disaster risk management link up with several other SDGs. For instance, new and renovated infrastructure in cities would have to take into account requirements under SDG 9 (industry, innovation and infrastructure), while measures to address potential flooding and other water-related disasters in cities would touch upon SDG 14 (life below water). SDG 11 has a strong cross-cutting character and contributes to a multitude of SDGs, due to the complexity and spread of cities.

Cities are expected to provide housing for 68% of the world population by 2050 (UN Habitat 2016), requiring substantial investments for adaptation and climate-proof expansion. Moreover, as indicated above, cities make up for 70% of all greenhouse gas emissions (Seto et al. 2014). Therefore, a large share of climate change mitigation activities is expected to take place in cities, and these can be closely linked to transport system changes (mitigative measures) as well as disaster risk management (adaptive measures). It is, therefore, not surprising that NDC activities attributed to SDG 11 tend to tackle climate change mitigation and adaptation in comparable amounts – 35% adaptation, 47% mitigation, and 17% adaptation and mitigation concurrently.

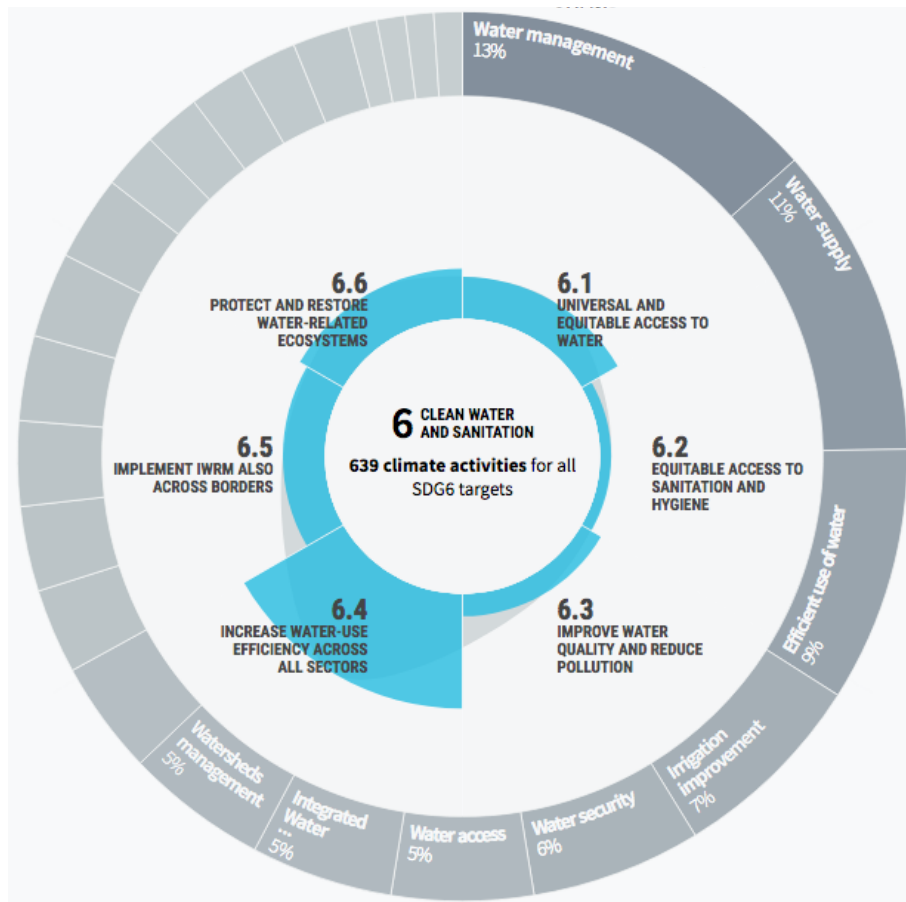
Beyond this, only 11% of the commitments are quantifiable in their nature of commitment. Considering the large share of mitigation activities, we see room for improvement especially in the transport sector, for NDCs to raise ambitions towards more quantifiable emission reduction and creation of co-benefits for example health through reduction of air pollution.

Fifth-strongest links to NDCs activities: clean water and sanitation (SDG 6)

SDG 6 (clean Water and sanitation) contains targets on resource efficiency, water governance, transboundary management, and provision of sanitation for all. Transition towards a low-carbon and climate-resilient society will increase the multiple demands on both water and land resources (Müller et al. 2015a). Hence, climate change is closely intertwined with the availability of and demand for water resources. For instance, climate change and extreme weather events can intensify water scarcity, especially in countries where access to water is already an issue – making water resource management an important element of adaptation (World Water Council 2018). At the same time, climate change-related flooding can spread water-borne pollution and diseases, particularly in areas with poor sanitation infrastructure.

In total, 630 NDC activities, equaling 9% of the total number of activities. They relate mainly to improving water management and increasing efficiency in water supply. At the level of targets, SDG 6.4 (increase water-use efficiency across all sectors) is the most commonly addressed in climate activities. Thus, most activities related to SDG 6 focus on water, while sanitation fails to attract the same level of attention. For example, SDG 6.2 (equitable access to sanitation and hygiene) receives least attention of the six targets (Figure 6). Room for improvement can be seen in regard to wastewater treatment; this is an issue area that has potential to address water sector

Figure 7: Links between NDC activities and SDG 6 (clean water and sanitation)



Source: ndc-sdg.info

mitigation, and, at the same time, to decrease stress in many countries worldwide that face stress from high pollution levels. Household-level provision of sanitation facilities as such is not in the radius of climate activities, even though such provision can be an element that meaningfully complements climate activities when implementing the SDGs at national level.

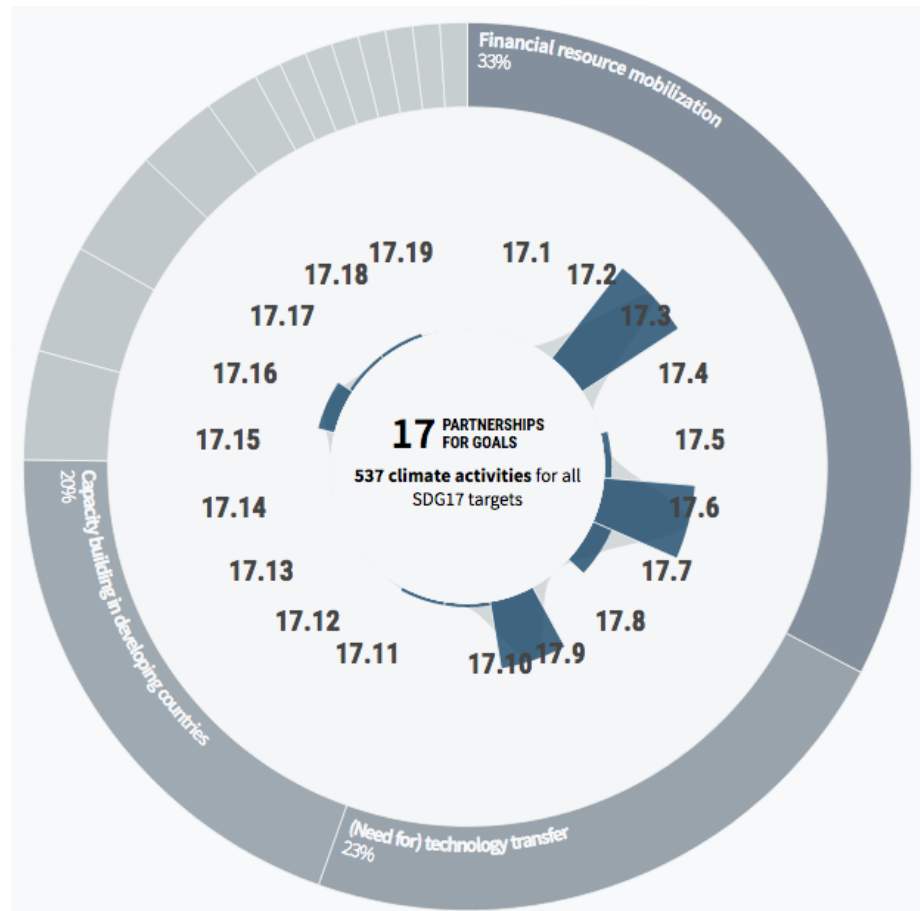
Achieving SDG 6 is also crucial to achieve multiple other SDGs, such as food security (SDG 2), health and well-being (SDG 3) and poverty eradication (SDG 1). Beyond these co-benefits from water activities, water resources are needed as an input to achieve multiple other SDGs, such as renewable energy from hydropower (SDG 7) (Dombrowsky and Hensengerth 2018, Ringler et al. 2013, Weitz et al. 2014) as well as responsible production of raw materials and substitutes for plastic (SDG 12) (Müller, et al. 2015b).

SDG 6 mainly consists of adaptation measures (87%), with only 3% of activities relating to mitigation. Increasing mitigation opportunities from the water sector remains a relatively untouched issue area in both academia and policy. However, water management's impact on greenhouse gas emissions is not irrelevant. For example, irrigation systems are both energy intensive and require more fertilizer than most rainfed systems (Siebert et al., 2010). Furthermore, sewage treatment can be a major source of methane emissions, but this can also be captured as biogas (Never and Stepping 2018).

Sixth-strongest links to NDCs: partnerships for goals (SDG 17)

Addressing climate change requires financial resources, the widespread adoption of new technologies (Iyer et al. 2018), capacity building, climate-friendly trade policies (Dröge et al. 2016; Brandt 2017), improved policy coherence, and intensive global cooperation. SDG 17

Figure 8: Links between NDC activities and SDG 17 (partnerships for the goals)



Source: *ndc-sdg.info*

(partnerships for goals) calls for strengthening the means of implementation to reach the goals, and in particular global partnership to work towards sustainable development. It has no fewer than 19 targets covering a wide range of areas. These are set out in five subsections: finance, technology, capacity building, trade and “systemic issues” (policy and institutional coherence). It is therefore not surprising that SDG 17 is one of the most important SDGs for climate change. In total, around 7% of NDC activities are connected to SDG 17. The most represented targets of Goal 17 are SDG 17.3 (mobilize additional financial resources for developing countries from multiple sources), SDG 17.6 (enhanced North-South, South-South and triangular cooperation on and access to science, technology and innovation and enhanced knowledge sharing) and SDG 17.9 (enhanced international support for capacity building in developing countries). In terms of climate actions, most activities relate to financial resource mobilization, capacity building, research and technology cooperation. With more than 86% of the NDCs including activities corresponding to SDG 17, it seems clear that the relevance of international partnerships is truly global (Figure 7).

In the area of finance, SDGs 17.1–17.5 call for mobilization of resources from many sources, including within developed countries. Developed countries have committed to mobilize US\$100 billion a year in climate finance by 2020. As many developing countries condition their NDC activities on the prospect of assistance and partnership (Pauw et al. 2016), international development finance for climate action and sustainable development is a critical issue and key to achieve the long-term goals of the two agendas. Moreover, one of the key objectives of the Paris Agreement is to make all financial flows consistent with low-carbon and climate-resilient development pathways. The need for international partnerships and financial support both for climate mitigation and for adaptation is reflected in the type of identified NDC climate activities

that are almost equally addressing each area – 21% adaptation, 29% mitigation, 41% adaptation and mitigation concurrently.

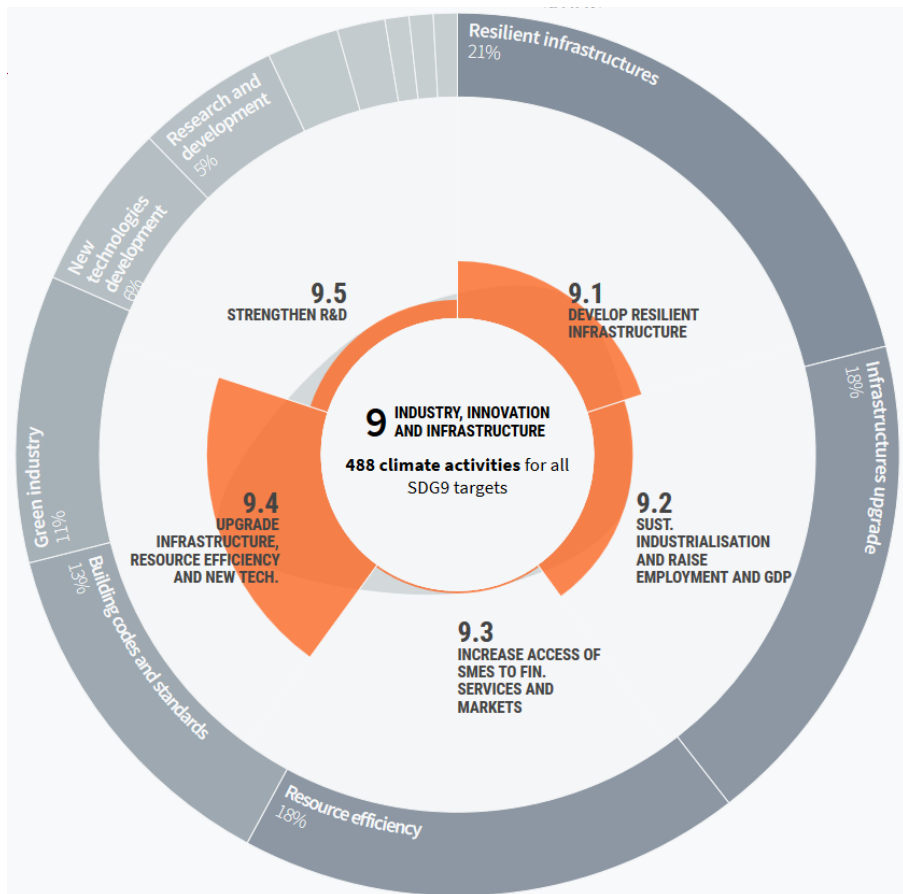
4.2 The middle tier: SDGs with mid-level connections to NDC activities

Beyond the six SDGs with strong connections, several climate activities contribute to other SDGs, but to a limited extent. The most prominent goal in this category is SDG 9 (industry, innovation and infrastructure), which is seen as a crucial driver of economic growth and development. Following is SDG 13 (climate action), with its strong focus on adaptive capacity and climate education. In this category, there is also SDG 8 (decent work and economic growth), which aims to increase labour productivity and reduce the unemployment rate; SDG 3 (good health and well-being), where efforts are made to alleviate negative health impacts from climate change; SDG 14 (life below water), focusing on conservation and sustainable use of the oceans, seas and marine resources; and lastly, SDG 4 (quality education), which places obtaining a quality education as a foundation for achieving sustainable development. The remainder of this section presents the pertinent findings at target and climate action levels for the respective goals, aiming to highlight potential overlaps and gaps between climate activities and sustainable development.

Industry, Innovation and Infrastructure (SDG 9)

SDG 9 (industry, innovation and infrastructure) lies at the intersection of infrastructure, energy, and housing. This goal calls for building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. Sustained investment in infrastructure and innovation are seen as crucial for economic growth as well as for low-carbon and

Figure 9: Links between NDC activities and SDG 9 (industry, innovation and infrastructure)



Source: ndc-sdg.info

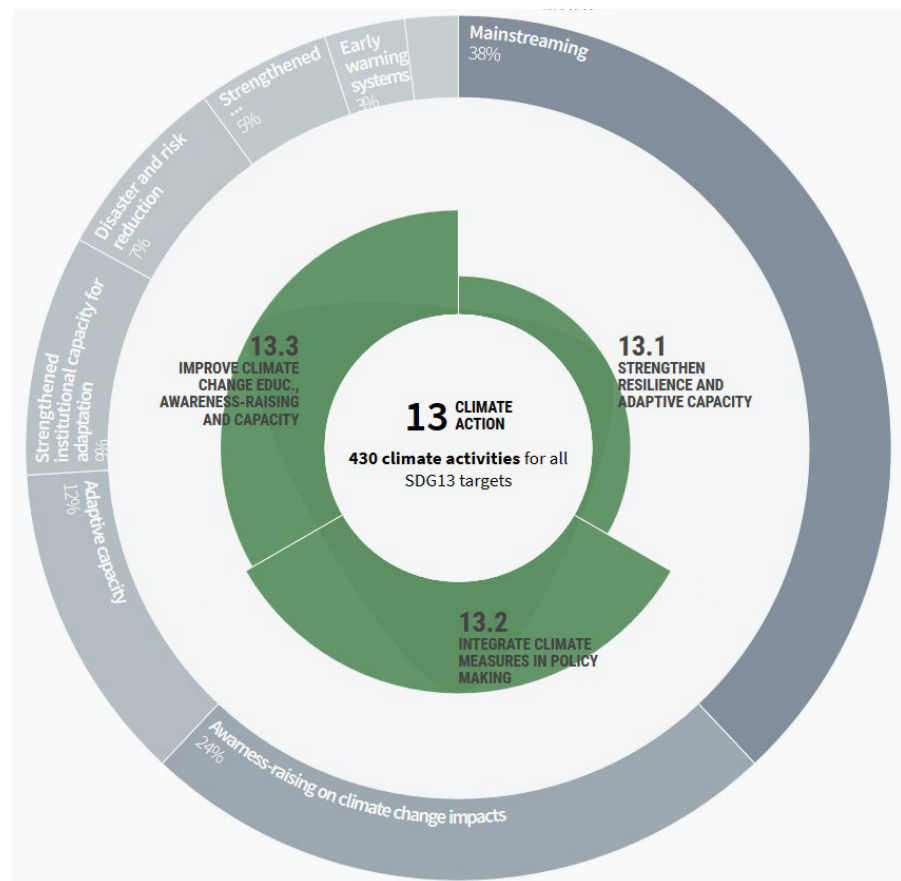
climate-resilient development (New Climate Economy 2016). Around 7% of NDC activities are connected to SDG 9. The majority of relevant climate actions focus on building new and upgrading existing infrastructure. To do this, issues such as resource efficiency, promotion of green industry, and revisiting building codes and standards are particularly important.

Under this SDG, more than half of NDC activities relate to SDG 9.4 (upgrading infrastructure, resource efficiency and new technologies), while 25% relate to SDG 9.1 (resilient infrastructure) (Figure 8). The implementation of the Paris Agreement to limit global warming requires substantial investments in cleaner infrastructure (McCollum et al. 2018). On the one hand, existing infrastructure will need to be upgraded, for instance, by improving efficiency and reducing emissions of coal power plants, installing carbon capture and storage, but also by improving energy efficiency in current buildings, greening public transport. On the other hand, new infrastructure will be essential for a full transition to carbon neutrality, in particular in the energy sector where renewable energy sources would need to replace existing fossil fuel-based power plants, and to account for increasing energy demand.

The NDCs recognize that climate-resilient infrastructure is a key factor for decreasing socio-economic and bio-physical vulnerability. Climate impacts such as sea-level rise, flooding and other extreme weather events make this SDG particularly important for vulnerable countries. While new and upgraded infrastructure will be essential for the transition to a low-carbon economy, this is also needed to increase resilience of communities.

NDC activities in this SDG additionally interact with other sectors, such as housing and industry (SDG 11) and energy (SDG 7). Many activities discuss new and resilient infrastructure under the mandate of energy savings and resource efficiency. There are, however, gaps between

Figure 10: Links between NDC activities and SDG 13 (climate action)



Source: ndc-sdg.info

NDC activities and the full ambitions of this goal. For example, focus is lacking on the need to strengthen both the capacities of small- and medium-sized enterprises (SMEs) and ambitions in climate- and sustainable development-related research and development.

Close to two thirds (63%) of NDC activities connected to SDG 9 contribute to climate change mitigation, highlighting once more the large number of activities that address infrastructure upgrades for resource efficiency, buildings codes and green industry, among others. SDG 9 also contributes to adaptation through development of resilient infrastructure, but to a far lesser extent. Finally, 93% of all activities are not quantified, but expressed merely in general terms.

Climate Action (SDG 13)

Combating climate change is naturally present in all NDC activities. Failing to address climate change impacts can undermine progress towards most SDGs (Le Blanc 2015). Many activities not only declare mitigation targets but also cite the importance of adaptation. While it might sound strange that SDG 13 climate action is not the most prominent SDG, a key message from NDC-SDG Connections is that NDCs go beyond SDG 13, and that climate action is a concern for the whole spectra of sustainable development (Dzebo et al. 2017). While all NDCs are inherently connected to climate change, only 6% of activities directly correspond to SDG 13 and its targets. A reason for this is that the SDG targets are relatively narrow, focusing on resilience and adaptive capacity (13.1), policy mainstreaming (13.2) and education and awareness (13.3), which has overlaps with SDG 4.

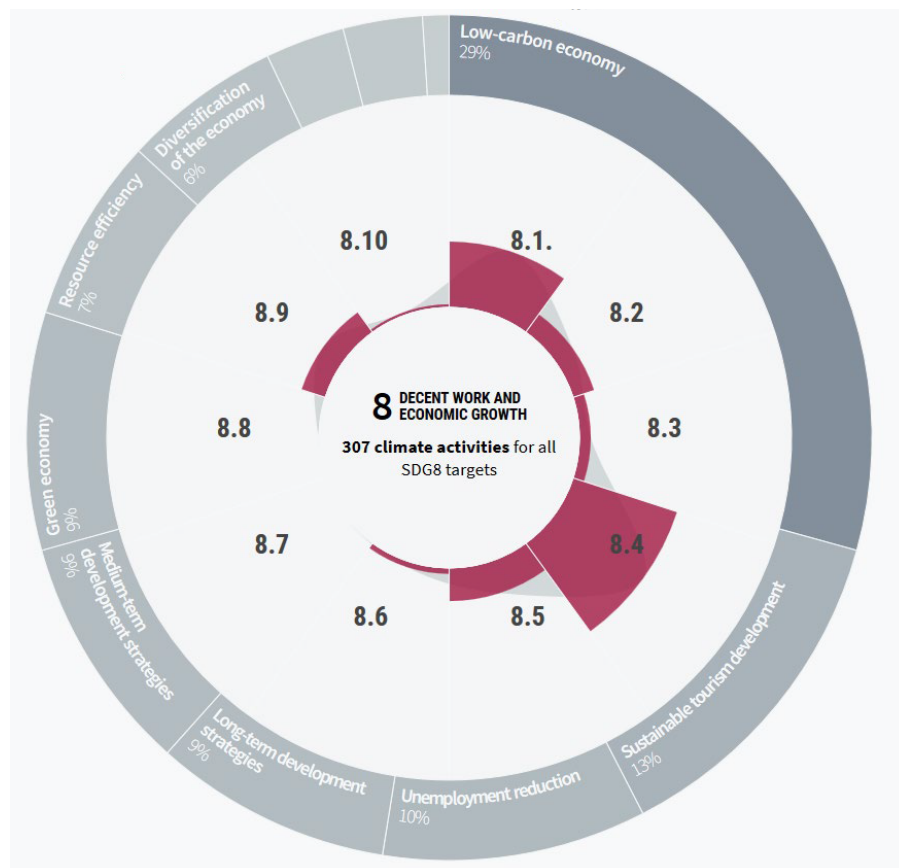
At the level of targets, the NDC activities most frequently relate to SDG 13.2 (integrate climate change measures into national policies, strategies and planning) and SDG 13.3 (improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning), with a bit less focus on SDG 13.1 (strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries). Following from the logic of the targets of SDG 13, two-thirds of the activities relate to climate change adaptation. In terms of climate actions, countries address mainly issues around mainstreaming climate change into national policies and strategies, increasing awareness-raising on climate impacts, and on building adaptive capacity (Figure 9).

The 2030 Agenda reflects the centrality of climate change mitigation and adaptation for global sustainable development. Climate change issues cut across the agenda, appearing in targets under several other goals. SDG 13 acknowledges that the UNFCCC is the main forum for negotiating the global climate response. It does not set specific, measurable targets for mitigation or adaptation, leaving that task to the Paris Agreement. Many activities in SDG 13 refer to themes highly relevant for other SDGs, including energy (SDG 7) and education (SDG 4) as well as resilience and disaster risk management, which appear under several SDGs, most notably SDG 2 (zero hunger) and SDG 11 (sustainable cities). However, NDC activities under SDG 13 disproportionately address climate change adaptation (67%) as compared to mitigation (9%, and 21% adaptation and mitigation concurrently). This is in part due to the aim of SDG 13 targets, which individually address adaptation (13.1), but not mitigation. Another contributor is the finding that only 1% of climate activities attributed to SDG 13 are quantifiable. SDG 13 is mainly about awareness raising and procedural change, and less about transformation towards a low-carbon society.

Decent work and economic growth (SDG 8)

SDG 8 (decent work and economic growth) aims to achieve full and productive employment, and decent work, for all women and men by 2030. Thus, the main focus areas are: economic growth and economic development through sustained, inclusive and sustainable growth; full and productive employment; and decent work for all. Two additional key elements are: improving resource efficiency and decoupling economic growth from

Figure 11: Links between NDC activities and SDG 8 (decent work and economic growth)



Source: ndc-sdg.info

environmental degradation (UNEP 2011; Schandl et al. 2016; Rockström et al. 2017; New Climate Economy, 2018).

The SDG 8-relevant activities in countries' NDCs focus mainly on promoting a low-carbon economy, sustainable tourism, and unemployment reduction. In general, NDCs underscore the significance of SDG 8, with 4% of NDC activities connecting to this SDG. The bulk of NDC activities largely relate to just two of the 10 targets: SDG 8.4 (improve global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation) and SDG 8.1 (sustain per capita economic growth in accordance with national circumstances). Recurrent climate actions are promoting a low-carbon economy, sustainable tourism (also SDG 8.9) and reducing unemployment (also SDG 8.5) (Figure 10). Limiting global warming to no more than 2°C require a fast and radical transformation of the economy, while a temperature increase limit of 1.5°C is even more disruptive and requires global CO₂ emissions to reach net zero by 2050 at the latest, as shown by the IPCC Special Report on Global Warming of 1.5°C (IPCC 2018).

NSDS's could complement climate policies related to this goal by focusing on issues such as increased access to financial services, protecting labour rights, and eradicating forced labour. Poor communities are most vulnerable to climate change impacts due to their low capacity to adapt, and the fact that they are more often located in disaster-prone areas. In that sense, more than two-thirds of NDC activities related to SDG 8 focus on adaptation. However, mitigation also plays an important role for SDG8 because it is expected to substantially transform countries' economies and affect labour in various sectors (Babiker and Eckaus, 2007; ILO, 2010; Fankhauser et al. 2008).

Figure 12: Links between NDC activities and SDG 3 (good health and well-being)



Source: ndc-sdg.info

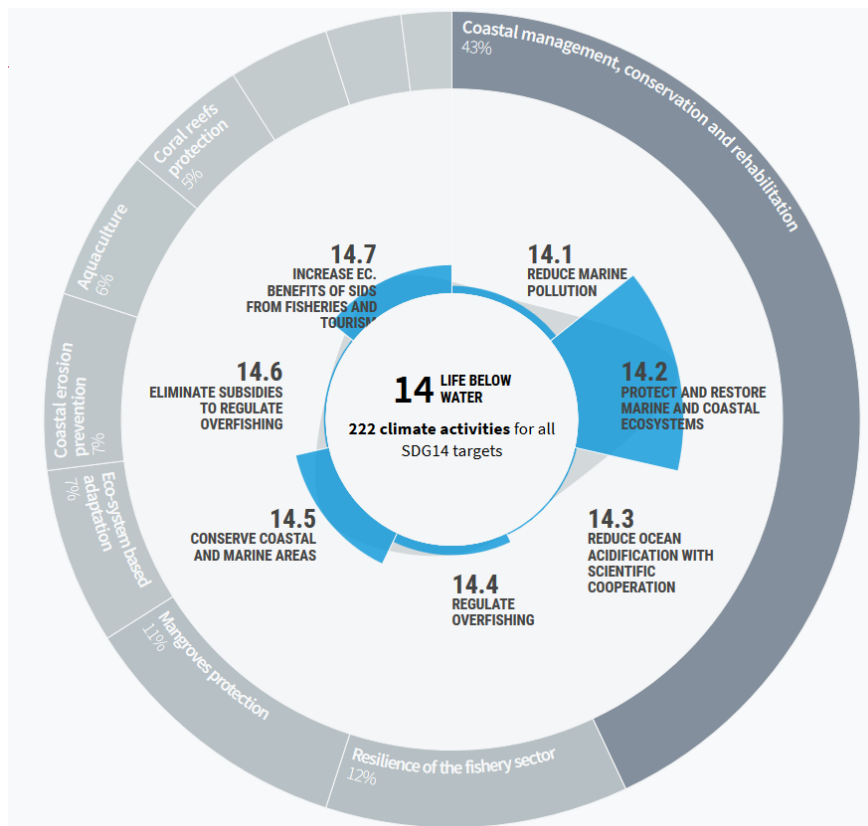
Good health and well-being (SDG 3)

SDG 3 (good health and well-being) focuses on preventing disease, reducing preventable deaths, and boosting health and well-being by improving access to health care services, promoting healthy lifestyles, and ensuring a healthy and safe environment for all. NDC activities have great potential to contribute directly and indirectly to this SDG, both through mitigation – for instance, by improving air quality (Braspenning Radu et al. 2016) – and through adaptation – for instance, by increasing resilience of communities in high-risk areas (Watts et al. 2015; Watts et al. 2017). In that regard, many climate actions relevant to SDG 3 relate to reducing climate-induced health risks and preventing communicable diseases (see also Wu et al. 2016). Climate change itself can lead to increased spread of tropical diseases such as malaria. At the same time, climate change indirectly affects health for all through deteriorating air, soil and water quality. Climate-related extreme weather events not only directly cause deaths and injuries, but can also harm health care services and vital infrastructure (Smith et al. 2014).

These important links are, however, poorly reflected in the NDCs as just over 3% of all NDC activities mention health, indicating a lower priority compared with other sectors. The focus of SDG 3-relevant climate actions is on SDG 3.3 (end epidemics and other communicable diseases), SDG 3.9 (reduce illness and deaths from chemicals and pollution), and SDG 3.8 (provide access to universal health care and vaccinations). Beyond these targets, climate actions are primarily concerned with reducing climate-induced health risks, and preventing the spread of communicable diseases (Figure 11).

Beyond these links are opportunities to work with closely linked sectors such as sanitation (SDG6) and nutrition (SDG2), gender equality (SDG5), and reduced inequalities (SDG10) – all of which have the potential to play important roles in dealing with health-related climate impacts.

Figure 13: NDC activities linked to SDG 14 (life below water)



Source: ndc-sdg.info

The link to effects on global health of these activities is not very strong; this connection should be made clearer (Dickin and Dzebo 2018).

NDC activities related to SDG 3 mostly tackle climate change adaptation, as they focus on provision of universal, improved and resilient health-care systems. However, as indicated above, climate change mitigation can also play an important role in achieving SDG 3 targets related to pollutants, particularly through a direct reduction in air pollutants through the reduced use of fossil fuels.

Life below water (SDG 14)

Climate change is a threat to ocean ecosystems and to coastal communities and livelihoods that depend on marine resources. SDG 14 (life below water) focuses on conserving and sustainably using the oceans, seas and marine resources. The oceans provide livelihoods for a sizeable share of the world population. Many communities in developing countries depend heavily on marine resources and fishing. Climate change is linked to the warming of the world’s oceans. This threatens marine ecosystems and affects global weather patterns. It also causes sea level rise, which threatens many coastal communities, including major cities, and accelerates coastal erosion. In addition, warming seas and ocean acidification are likely to reduce the capacity of the oceans to act as a carbon sink.

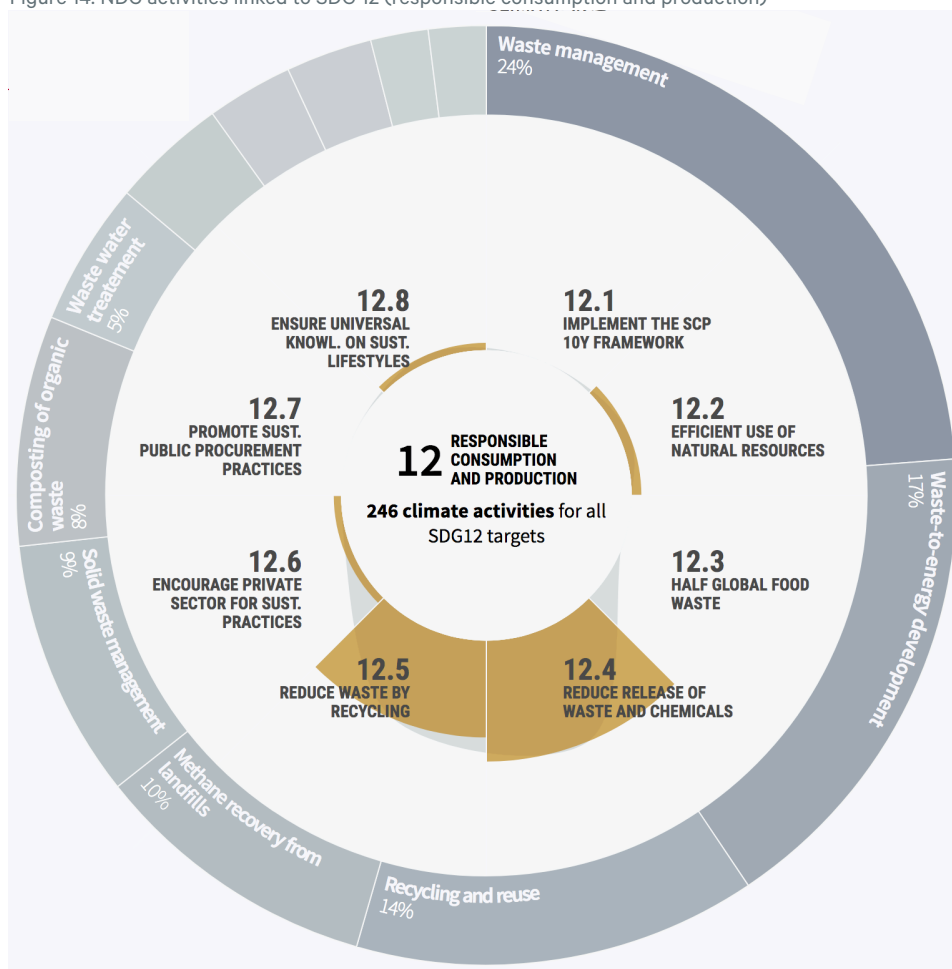
Only around 3% of NDC activities relate to SDG 14. This means that the focus on oceans is well behind other climate-sensitive areas. As Figure 12 shows, NDC activities are primarily concerned with coastal management and protection (in particular of mangroves), and on increasing resilience of the fish stock. In terms of SDG targets, SDG 14.2 (protection and restoration of marine and coastal ecosystems) is relevant to the largest share of these

activities, followed by SDG 14.5 (conservation of coastal and marine areas) and SDG 14.7 (increasing economic benefits to small island developing states and least-developed countries from marine resources). Pertinent issues such as marine pollution, particularly from micro-plastics, and ocean acidification are largely excluded from NDCs. However, climate change is an important stressor on marine and coastal ecosystems. It is associated with significant adverse impacts, including ocean acidification and coral bleaching (Hughes et al. 2003).

Most activities (roughly 70%) related to this SDG are adaptation oriented. Furthermore, despite its focus on life below water, achieving SDG 14 is highly dependent on terrestrial activities and vice versa. Thus, ocean health is central to multiple SDGs (Unger et al. 2017; Neumann and Unger 2019). Issues such as coastal protection, mangrove protection, and land use and management have strong synergies with SDG 2 (no hunger) and SDG 15 (life on land).

In order to emphasize the lack of ocean-related climate action, in 2017 the UN organized an Ocean Conference, focused particularly on Small Island Developing States. The aim was to raise the profile of the many threats that are affecting the world’s oceans and, in turn, people’s lives. Among the issues addressed were: climate change, land-based pollution, coral bleaching, overfishing, marine habitat degradation, ocean acidification, and the importance of healthy oceans to sustainable development and the achievement of the SDGs.

Figure 14: NDC activities linked to SDG 12 (responsible consumption and production)



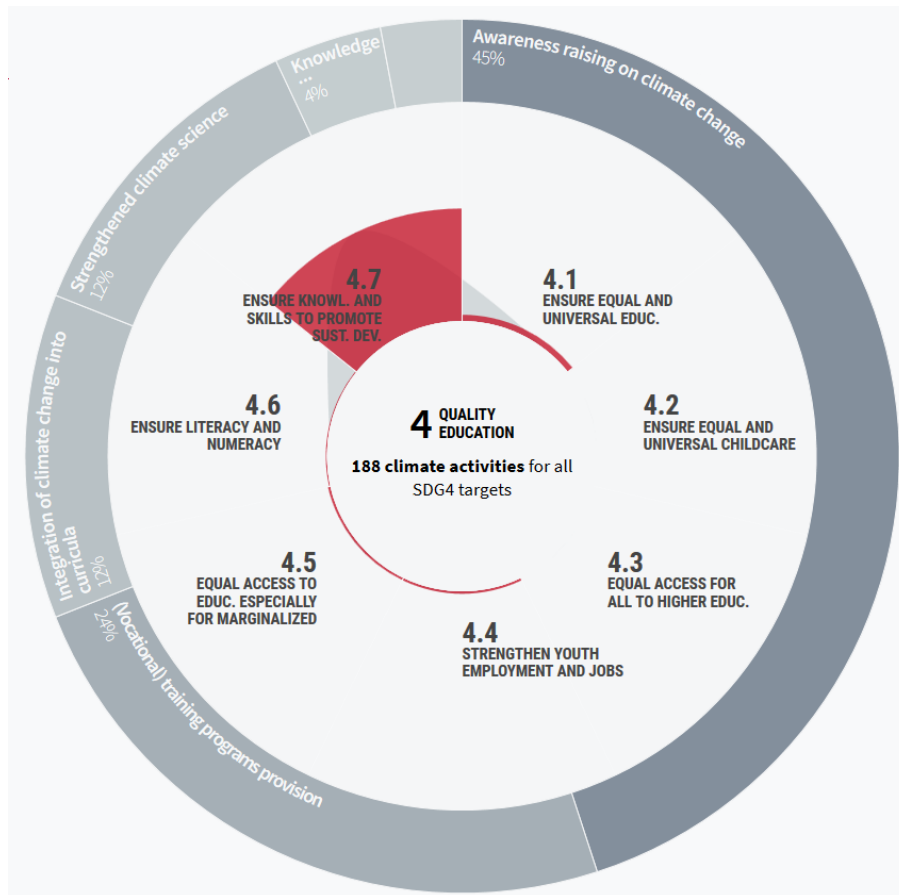
Source: ndc-sdg.info

Responsible consumption and production (SDG 12)

SDG 12 intends to “ensure sustainable consumption and production patterns”. Overall, the production of goods and services today not only depletes resources (water, energy, rare earths, wood, etc.) and causes environmental degradation (water and air pollution, waste), but also generates huge amounts of greenhouse gases (Garnett, 2011; Arto and Dietzenbacher, 2014). The goods and services consumed contribute to climate change throughout their whole lifecycle – from extraction of raw materials, production and transportation, to use and end of life (Gardner et al. 2018; Godar et al. 2016). Rethinking and redesigning production systems, changing consumption habits (reducing consumption, and by consuming goods with lower environmental footprints) (e.g. Hedenus et al. 2014), and establishing more circular resource management (Lieder and Rashid 2016) are key to fighting climate change.

Around 3% of NDC activities are connected to SDG 12, while 62 % of the NDCs include SDG 12-related activities. The majority of climate actions relate to improving waste management, using waste as a source of energy, recycling and reuse; and recovering methane from landfills. Two SDG targets are most relevant for SDG12-related NDC activities: SDG 12.4 (environmentally sound management of chemicals and all wastes throughout their lifecycle) and SDG 12.5 (reducing waste generation through prevention, reduction, recycling and reuse). Most activities in the NDCs, thus, focus on recycling and reducing waste. Conversely, the production side receives little attention. This represents a gap, given that the sustainable production of goods and services is essential and strongly linked to emissions and other types of pollution, and to the use of inputs such natural resources and raw materials (Müller et al. 2015b). The focus on waste and waste-to-energy indicates strong synergies

Figure 15: NDC activities linked to SDG 4 (quality education)



Source: ndc-sdg.info

between SDG 12 and SDG 7. However, countries' NDCs also mention agriculture and water as being important for sustainable consumption and production. In addition, there are strong links with cities and urbanization, arguably because waste management in urban areas is often a challenge.

Given the high potential of sustainable consumption and production to reduce GHG emissions, it is no surprise that almost all NDC activities related to SDG12 that can be clearly categorized refer to climate change mitigation. However, sustainable approaches, for instance, in agricultural production, could increase the resilience of soil quality in the face of climate change, and could also reduce the use of valuable resources, such as water.

Quality education (SDG 4)

Several countries' NDCs feature activities corresponding to SDG 4 (quality education), which calls for inclusive and equitable quality education, and the promoting lifelong learning opportunities for all. Education ensures the next generation's awareness of climate change, and encourages the adoption of more climate-friendly lifestyles. However, not more than 3% of all NDC activities incorporate actions relating to systemic changes in awareness and education.

Climate actions in SDG 4 predominantly focus on awareness raising and provision of vocational training. The need to strengthen climate change research, and to incorporate climate change into educational curricula and programmes receive mention, but not to a great degree. Countries emphasize the need for education and awareness both on the need for general reduction of greenhouse gas emissions, but also, and particularly, on the need for climate change adaptation, for example, through community-based education and awareness-raising activities.

With regards to the SDG targets, almost exclusively all activities correspond to SDG 4.7 (ensure knowledge and skills to promote sustainable development) (Figure 13). Furthermore, from a climate perspective, SDG 4 overlaps very much with SDG 13 (climate action) through SDG 13.3 (improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning). Hence, more climate activities come under SDG 13.3 than under SDG 4. NDC activities related to SDG 4 almost entirely address climate change adaptation (82%). However, life-style changes; community-based climate action, education and awareness raising; and community-level capacity building that targets greenhouse gas emissions reductions hold high potential for climate change mitigation. Thus, these actions should play a more important in countries' strategies than they currently do.

4.3 The bottom tier: SDGs with few connections to NDC activities

Some SDGs within the 2030 Agenda focus mainly on the social and political issues. Among these are: SDG 1 (no poverty), SDG 5 (gender equality), SDG 10 (reduced inequalities) and SDG 16 (peace, justice and strong institutions). These SDGs are far less connected with NDC activities. Nevertheless, important connections between these SDGs and climate change should not be overlooked (Klinsky et al. 2017). This section discusses those NDCs that included activities relating to these goals.

First, only 71 countries and 2% of total NDC activities address SDG 1 (no poverty). These activities focus on reducing relative poverty and increasing resilience of vulnerable communities. Climate plans hardly commit to access to basic services (SDG 1.4) or social protection schemes (SDG 1.3). Yet, climate change can strongly affect vulnerable communities, which can fall further into poverty as the result of related changes (IPCC 2014). Access to basic services is essential for increased resilience and adaptation to potential environmental changes. Moreover, social protection schemes can help those affected to recover more quickly (Burke et al. 2015). In addition, climate change mitigation measures themselves can impact the poor, for example, by leading to increased prices through energy or carbon taxes, or through the use of more

expensive technologies for electricity production (Hirth and Ueckerdt, 2013; Jakob and Steckel, 2016; Labandeira et al. 2009). Policymakers should take such impacts into account, and consider complementary measures that protect poor households from such adverse effects. All themes where access to services and social protection are the vision of an SDG or a target are left to NSDS's.

Second, 56 countries included at least one activity related to SDG 5 (gender equality) in their NDCs. Most of these activities focus on integrating gender considerations into national policy design, and on increasing protection of women from climate change risk, given that women are particularly vulnerable to climate impacts (Djoudi et al. 2016). With regards to SDG targets, most activities relate to SDG 5.5 (ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life). Many women lack access to knowledge, resources, capital, and decision-making power, which makes them more vulnerable to climate change impacts. In particular, SDG 5.5 calls for increasing women's full and effective participation and equal opportunities for leadership. There is currently an underrepresentation of women in climate change negotiations and decision-making at all levels (Sellers 2016).

Third, only 23 countries' NDCs included activities that relate to SDG 10 "reducing inequality". However, evidence suggests that climate change hurts both poor countries the most, and the poorest within countries the most (Sovacool et al. 2017). Poor and vulnerable communities are subject to double exposure; climate change and (economic) globalization that is not inclusive (O'Brien and Leichenko 2000). Thus, reducing climate risks can also help address poverty. The majority of climate actions in NDC activities are focusing on inequality reduction, and the inclusion of low-income and vulnerable communities.

Lastly, SDG 16 (peace, justice and strong institutions) has fewest connections to NDC activities. Just a dozen of countries' NDCs call for effective and accountable institutions and to integrate climate change impacts in security measures. For example, fuelwood scarcity has been linked to violence against women (Patrick 2007). Furthermore, SDG 16 aims to promote rule of law, strong institutions and participation of all to foster sustainable development. These aspects are a precondition to achieve a multiple SDGs as well as a cross-cutting theme that runs through the entire 2030 Agenda (Tosun and Leininger 2017).

5. Discussion

5.1 NDCs are more than climate action plans

In light of the multiple overlaps, the assessed NDCs can be regarded not only as climate plans but also as de facto sustainable development plans because they include many priorities that reflect the 2030 Agenda. NDCs were initially intended to indicate countries' ambitions to reduce emissions of greenhouse gases. However, as this was a bottom-up driven process, countries chose to include other priorities beyond mitigation targets (Brandt et al. 2017). The connections between NDCs and SDGs indicate that the process of coordinating the Paris Agreement and the 2030 Agenda does not start from zero in these countries but will build on existing potential. However, while our analysis finds connections between climate activities in countries' NDCs and the 17 SDGs as described above, gaps remain. The presence of these gaps underscores the untapped potential for further alignment of the two agendas. This section highlights the potential for complementarity with the NSDS's and identifies gaps where ambitions of the next NDC cycle could be scaled-up.

As shown in Section 4 climate action overlaps with all 17 goals to various extents, with energy (SDG7) being the most prominent climate action, followed by land use (SDG14), agriculture (SDG2), cities (SDG11), water (SDG6), and partnership for the goals (SDG17). However, even though the connections are numerous at the goal level, this does not always translate into

strong connections at the target level, which is where implementation of the 2030 Agenda can meaningfully complement the NDCs. For example, for SDG 6, the focus of commitment made in the NDCs is mainly on water availability and management, while access to water and sanitation services receives less attention. Similarly, for SDG 7 (energy), most of the focus lies on increasing the share of renewable energy and efforts towards energy efficiency, whilst much less attention addresses increasing energy access to poor and vulnerable populations - a target that is relevant, both in climate change mitigation and adaptation.

On the one hand, these gaps at target level hint at the potential for complementarity of both agendas. For example, increasing sanitation services and cleaning of wastewater, (SDGs 6.2 and 6.3) develop co-benefits for water availability (SDG 6.4). Moreover, access to energy (SDG 7.1) is key to achieve economic development (SDG 8) and at the same time increase in energy access needs to be based on renewables to avoid creating negative spillover effects for multiple SDGs.

At the same time, in some cases, NDCs might also run a risk of undermining specific development objectives. While some tensions are sparsely mentioned in the NDCs, explicit acknowledgement of trade-offs is rare and needs further systematic identification and contextualization.

Nevertheless, it is still possible to expose areas where there are few or no connections, which could indicate potential policy conflicts (Dzebo et al. 2018). It is crucial that countries consider how trade-offs will arise in national implementation. This could be done by taking account of critical trade-offs at the global level, through the HLPF and UNFCCC global stock-take processes, for example. These processes can highlight areas where critical mediation is needed to avoid environmental harm, and can draw attention to policies that have the potential to be counterproductive for social or economic aims.

5.2 NDCs need to be complemented and strengthened

At the same time, several goals - above all SDGs 1 (no poverty), 5 (gender equality), 10 (reduced inequalities) and 16 (peace, justice and strong institutions) - have only few connections to climate action in countries' NDCs. Notwithstanding this, these SDGs that only appear relatively rarely in the NDCs play an important role for climate change policy. For example, equity and justice, which are central to SDG 1 (no poverty), SDG 5 (gender equality) and SDG10 (reduced inequalities), are crucial components of the climate change negotiations (see e.g. Adger et al. 2009; Baer et al. 2009). Dealing with climate change is closely related to combating poverty because those hit hardest by climate change are typically the poorest, and their vulnerability stems in large part from their poverty, which limits access to basic services, adequate housing and financial safety nets.

Across all NDC activities, a key finding of NDC-SDG connections analysis is that not more than 12% of the stated activities are quantified. This means that most policy targets in NDC activities are described only in general terms. For the specific goals, SDG 7 (affordable and clean energy) is in the lead, with 31% of the total number of activities quantified, followed by SDG 15 (life on land) with 17% of activities quantified. An implication from this is that, in terms of implementation of the NDCs, devising clear implementation strategies may be problematic without undertaking significant additional work (AfDB 2018).

The number of activities in the NDCs varies across countries. Sri Lanka, Moldova and Jordan include a large number of activities that relate to many SDGs (Brandt et al. 2017). For example, Sri Lanka's NDC includes 189 activities, with SDG 11 (sustainable cities and communities) being the most prominent goal in terms of number of activities. On the other side of the spectrum, the EU's NDC, which represents commitments of 27 member countries, only includes one single activity (SDG 15, addressing life on land) beyond its emission commitment. Thus, while some countries have emphasized the NDC as a key climate policy document, others have prioritized short and concise statements with little information in their NDCs. At the same time, it is important to note that a high number of activities is not necessarily an indicator for good and effective governance. Many countries that include a high number of activities face severe implementation challenges

Countries need to consider how trade-offs will arise in national implementation.

of both the Agenda 2030 and the Paris Agreement (AfDB 2018; GIZ 2018). Commitments in the NDCs still have to be translated into coherent implementation at the national level; and the same is true for the implementation strategies of the Agenda 2030. While much is unclear regarding the specifics of national implementation, the two agendas share a similar architecture when it comes to implementation planning because they include both forward- and backward-looking dimensions. The next section addresses these dimensions.

5.3 Opportunities for increased policy coherence

The Paris Agreement combines the top-down setting of global goals with NDCs that are formulated from the bottom up, meaning that countries are free to determine their own priorities and ambitions to address climate change. Under the provisions of the Paris Agreement, each country will be asked to submit an updated and more ambitious NDC every five years. The Paris Agreement, thus, includes institutionalized, ratified and binding forward-looking commitments. In addition, it contains a backward-looking stocktake process intended to facilitate a periodic review of countries' collective progress towards achieving global climate change goals. The global stocktake will also serve as a prelude to countries submitting enhanced NDCs (Milkoreit and Haapala 2017). This is intended to take place once every five years. Equivalent in its institutionalization, but less binding and committing, the 2030 Agenda builds in implementation of the NSDS's, and has a well-elaborated and institutionalized follow-up and review process. On a periodical basis, countries report their progress on sustainable development to the HLPF through the Voluntary National Reviews (VNRs). There is no standardized form of how to do so. Hence the provided VNRs vary immensely in similar fashion to the NDCs. Nevertheless, the reporting structures of both global agendas potentially sets the stage for providing opportunities to compare the complementarity of approaches within the respective climate or sustainable development process - both over time and across the two processes at national scales (Table 1).

Table 1: Forward and backward perspectives of both agendas

	Paris Agreement	2030 Agenda
Policy plans (forward looking)	Nationally determined contributions (NDCs)	National Sustainable Development Strategies (NSDS's)
Tracking achievements (backward looking)	Transparency framework Periodic stocktake process	Follow-up and review mechanism, periodic Voluntary National Reviews (VNRs) reporting at the High-level Political Forum (HLPF)

This institutional structure should allow for aggregating insights at a global scale to seek synergies and avoid goal conflicts between the two agendas. It should also identify areas of action that some nations are tackling more prominently or more effectively; provide information about how worthwhile methods could be replicated; highlight issue areas that require more attention for implementation; and generate knowledge about how to best undertake meaningful action. In addition, it could help international development agencies and the multilateral development banks to channel future financial assistance more efficiently. The reporting structures of both global agendas offer opportunities to provide insights that compare complementarity of approaches within the respective process over time, as well as across the two processes at national scales. It also indicates a need for monitoring and evaluation systems for coherent implementation (Persson et al. 2016).

The implementation of these universal and, thus far, vaguely defined targets of enhancing policy coherence will result in different implementation approaches at national levels. For this reason, attention needs to shift towards understanding the domestic drivers and barriers for implementing the global goals in a national context (Keohane and Victor 2016). Domestic politics will be crucial in determining the ability of countries to transform global goals into actions on the ground. At the national level, goal conflicts cannot be resolved through technical measures; rather they represent

political dilemmas, and are manifestations of deep-seated interests, institutions, and ideologies at the national level (Persson 2016). Thus, the actual impacts of the two agreements will depend on whether they can be used by domestic groups favoring climate action and sustainable development as points of leverage in domestic politics. This is referred to as a “two-level game” (Putnam 1988), simultaneously involving international and domestic politics. For a truly ambitious national climate policy in the medium and long terms, coherence between climate change, sustainable development and other important policy targets and objectives adopted is crucial. Hence, policy coherence will most likely be enhanced by learning processes across and within countries.

More broadly, to improve coherence in the context of the implementation of the Paris Agreement and the Agenda 2030 strengthened coherence is needed at various levels: between global and national goals; across international agendas and processes; between economic, social and environmental policies; between different sources of finance; and between different actions of multi-actors and stakeholders (OECD, 2014). This will demand coordination throughout the policy cycle. There should, for example, be horizontal coherence through coordination between line ministries. At the same time, ideally, coherence goes beyond the state level and is also strengthened by non-state actors, including civil society, businesses and development organizations. However, non-state actors have so far been mostly focusing on closing narrow functional gaps (e.g. greenhouse gas emissions reduction), and this approach may not lead to policy coherence without deliberate consideration towards this challenge (Chan et al., 2019).

6. Conclusions and next steps

Climate change is a multi-level and multi-sectoral problem with far-reaching implications for most aspects of social life. Against this backdrop, this paper focuses on the extent to which climate change connects with the broader sustainable development agenda. Nationally Determined Contributions (NDCs) are critical tools; they are the primary means for governments to indicate to the international community the specific steps countries will take to tackle climate change and achieve the Paris Agreement. The Sustainable Development Goals (SDGs) are universally adopted goals that provide a shared blueprint for a sustainable future that leaves no one behind. This paper analysed how countries' NDCs connect with the 17 SDGs of the 2030 Agenda. It shows that NDCs not only address climate change but also promote sustainable development. It finds that NDCs connect with all 17 SDGs, but to varying extents.

The strongest links between the NDCs and the SDGs are found in the areas of land use, food, energy and water. By contrast, many SDGs are highly under-represented in NDC activities; in particular, those addressing the following goals: no poverty (SDG 1), gender equality (SDG 5), reduced inequalities (SDG10), and peace, justice and strong institutions (SDG 16). More concrete activities that connect climate change to these areas should be included as countries strengthen or add to their next iteration of NDCs.

At the national level there is growing complexity in sustainability and climate policymaking and action, where possible conflicts and synergies abound among a multiplicity of actors regarding various goals (Persson and Runhaar 2018). Evidence of effective orchestration between NDCs and SDGs is largely absent at the national level, where the implementation responsibilities for both chiefly lie (Keohane and Victor 2016). To understand viable ways to capitalize on potential links and synergies, knowledge is urgently needed at national levels of governance, where the chief context-specific challenges to policy coherence occur.

Countries can learn from each other's approaches to policy planning, budgeting, monitoring and reporting. An integrated approach offers greater leverage for advancing the two agendas - simultaneously allowing governments to step up ambition and impact, and to avoid costly and counterproductive trade-offs. Distinct SDG- and NDC-led institutions can overcome their weaknesses and build on their respective strengths for mobilizing government and society

A key finding: only 12% of the stated activities are quantified. That is, policy targets in NDC activities are described only in general terms.

Countries should design their future National Sustainable Development Strategies in ways that align with their Nationally Determined Contributions.

around both agendas. Such efforts should be supported by more integrated interventions from development partners.

By analysing the content of NDCs through the SDG-lens, and by underlining the connections between the NDCs and the SDGs, we demonstrate that the actions outlined in the NDCs foster national development priorities and strategies that reflect the 2030 Agenda. Increasing the transparency about and understanding of these connections can contribute to leveraging buy-in for ambitious climate action across multiple stakeholder groups, including the government and broader society. This in turn can provide the basis for increasing the ambition of future NDCs. As discussed above, there is room for improved policy coherence from two perspectives. First of all, countries should design their future National Sustainable Development Strategies (NSDS's) in ways that align that align with their NDCs. They need to complement the NDC activities by focusing on issues that have not been addressed, and by avoiding uncoordinated – and costly – duplication of efforts. Second, new and updated NDCs need to take account of existing NSDS's. Countries could use future NDC updates to more closely align their climate actions with the SDGs. This can further promote the buy-in of different types of stakeholders, and can increase chance of promoting higher ambition.

At the same time, there is further potential to go beyond the analysis in this paper by examining both Voluntary National Reviews (VNRs) and NSDS's. This would allow a broader comparison of climate change through a sustainable development lens, and identify additional synergies, overlaps, gaps and conflicts. Assessing the UNFCCC stocktaking process will help to highlight at an aggregate level how far countries have come – and how far they have to go – in achieving the goals of the Paris Agreement and the 2030 Agenda. This would identify future needs as well as help avoid potential duplication, conflicting, and ineffective practices related to both agendas.

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