

Identifying interactions for SDG implementation in Ireland

Martin Le Tissier and Hester Whyte, University College Cork, Ireland; and Anne-Sophie Stevance, International Science Council, France

Abstract

The SDGs form by design an integrated agenda that brings together many of the economic, social and environmental dimensions of development and are celebrated as indivisible recognising that achieving sustainable development will require addressing all the SDGs. Moving from the aspirational goals to implementation on the ground comes with two important considerations: 1. Prioritising and implementing the SDGs need to be fully cognizant of the synergies and conflicts between SDGs. 2. The SDGs need to be translated and integrated within national policies to drive change and mobilise actors. The International Science Council has a programme to understand the interactions between SDG targets to identify nodes of interaction where actions, including policy actions, are most likely to have impact. These can then be prioritised. Further the spill-over effects and trade-offs can be made more apparent to policymakers and influence their option-taking. The programme has developed an online software tool to score between goals or targets (based on a seven-point scale describing the level of influence of one target on another) and visualising the web of links between SDGs. This paper reports on the initial outcomes of a project to explore SDG interlinkages from the outlook of the Republic of Ireland's national priorities and context in order to arrive at a consensus map showing critical policy nodes to advance SDGs implementation and monitoring from the perspective of the role the environment plays in sustainable development. The results signpost the challenges for the interpretation of SDGs in the context of national priorities and circumstances to facilitate integration of sustainability goals with those of social and economic development.

Introduction

The 17 SDGs and their 169 targets provide the means to achieve the aspirations of the 2030 Agenda [1,2], and poses conceptual as well as implementation challenges that will require collaboration between the policy and scientific communities and other stakeholders [3,4]. The scientific and governance challenges of the SDG framework to be transformative and universal in order to achieve “Poverty eradication, changing unsustainable and promoting sustainable patterns of consumption and production and protecting and managing the natural resource base of economic and social development” [5] has been the subject of debate [3,6,7]. Studies addressing the universal nature of the SDGs have focussed on the identification of interactions and interlinkages between SDGs, their targets and whether the interactions are synergistic or trade-offs [8,9]. A number of tools have been

developed that visualise the multiplicity of interlinkages between SDGs and targets based on published literature [9–11], and the complexity these lead to for policy [9].

The connection between SDGs and policy is a critical challenge for the success of the 2030 Agenda and policy coherence as a key approach to foster synergies across economic, social and environmental policy areas, as well as reconciling trade-offs where policy areas potentially lead to conflicting outcomes [12–14]. Whether implementation of SDGs is likely to lead to synergistic or trade-off outcomes has been the focus of studies on the interlinkages between SDGs and their targets [8–10,15]. At a national level, understanding interlinkages across SDG targets will not in itself lead to policy coherency but depends on to what extent approaches exist for competent authorities to integrate their roles and responsibilities across policy domains [16,17]. At the international level there is some guidance for mainstreaming SDGs [18,19], but at the national level this has often not got beyond labelling national policy actions with their associated SDGs. Governments face an ever increasing complexity of balancing economic, social and environmental interests that requires prioritisation and negotiation involving all parts of government [20]. To this end mainstreaming SDGs into national policy, plans and strategies and integrating them into national objectives for sustainable development is considered an important activity [21]. A recent study found that EU Member States are integrating SDGs into national strategies [22]. While Member States have taken steps to enhance horizontal policy coordination, there is a continuing need to better mainstream sustainability into national planning processes in a way that enhances collaboration across Government and addresses governance principles of the 2030 Agenda that demand:

Interconnectedness and indivisibility so the 17 SDGs are implemented in their entirety supported by policy integration, coherence, and coordination.

Universality to consider the interconnectedness of internal and external policies that are aligned with implementing the SDGs and Agenda 2030.

At a national level the SDGs present a challenge because action to meet one SDG and/or its targets could have unintended consequences on others if they are pursued separately. Analysis is also required to reconcile the fact that the categorisation of the SDGs does not fit well with the way in which governments operate and are organised. Practitioner and academic communities have recognised the need to provide support to policy makers to more effectively understand and use the nature of interactions between SDGs/targets – both positive and negative – to plan and drive coherent and efficient policy design and implementation [13,23].

This paper reports on a national example from a programme led by the International Science Council to design the means to enable and facilitate the collaboration and cooperation between actors necessary to disrupt institutional silos [6] that are at the core of realising an integrated and universal approach to sustainable development. The paper firstly identifies the institutional complexity for SDG implementation in the Republic of Ireland, and the institutional challenges to develop more coherent approaches to SDG implementation. Secondly, a tool that enables interdepartmental collaboration in interpreting SDG interlinkages in the context of national policy to realise the opportunities presented by the universality and interconnectedness of the SDGs and their targets is presented. The tool is a development from one first employed by the Stockholm Environment Institute [15].

SDG implementation in Ireland

In 2012 Ireland published “Our sustainable future: A Framework for Sustainable Development for Ireland” [24] to take into account developments at international and EU level designed to deliver an effective transition to an innovative, low carbon and resource efficient future that decouples environmental degradation and resource consumption from economic and social development. ‘Our

Theme	Principle	SDGs	Theme	Principle	SDGs
Economy	Promote an innovative, competitive and low-carbon economy with the aim of achieving smart, sustainable and inclusive growth.		Respect for ecological integrity and biodiversity	The abundance of wildlife and extent of habitats should be maintained, improved and restored where necessary, through sustainable management.	
Satisfaction of human needs by the efficient use of resources	Prices should reflect the real costs to society of production and consumption activities and polluters should pay for the damage they cause to human health and the environment.		Social equity	Social inclusion should be promoted to ensure an improved quality of life for all.	
Equity between generations	The needs of current generations should be addressed without compromising the ability of future generations to meet their needs.				
	Resources should be used within the capacity for regeneration.		Respect for cultural heritage /diversity	The quality of landscapes, the heritage of the man-made environment and historic and cultural resources should be maintained and improved.	
Gender equity	Women have a vital role in environmental management and development and their full participation is therefore essential to advance sustainable development.		Equity between countries and regions	Promote human rights and fundamental freedoms, by combating all forms of discrimination and contributing to the reduction of poverty.	

Figure 1. Themes and principles for sustainable development outlined in "Our Sustainable Futures" aligned against relevant SDGs as identified in Ireland's National Implementation Plan (NIP) [26].

Sustainable Future’ sets out the challenges facing Ireland and proposes actions across some seventy measures to promote clean energy, more sustainable approaches to agriculture and transport, and for the conservation and management of natural resources to ensure their sustainability for future

generations. This has been aligned with Ireland's approach to the 2030 Agenda and SDGs that recognises that sustainable development relates to equitable approaches to the economy, society and environment within limits where the needs of the present do not jeopardise the needs of the future (Figure 1).

To realise both Ireland's national sustainable development plan and the 2030 Agenda the Department of the Taoiseach, with support from the National Sustainable Development Unit, chairs a Senior Officials Group (SOG), made up of Assistant Secretaries from all Government Departments, to provide strategic coordination and to report to Cabinet to ensure coordination across government departments through a whole-of-government approach [25]. The SOG is assisted by an SDG Interdepartmental Working Group [IDWG], comprised of representatives from all Government Departments. This structure aims to facilitate information sharing, discussion and negotiation on a coordinated response to SDG implementation and address (potential) trade-offs to promote policy coherence whilst line departments retain responsibility for implementing the elements of the SDGs most relevant to their work [26]. The IDWG, chaired by the Department of Communications, Climate Action and Environment (DCCAE), is responsible for developing national policy in relation to SDG implementation.

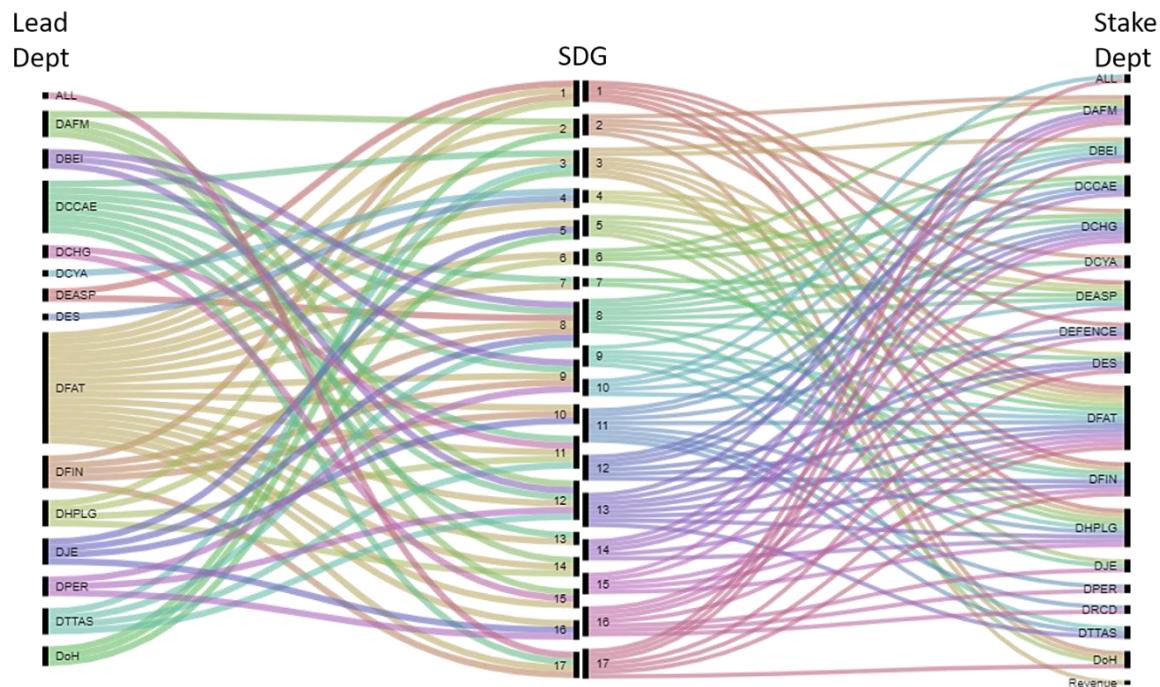


Figure 2. Distribution of Lead Government Depts (left) at the level of the 17 SDGs (middle) and distribution of Stakeholder Government Depts (right) to the 17 SDGs. 14 out of 16 Government Depts are in the Lead Group (Department of Rural and Community Development and DEFENCE are not a Lead Dept. for any SDG). All 16 Government Depts are represented in the Stakeholder group. The Department of the Taoiseach is not included in this analysis as it has overarching responsibility across all 17 SDGs. Note that 1 SDG (SDG 17) under a 'Lead' heading and 2 SDGs under 'Stakeholder' (SDG 10 & 17) have 'All' Depts. allocated to them for at least 1 of their targets. Source: Authors elaboration based on [26].

Ireland's SDG National Implementation Plan (NIP) identifies policy coherence as a strategic priority [26]. The NIP identifies how Government Departments, through existing national policies, are already contributing to achieving the SDGs and how national policies and targets correspond to the SDGs global vision. The complex equation of synergies and trade-offs across the whole spectrum of policy areas and individual Department portfolios covered by the SDGs requires prioritisation and negotiation involving all parts of government [20] to address increasingly complex economic, social and environmental challenges. Within this arrangement, line departments retain responsibility for implementing the elements of the SDGs most relevant to their work [26]. However, an EU-wide study [22] noted that, while Ireland's NIP was characterised by a 'whole-of-Government' approach and the SDGs were to be directly incorporated into a new foreign policy strategy (launched in 2018 [27]), the National Planning Framework to 2040 [28] and the strategy for public capital investment in the National Development Plan 2018-2027 [29] do not explicitly include a focus on the SDGs. Each SDG target has had a Lead Department, Stakeholder Departments and associated policy documents assigned to it (Figure 2).

Further analysis showed that:

- There is an uneven spread of allocation as Lead Department across Government to the SDGs and Targets (Figure 3).
- The Department of Foreign Affairs and Trade (DFAT) is the department with the most connections to SDG Targets as Lead and Stakeholder. As Lead department this is primarily a

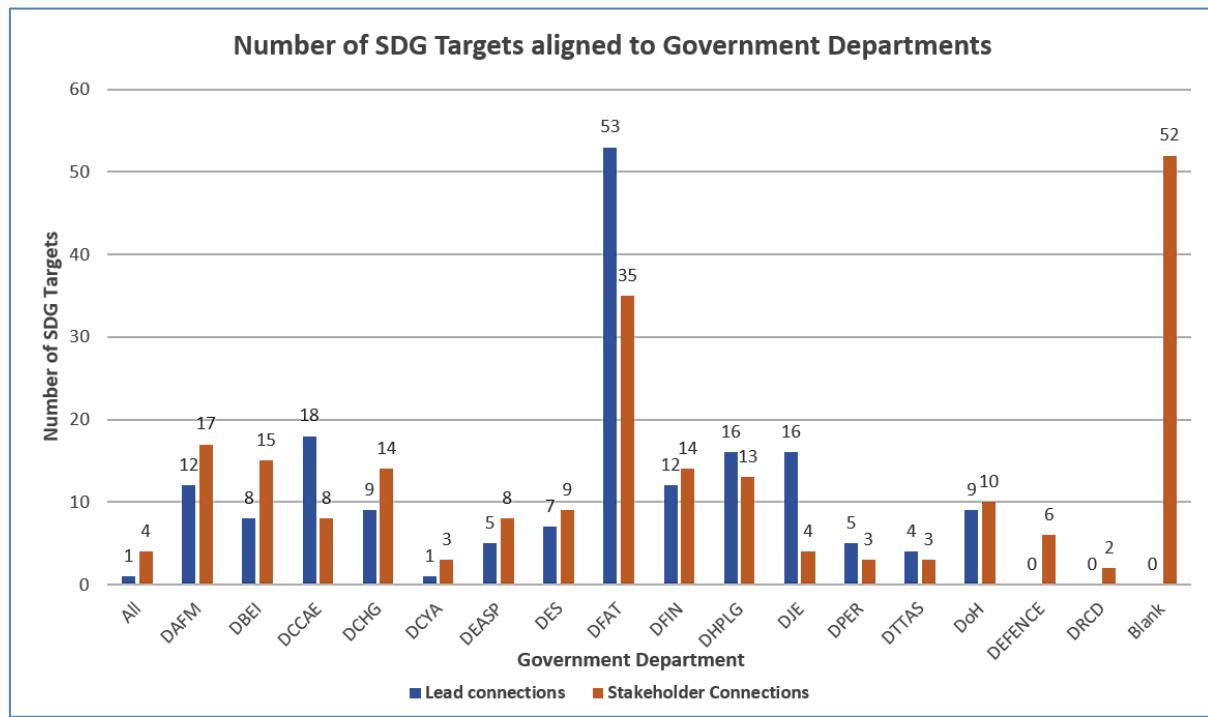


Figure 3. The number of times each Government department is aligned to a SDG target as either a Lead Department or as a Stakeholder department. 'All' is where all 17 Government departments are aligned and 'Blank' is the number of times no department is aligned to a SDG target showing that there is no SDG target with no associated Lead Government department but there are 52 targets where there is no aligned Stakeholder Government department.

consequence of their alignment to nearly all Means of Implementation (MoI) targets. Conversely, most departments are aligned only to Outcome focussed targets either as Lead or Stakeholder.

- 52 of the 169 targets only have a Lead Department allocated to them with no Stakeholder Departments identified (Figure 3 and Annex 1 of [26]).
- In conjunction with the alignment of Departments to SDGs and targets, some 118 policy documents (including all plans, programmes, strategies and legislation) from 16 (of the 17) Government Departments and some EU legislation (Directives) and regional and international obligations (e.g. OSPAR and CDB respectively) have been identified as containing objectives that intersect with the ambition outlined by SDG targets (Annex 2 of [26]).
- Variance was found in the distribution of both the number of policy documents and Government departments aligned to any given SDG target with most targets are only aligned with one Department and its own policy document/s with few instances of Stakeholder Departments contributing policy documents to any given target (Figure 4). This variance was found to become more complex when the distribution of Lead and Stakeholder departments and policy documents with SDG targets is considered (Figure 5). Within this variation there are only 25 targets that include policy documents from Stakeholder departments; 5 targets where a Lead department does not also have an associated policy document; and 7 targets that have associated policy documents not belonging to either Lead or Stakeholder departments. This suggests that in most cases Stakeholder Departments have an interest in the ‘outcome’ of the implementation of any given SDG target, but this is not necessarily reflected in their Departmental responsibilities. It may also mean that there is little facility for a Lead Department to be able to assess how its own policies impact upon other policy areas.

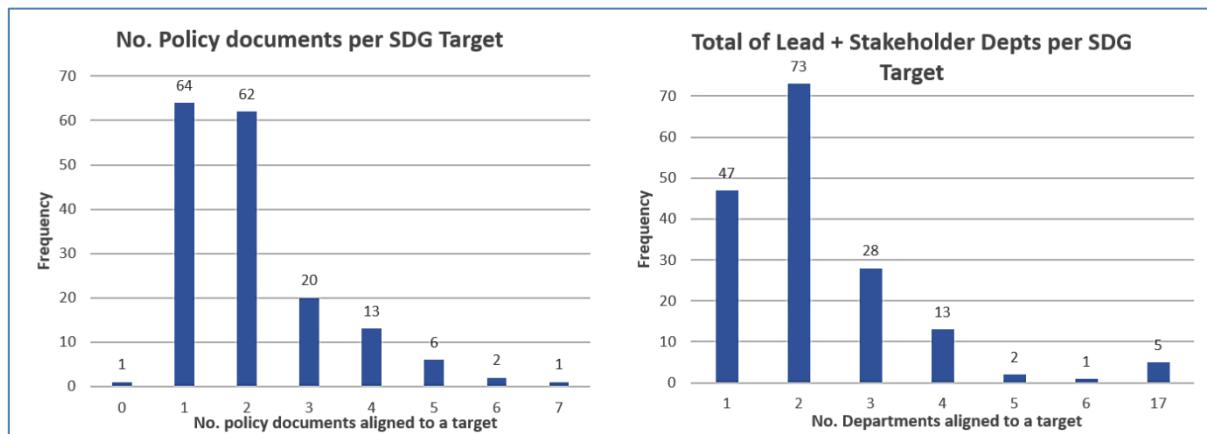


Figure 4. Left: The number of policy documents (from Lead and Stakeholder departments) aligned to a SDG target showing that for one target (16.3) a Lead (no Stakeholder) department is allocated but no policy document has been identified. Most targets have only 1 or 2 policy documents considered relevant to its implementation.

Right: The total number of Government departments aligned to a SDG target showing that most targets are considered relevant to the mandate of only 1 or 2 Government departments. 5 targets are considered relevant to the mandates of all 17 Government departments.

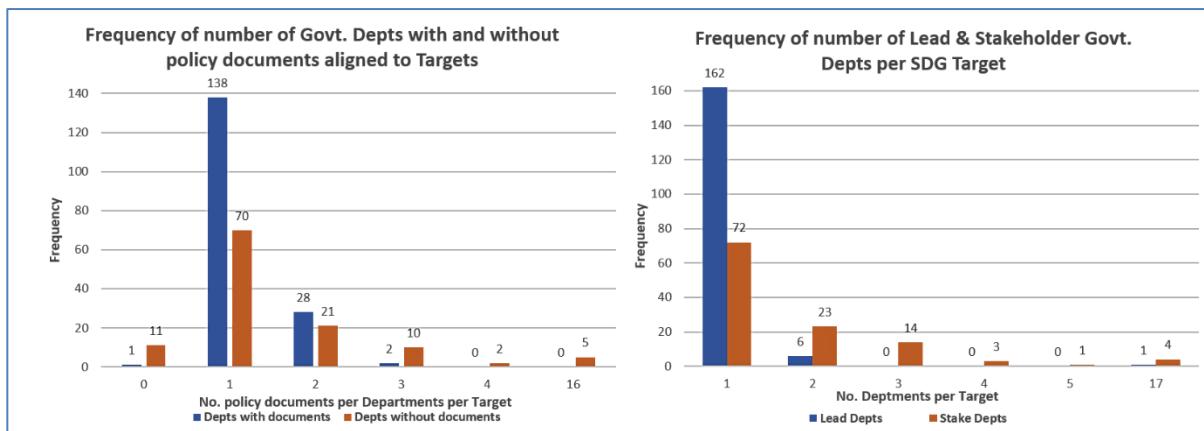


Figure 5. Left: The frequency of the number of Govt. departments that are aligned with a SDG target with and without policy documents. '0' represents one occasion where a SDG target has no policy documents associated with it and 11 occasions where all departments aligned with a SDG target also had policy documents associated with it. 16 represents 5 occasions where All Government departments are aligned with a SDG target but only one of them has a policy document associated with it. '1' represents that for 138 SDG targets only 1 department has policy documents associated it, while on 70 occasions a department aligned with an SDG target did not have a policy document also associated. '2' represents 28 occasions where 2 departments had policy documents associated with it, while on 21 occasions 2 departments aligned with an SDG target did not also have a policy document also associated, etc.

Right: The frequency of the number departments aligned with SDG targets either as Lead or Stakeholder departments. On 162 occasions there is only 1 Lead department aligned, 6 occasions where 2 Lead departments are aligned but never 3 or more except on one occasion (Target 17.17) where all Government Departments are identified as Lead departments. Although most SDG targets have only 1 Stakeholder department aligned to it on 22 occasions there are 3 or more Stakeholder departments aligned, including 4 occasions where all departments are aligned as Stakeholder departments.

- Considering individual policy documents, it was found that some individual policy documents have very specific alignment to a defined target, others have alignment to multiple SDGs and targets.

The implications from this analysis suggests that there is an absence of policy association between Lead and Stakeholder departments with each SDG target that could mean that activity by any given Department enacting policy under its jurisdiction could compete with that from other departments. Such an outcome could mean that stewardship of any given target is not widely spread and, given that an interest has been identified, could lead to a break down in supporting institutional mechanisms (e.g., an absence of policy integration) and policy interactions (e.g., contrasting policy objectives). Furthermore, there is a disconnect between alignment of Lead Departments between Outcome and Means of Implementation targets, which is not always addressed by the assignment of Stakeholder departments that could lead to weak institutional mechanisms to ensure 'joined-up' delivery of the SDGs. In addition, Means of Implementation targets are predominantly associated with Ireland's non-domestic contribution towards achieving global goals, which could mean that there is a disconnect between the management of an activity with actions designed to achieve its desired outcome, and transboundary aspects (the link between domestic activity on non-domestic outcomes) are missing.

However, a preliminary analysis of the association of SDGs with the 8 objective areas of Ireland's sustainable development policy has identified that the Biosphere, Social and Economic sub-sets of SDGs cross-cut multiple objectives (Figure 6). This could mean that the SDGs provide an opportunity for policy coherence across implementation of Ireland's policy portfolio (i.e., more than a reporting structure). For instance, the SDGs can integrate across sustainable development categories: For instance, respect for ecological integrity and biodiversity is linked through SDG 13 to Equity between generations and Economy. In the same vein, the Biosphere grouping of SDGs integrates across 5 sustainable development categories.

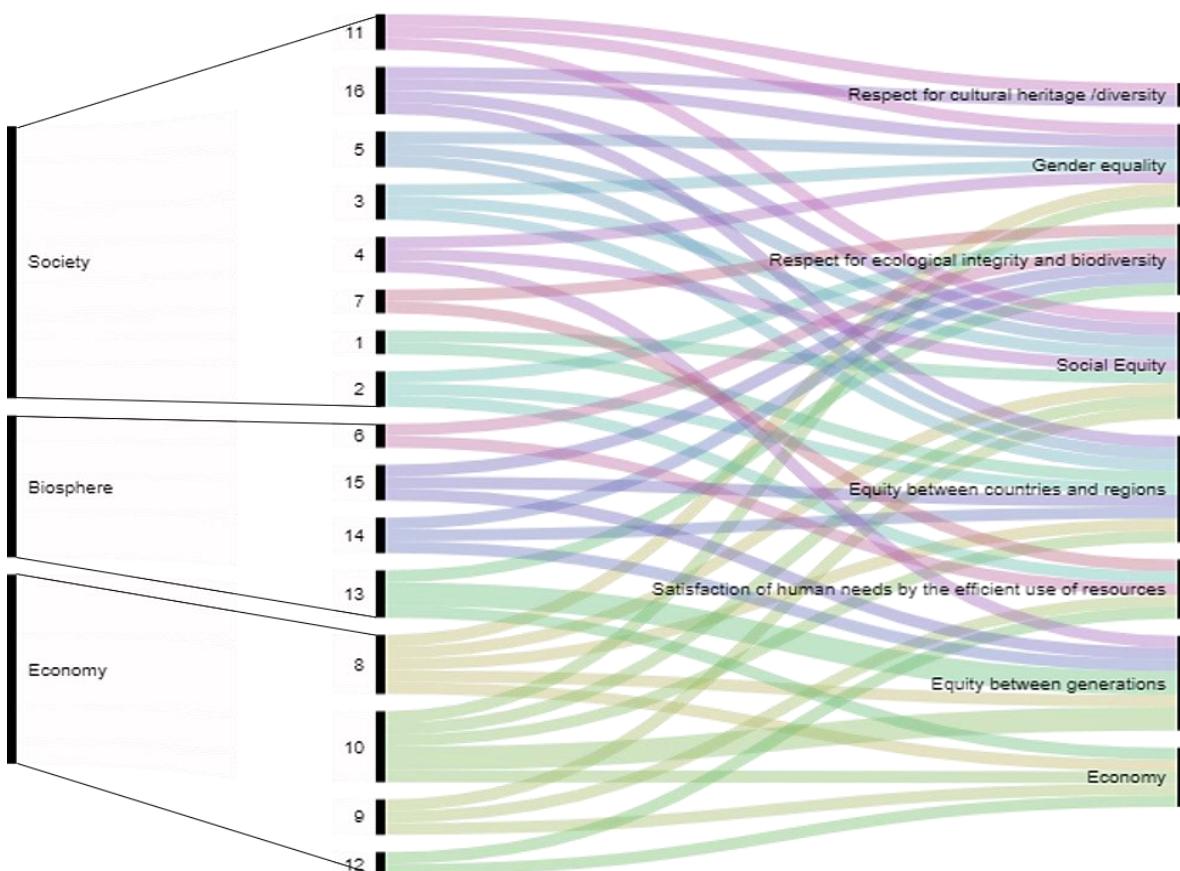


Figure 6. Association of SDG Wedding cake configuration into Economic, Society and Biosphere categories with SDGs and the categories of sustainable development identified in Sustainable development: A strategy for Ireland [3]. Source: Authors elaboration based on [1].

Developing a tool to support SDG implementation

Institutional interactions have been shown to be important to achieving policy integration and policy coherence in support of the 2030 Agenda and SDG implementation, and in particular to address the interlinkages between SDGs and their targets which characterise the Agenda's universality,

indivisibility and interconnectedness [13,30–33]. There are many SDG implementation initiatives¹ underway that seek to bring expertise, tools and approaches to support countries' and stakeholders' efforts in implementing the SDGs through provision of technical solutions for the implementation of individual SDGs and targets. Tools that enable and facilitate engagement across multiple areas of government and policy to exploit benefits and opportunities arising from SDG synergies, whilst mitigating trade-offs, are less common. An assortment of tools and frameworks, some bespoke and others adapted from pre-existing ones, have been advocated in support of SDG implementation and an integrated agenda for national and international development [34,35]. A number of these tools and frameworks are focussed on the type of future that may emerge from the successful implementation of the SDGs (e.g. Qualitative scenario building) – and specifically addressing links between the economic, social and environmental dimensions of investment, trade and related economic activity (e.g. Input-output analysis) [35,36].

Since the adoption of the 2030 Agenda for Sustainable Development attention has been paid to how to deliver the SDGs and targets as an “indivisible whole” nature, with the objectives to propose viable methods and tools for integrated planning of their implementation (Figure 4) [37–40]. Such efforts are critical to overcome traditional compartmentalisation of Government organisation that leads to conflicts of interest, interpretations of sustainable development and decreases coherence and transformative opportunities of policy implementation [41–43]. Efforts to develop a better understanding of the linkages among the SDGs, both at the Goal level and among their targets, have focussed on the intersections (meeting points) and complex causal relationships to model the network of interlinkages and analysing clusters of issues ([44], Table 2).

Table 1. Examples of tools highlighted by the SDG Knowledge Hub as approaches and tools available to analyse and understand linkages, and to examine the impacts of specific policies and strategies on interlinked issues. Source [47].

Source	Details	Reference
UN Department of Economic and Social Affairs (DESA)	<p>Network mapping technique derived from social network analysis to provide a map of direct references in SDG targets to other SDGs, based on the wording of the targets.</p> <p>The result is a visual representation of the references between SDGs and targets to make linkages explicit for institutions whose work often focuses on issues within a specific Goal</p>	[10,45]
The Stakeholder Forum	<p>Classification of Type and Nature of SDG Interlinkages by defining eight types of interactions that are grouped into three categories: Supporting; enabling/disenabling; and relying.</p> <p>The analysis suggests that identifying the type of interlinkage can help policy makers amplify the impact of policies and identify “missing</p>	[46,47]

¹ See for instance <https://sdghelpdesk.unescap.org/toolboxes> which is the Sustainable Development Goals Help Desk that provides a one-stop online service providing access to Sustainable Development Goal (SDG)-related tools, knowledge products, data portals, expertise and advice.

	linkages,” that policy makers can consider ways of creating such linkages through national policies that ensure further integration of SDG implementation in accordance with national priorities and circumstances.	
The Millennium Institute	<p>The Integrated Sustainable Development Goals Planning Model (iSDG) as a simulation tool to help policy makers understand the interconnections among the SDGs and their targets, enabling them to design synergistic strategies for SDG implementation. The Model includes a broad selection of tools to conduct an in-depth analysis of the simulated outcomes, including a Synergy Assessment Tool to assesses the contribution of each policy within a broader SDG strategy and reveals the synergies or trade-offs that might emerge from interactions among different policies.</p> <p>For each SDG, the Model offers a range of interventions that are expected to affect progress towards that Goal. Policy makers can select different levels of investment for each intervention and see how the country's progress towards that goal and all other SDGs changes.</p>	https://www.millennium-institute.org/isdg
The Organization for Economic Co-operation and Development (OECD)	<p>The OECD New Framework Policy Coherence for Sustainable Development aims to assist countries in updating current institutional mechanisms, processes and practices towards policy coherence to ensure they are “fit for purpose” for SDG implementation that can be adapted to national circumstances.</p> <p>The PCSD Screening tool includes options for monitoring data, indicators modelling tools and other approaches available to track institutional mechanisms, policy interactions, and policy effects.</p>	[13]
	<p>OECD Measuring distance to SDG targets uses indicators aligned with UN Global Indicator list and assesses 105 of 169 targets at country-level, and for only 87 of these it has been possible to assess whether indicators have been moving towards the target levels, rather than away from them.</p> <p>The assessment is based only on what can be measured at present. Data coverage is poorest on some of the planet-related goals, such as Oceans and Sustainable Production, and best in relation to goals on Health and Education.</p>	[48]

There are a growing number of tools introduced to explore interactions and interlinkages between SDGs and targets to assist implementation of existing policy, as well as design of future policy, to meet the aspirations of the 2030 Agenda and sectoral implementation processes [49]. These tools address such aspects as descriptive analysis of potentials, scientific methods for quantifying and qualifying interactions, as well as guidelines for integrated policymaking [op. cit.]. However, there is not currently a tool that enables and facilitates conversations between policymakers around how SDG interactions impact upon their own policy area, or how existing and planned policy in a national context interacts with the SDGs and their targets.

Most existing tools do not include interactive features with interfaces that greatly facilitate participation and engagement associated with SDG assessment and those that do are usually not (fully) open source; their application is resource-intense, often specialised and technical, both in terms of time and money [49]. The Stockholm Environment Institute (SEI) have demonstrated a practical approach to support decision-makers and practitioners faced with questions of what progress on one target mean for progress in the other targets, and how to prioritize action [15]. This approach

Interaction	Name	Explanation	Example
+3	Indivisible	Inextricably linked to the achievement of another goal.	Ending all forms of discrimination against women and girls is indivisible from ensuring women's full and effective participation and equal opportunities for leadership.
+2	Reinforcing	Aids the achievement of another goal.	Providing access to electricity reinforces water-pumping and irrigation systems. Strengthening the capacity to adapt to climate-related hazards reduces losses caused by disasters.
+1	Enabling	Creates conditions that further another goal.	Providing electricity access in rural homes enables education, because it makes it possible to do homework at night with electric lighting.
0	Consistent	No significant positive or negative interactions.	Ensuring education for all does not interact significantly with infrastructure development or conservation of ocean ecosystems.
-1	Constraining	Limits options on another goal.	Improved water efficiency can constrain agricultural irrigation. Reducing climate change can constrain the options for energy access.
-2	Counteracting	Clashes with another goal.	Boosting consumption for growth can counteract waste reduction and climate mitigation.
-3	Cancelling	Makes it impossible to reach another goal.	Fully ensuring public transparency and democratic accountability cannot be combined with national-security goals. Full protection of natural reserves excludes public access for recreation.

Figure 7. Scoring scale developed by ICSU and Nilsson for measuring interactions between SDG targets using water as a nexus example. Source: UN-Water 2016 & UNESCAP 2017 & Nilsson et al Nature 2016.

demonstrates a practical approach for gaining a systemic and contextual perspective on the SDGs by using a 7-point scale on the nature of interactions developed by ICSU and SEI (Figure 7) [8,50], a cross-impact matrix and network analysis techniques. The scoring scale extends beyond the common but overly simplified dichotomy of synergies vs. trade-offs categorisation to one that supports policy coherence by an assessment of interlinkages that focuses on the degree to which instruments and actions to pursue one set of objectives affect our ability to pursue another set [15,50]. The scale is intuitive and relatively easy to use as a first level of assessment of the interlinkages at the level of SDG, targets, or at the level of policy interventions and instruments to determine potential synergies and trade-offs. The scale can also assist “organize evidence and support decision-making about national priorities [...] to help policy makers to identify and test development pathways that minimize negative interactions and enhance positive ones” [51]. The magnitude of the score, in whichever direction, provides an indication of how influential a given SDG or target is on another, or if the interaction is neutral a score of 0 ('consistent') is assigned.

In partnership with the European Commission’s Joint Research Centre’s (EC-JRC) Global Conservation and Development Knowledge Management Unit we have developed the SEI analytical approach, using a typology for scoring interactions in a cross-impact matrix [8,15,50–53], to produce an assessment methodology designed to be employed in a workshop and/or virtual setting to explore systemic and contextual interactions of SDG targets.



Figure 9. Example of a cross-impact matrix that includes SDG targets alongside specific policy actions (CA25, CA110 & CA115). Colour according to the 7-point scale from dark red (strongly restricting) to dark green (strongly promoting). The net influence from a target on all other targets is shown by the row-sum and the column-sum shows how much a target is influenced by all other targets in total. A feature within the matrix is the ability to analyse statistical outcomes from the interlinkage results. Users can also add comments – such as the data source they have used in making an assessment as well as the certainty of the information presented.

The resulting web-based application - Enabling SDGs - allows users to enter the scores digitally into an online matrix leading to a quick visualization of results either individually or as part of wider stakeholder discussions. The Enabling SDGs tool (Figure 8) is designed to support SDG implementation in the context of national policy instruments. The utility of the matrix and scoring tool is not as a scientific assessment of data relating to either specific SDG targets and/or policy actions but as a tool to support policy making, with a high degree of transparency and opportunity for engagement compared to modelling approaches [15]. Scoring is predominantly qualitative and judgment-based from the expertise and knowledge held by those responsible for implementing relevant policy areas under investigation. However, scoring can also be informed by relevant datasets (e.g. the EPA geoportal (<http://gis.epa.ie/>) and Ireland's Central Statistics Office (CSO) SDGs data hub (<https://irelandsdg.geohive.ie/>)). Each cell of the matrix (see Figure 8) is scored by asking the question “If progress is made on target x (rows), how does this influence progress on target y (columns)?” [15] so the discussion is focused on the interaction that occurs when making progress on a target to another target, and not the interaction that would emerge from fully achieving it. The application of the cross-impact matrix, using the scoring scale to categorize individual cells, provides a strongly systemic and visual for understanding how SDG targets interact and can be interrogated in the context of specific policy areas and choices. A key aspect for completing the matrix is that the scoring can be engaged with in a cross-sectoral/departmental collaborative manner to foster holistic discussion for priority setting and assessing existing and new policy pathways across not only the 2030 Agenda but national policy portfolios.

A resultant matrix shows patterns of relative frequency of positive and negative interactions that point to where implementation of policy linked to those areas could lead to synergistic or trade-off outcomes. A key development of the current project from the original matrix design of SEI is that in addition to goals and targets including specific actions and/or goals from policy documents make it possible to make an assessment against existing policy instruments in order to directly provide a policy perspective. For instance, a Department could evaluate whether a policy action focussed on one target affects additional targets and thereby where collaborations are needed for cooperation with policy instruments linked to those additional targets. Such an approach can enable ‘whole-of-government’ approaches for SDG implementation and foster policy cohesion by indicating where existing policy has dependency on each other, and decision makers should collaborate across policy areas.

Discussion

Implicit to policy coherence is that any given objective should have oversight from more than one policy organisation and/or instrument otherwise there may be no check whether its action has either a synergistic or trade-off outcome on another objective. In effect, the implementation of any Goal is difficult if not impossible if it remains the responsibility of one Department. Comprehending how and to what extent policy documents align to more than 1 SDG and/or target, and whether alignments lead to synergistic or incompatible (trade-off) outcomes, is important to determine in what way policy coherence can be gained. The nature of the alignment will also shape whether outcomes are beneficial across environmental, social and economic pillars of sustainable development.

The distribution of Government Departments to either Outcome (numbered) or Means of Implementation (a, b, etc.) targets shows that whereas there is a strong focus and diversity of Government Departments to Outcome targets, Mol targets are predominantly aligned to DFAT and/or DFIN and DFAT is the department with the most stakeholder associations: This may reflect a legacy perspective of the Millennium Development Goals and a distinction between national-level development, that is often viewed as predominantly a ‘technical’ challenge whereas international aspects of development are the domain of DFAT, this in turn suggests an absence of a strong convergence in recognition of the transboundary impacts of development and the transboundary nature of the SDG framework [22].

The SDGs do not exist in a policy vacuum, and it is important that their implementation is cognisant of the national planning context as well as regional/international perspectives. The SDGs are relevant to the context of Project Ireland 2040 [29] where there are significant alignments in areas such as climate action, clean energy, sustainable cities and communities and economic growth, although a detailed mapping exercise has not currently been undertaken. In the context of sustainable

development for Ireland [24] the NIP does map the SDGs at the goal level to sustainability objectives (Figure 1 & **Error! Reference source not found.**). Mapping the eight sustainability objectives to the SDGs and their organisation against Economic, Social and Biosphere labels demonstrates the potential utility of the SDGs to act as an integrator across Ireland's policy instruments where such mechanisms do not currently exist. Figure 6 demonstrates how the SDGs can integrate across sustainable development categories: For instance, respect for ecological integrity and biodiversity is linked through SDG 13 to Equity between generations and Economy. In the same vein, the Biosphere grouping of SDGs integrates across 5 sustainable development categories.

The analysis of the policy and structural setting for SDG implementation in Ireland suggests that an absence of policy is not the principle barrier to achieving a universal and indivisible whole, but rather the institutional arrangements for integration and cohesion in support of the agenda. Therefore, a tool is required that supports policy implementation towards national strategies and SDGs. Based on this study, this presents several challenges that could lead to contradictions between integrating the SDGs into national policy and ensuring compatibility between the SDGs and Ireland's development strategy at home and abroad, for instance:

1. Many of the individual targets contribute to several goals, and while in some cases interactions can lead to synergistic outcomes in others goals and targets may conflict; action to meet one target could have unintended consequences on others if they are pursued separately [50,54,55].
2. Individual policies that connect to one target could lead to an outcome from that target which then has negative (or conversely synergistic) outcomes on other targets [12,53].
3. Individual policies may connect to multiple targets such that a focus on its action on individual goals and/or targets could lead to perverse outcomes and progress across multiple elements of the 2030 Agenda [12,56,57].
4. How policies, that are usually designed to address a specific sector purpose, can be implemented in the context of a wider 'systems' perspective as required by the SDGs [3,58].
5. Analysis is also required to reconcile the fact that the categorisation of the SDGs does not fit well with the way in which governments operate and are organised.

In the context of Ireland, these challenges could lead to contradictions integrating the SDGs into national policy, and ensuring compatibility between the SDGs and Ireland's current national Sustainable Development Strategy "Our Sustainable Future"[24]; The National Planning Framework [28]; and The National Development Plan [29] amongst the portfolio of Ireland's policy strategies (see p.19 [26]). In practice meeting nationally defined priorities and sustainability solutions is a highly

contested space [41,42,59] and a tool, such as that presented here, that promotes dialogue and understanding across sectors and policy areas, using the SDGs as a framing mechanism could lead to better outcomes. The approach provides decision-makers and practitioners with a systematic way to structure discussion and analysis of their interactions across their policy domains and with the interlinkages that characterise the SDGs and their targets. Rather than focus on individual interactions it is more likely that clusters of interacting targets reflect where cross-sectoral collaboration will have more policy relevancy for priority setting [15,52]. To visualise where clusters of interactions exist, and the degree to which they lead to positive (synergistic) or negative (trade-off) outcomes a cross-impact matrix tool designed for analysing relationships between variables, factors, events, etc. associated with policy instruments is used [15,52]. The use of a cross-impact matrix allows policy-makers from multiple areas of Government to maintain a comprehensive view of the 2030 Agenda to account for systemic effects rather than focussing on a specific entry point and one-on-one interactions from one sector to others [8,47].

References

- [1] UN, Transforming our world: The 2030 agenda for sustainable development, United Nations, 2015. [https://sustainabledevelopment.un.org/content/documents/7891Transforming Our World.pdf](https://sustainabledevelopment.un.org/content/documents/7891Transforming%20Our%20World.pdf).
- [2] UNDG, Delivering the post-2015 agenda. Opportunities at the national and local levels, United Nations Development Group, 2014.
- [3] ICSU & ISSC, Review of Targets for the Sustainable Development Goals: The Science Perspective, International Council for Science (ICSU), 2015.
- [4] Secretariat of the UNESCO Scientific Advisory Board, The Future of scientific advice to the United Nations: A summary report to the Secretary-General of the United Nations from the Scientific Advisory Board, United Nations Educational, Scientific and Cultural Organization, 2016. <https://unesdoc.unesco.org/ark:/48223/pf0000245801>.
- [5] UNDESA, Open Working Group proposal for Sustainable Development Goals, United Nations, 2014. <http://undocs.org/A/68/970>.
- [6] N. Kanie, R. Zondervan, C. Stevens, Ideas on Governance “of” and “for” Sustainable Development Goals, UNU-IAS/POST2015 Conf. Rep. (2014).
- [7] R.B. Swain, A critical analysis of the Sustainable Development Goals, in: W. Leal Filho (Ed.), Handb. Sustain. Sci. Res., Springer International Publishing Switzerland, 2018: pp. 341–355.

doi:10.1007/978-3-319-63007-6_20.

- [8] ICSU, A Guide To SDG Interactions: From Science to implementation, D.J. Griggs, M. Nilsson, A. Stevance, D. McCollum (eds)]. International Council for Science, Paris, 2017. doi:10.24948/2017.01.
- [9] A. Miola, S. Borchardt, F. Neher, D. Buscaglia, Interlinkages and policy coherence for the Sustainable Development Goals implementation: An operational method to identify trade-offs and co-benefits in a systemic way, EUR 29646 EN, Publications Office of the European Union, Luxembourg, 2019. doi:10.2760/472928.
- [10] D. Le Blanc, Towards Integration at Last? The Sustainable Development Goals as a Network of Targets, *Sustain. Dev.* 23 (2015) 176–187. doi:10.1002/sd.1582.
- [11] X. Zhou, M. Moinuddin, Sustainable Development Goals Interlinkages and Network Analysis: A practical tool for SDG integration and policy coherence, IGES Research Report No. RR1602, Institute for Global Environmental Strategies (IGES), 2017. <https://pub.iges.or.jp/pub/sustainable-development-goals-interlinkages>.
- [12] OECD, Policy Coherence for Sustainable Development in the SDG Framework. Shaping Targets and Monitoring Progress, OECD, 2015. http://www.oecd.org/development/pcd>Note_on_Shaping_Targets.pdf.
- [13] OECD, Better Policies for Sustainable Development 2016. A New Framework for policy coherence, OECD Publishing, Paris, 2016.
- [14] OECD, Better Policies for Development 2015. Policy Coherence and Green Growth, OECD Publishing, Paris, 2015. doi:10.1787/eco_surveys-col-2015-en.
- [15] N. Weitz, H. Carlsen, M. Nilsson, K. Skånberg, Towards systemic and contextual priority setting for implementing the 2030 Agenda, *Sustain. Sci.* 13 (2018) 531–548. doi:10.1007/s11625-017-0470-0.
- [16] J. Tosun, J. Leininger, Governing the Interlinkages between the Sustainable Development Goals: Approaches to Attain Policy Integration, *Glob. Challenges.* 1 (2017) 12. doi:10.1002/gch2.201700036.
- [17] J. Tosun, A. Lang, Policy integration: mapping the different concepts, *Policy Stud.* 38 (2017) 553–570. doi:10.1080/01442872.2017.1339239.

- [18] UNDP, Rapid Integrated Assessment (RIA) To facilitate mainstreaming of SDGs into national and local plans, United Nations Development Programme, 2017.
- [19] UNDG, Mainstreaming the 2030 Agenda for Sustainable Development Reference Guide to UN Country Teams, United Nations Development Group, 2016.
- [20] OECD, Getting Governments Organised to Deliver on the Sustainable Development Goals, Organisation for Economic Co-operation and Development, 2017.
- [21] OECD, Better policies for 2030: An OECD action plan on the sustainable development goals, Organisation for Economic Co-operation and Development, 2016.
- [22] I. Niestroy, E. Hege, E. Dirth, R. Zondervan, K. Derr, Europe's approach to implementing the Sustainable Development Goals: good practices and the way forward, Policy Department for External Relations, Directorate General for External Policies of the Union, 2019. doi:10.2861/28364.
- [23] M. Nilsson, E. Chisholm, D. Griggs, P. Howden-Chapman, D. McCollum, P. Messerli, B. Neumann, A.S. Stevance, M. Visbeck, M. Stafford-Smith, Mapping interactions between the sustainable development goals: lessons learned and ways forward, Sustain. Sci. 0123456789 (2018) 1–15. doi:10.1007/s11625-018-0604-z.
- [24] Government of Ireland, Our sustainable future: A Framework for Sustainable Development for Ireland, DOE, 2012.
- [25] OECD, Policy Coherence for Sustainable Development Country Profiles: Ireland, OECD, 2019.
- [26] DCCAE, The Sustainable Development Goals National Implementation Plan 2018-2020, Department of Communications, Climate Action & Environment, 2018.
- [27] Government of Ireland, A Better World. Ireland's Policy for International Development, Government of Ireland, 2019.
- [28] Department of Housing Planning and Local Government, Project Ireland 2040. National Planning Framework, Government of Ireland, 2018.
- [29] DPER, Project Ireland 2040: National Development Plan 2018-2027, Department of Public Expenditure and Reform, Government of Ireland, 2018. <https://assets.gov.ie/19240/62af938dce404ed68380e268d7e9a5bb.pdf>.
- [30] OECD, Policy Coherence for Sustainable Development 2018: Towards Sustainable and Resilient

- Societies, OECD Publishing, Paris, 2018. doi:<http://dx.doi.org/10.1787/9789264301061-en>.
- [31] C. Rakotomahazo, L.A. Ravaoarinorotsihoorana, D. Randrianandrasaziky, L. Glass, C. Gough, G.G. Boleslas Todinahary, C.J. Gardner, Participatory planning of a community-based payments for ecosystem services initiative in Madagascar's mangroves, *Ocean Coast. Manag.* 175 (2019) 43–52. doi:[10.1016/j.ocecoaman.2019.03.014](https://doi.org/10.1016/j.ocecoaman.2019.03.014).
 - [32] I. Boas, F. Biermann, N. Kanie, Cross-sectoral strategies in global sustainability governance: towards a nexus approach, *Int. Environ. Agreements Polit. Law Econ.* 16 (2016) 449–464. doi:[10.1007/s10784-016-9321-1](https://doi.org/10.1007/s10784-016-9321-1).
 - [33] F. Biermann, N. Kanie, R.E. Kim, Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals, *Curr. Opin. Environ. Sustain.* 26–27 (2017) 26–31. doi:[10.1016/j.cosust.2017.01.010](https://doi.org/10.1016/j.cosust.2017.01.010).
 - [34] J. Grainger-Brown, S. Malekpour, Implementing the sustainable development goals: A review of strategic tools and frameworks available to organisations, *Sustain.* 11 (2019) 1381. doi:[10.3390/su11051381](https://doi.org/10.3390/su11051381).
 - [35] UNESC, Integrating the three dimensions of sustainable development: A framework and tools, United Nations, 2015. www.unescap.org.
 - [36] UNESC, Strategic foresight for the post-2015 development agenda Report of the Secretary-General Executive summary Economic and Social Council, United Nations Economic and Social Council, 2015.
 - [37] UNESCAP, Integrated Approaches for Sustainable Development Goals Planning: The case of Goal 6 on water and sanitation, Environment and Development Division United Nations Economic and Social Commission for Asia and the Pacific, 2017.
 - [38] D.L. McCollum, L.G. Echeverri, S. Busch, S. Pachauri, S. Parkinson, J. Rogelj, V. Krey, J.C. Minx, M. Nilsson, A.S. Stevance, K. Riahi, Connecting the sustainable development goals by their energy inter-linkages, *Environ. Res. Lett.* 13 (2018) 24. doi:[10.1088/1748-9326/aaafe3](https://doi.org/10.1088/1748-9326/aaafe3).
 - [39] P.J.K. McGowan, G.B. Stewart, G. Long, M.J. Grainger, An imperfect vision of indivisibility in the Sustainable Development Goals, *Nat. Sustain.* 2 (2018) 1. doi:[10.1038/s41893-018-0190-1](https://doi.org/10.1038/s41893-018-0190-1).
 - [40] IAEG-SDGs, Interlinkages of the 2030 Agenda for Sustainable Development, Interlinkages Working Group of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators, 2019.

- [41] S. D'Errico, T. Geoghegan, I. Piergallini, Evaluation to connect national priorities with the SDGs. A guide for evaluation commissioners and managers, IIED, London, 2020. <http://pubs.iied.org/17739IIED>.
- [42] EEA, FOEN, Is Europe Living within the natural limits of our planet, European Environment Agency, 2020. <https://www.eea.europa.eu/publications/is-europe-living-within-the-planets-limits>.
- [43] K.L. Nash, J.L. Blythe, C. Cvitanovic, E.A. Fulton, B.S. Halpern, E.J. Milner-Gulland, P.F.E. Addison, G.T. Pecl, R.A. Watson, J.L. Blanchard, To Achieve a Sustainable Blue Future, Progress Assessments Must Include Interdependencies between the Sustainable Development Goals, *One Earth*. (2020) 1–13. doi:10.1016/j.oneear.2020.01.008.
- [44] SDG Knowledge Hub, Policy Brief: Towards Integrated Implementation: Tools for understanding linkages and developing strategies for policy coherence, 2016. <https://sdg.iisd.org/commentary/policy-briefs/towards-integrated-implementation-tools-for-understanding-linkages-and-developing-strategies-for-policy-coherence/>.
- [45] D. Le Blanc, Towards integration at last? The sustainable development goals as a network of targets, Division for Sustainable Development, United Nations Department of Economic and Social Affairs, UN DESA, 2015.
- [46] A. Coopman, D. Osborn, Healthier Planet - Healthier Lives. An analysis of the connections between environment and health - related targets in the Sustainable Development Goals and the 2030 Agenda, Stakeholder Forum, 2016.
- [47] A. Coopman, D. Osborn, F. Ullah, E. Auckland, G. Long, Seeing the Whole: Implementing the SDGs in an Integrated and Coherent Way - A Research Pilot by stakeholder forum, Bioregional and Newcastle University, A research pilot by Stakeholder Forum, Bioregional and Newcastle University, 2016. <https://flic.kr/p/5sbJAj>.
- [48] OECD, Measuring distance to the SDG targets 2019. An assessment of where OECD countries stand, OECD Publishing, Paris, 2019. doi:<https://doi.org/10.1787/a8caf3fa-en>.
- [49] A. Ochs, L. Indriunaite, S. Engstroem, Towards policy coherence: An assessment of tools linking the climate, environment and sustainable development agendas, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2020.
- [50] M. Nilsson, D. Griggs, M. Visbeck, C. Ringler, A draft framework for understanding SDG

- interactions, International Council for Science (ICSU), 2016.
- [51] M. Nilsson, D. Griggs, M. Visbeck, Map the interactions between Sustainable Development Goals, *Nature*. 534 (2016) 320–322. doi:10.1038/534320a.
- [52] N. Weitz, SDG Synergies: An approach for coherent 2030 Agenda implementation, Stockholm Environment Institute, 2019.
- [53] M. Nilsson, Understanding and mapping important interactions among SDGs: Readying institutions and policies for integrated approaches to implementation of the 2030 Agenda., in: Expert Meet. Prep. HLPF 2017, 2016: pp. 1–33. <https://sustainabledevelopment.un.org/content/documents/12067Understanding and mapping important interactions among SDGs.pdf>.
- [54] M. Elder, P. King, Realising the Transformative Potential of the SDGs, Institute for Global Environmental Strategies (IGES), 2018.
- [55] M. Elder, M. Bengtsson, L. Akenji, An optimistic analysis of the means of implementation for sustainable development goals: Thinking about goals as means, *Sustain.* 8 (2016). doi:10.3390/su8090962.
- [56] OECD, Framework For Policy Coherence For Sustainable Development: A Self-Assessment Tool to Design, Implement and Track Progress on Mutually Supportive Policies for Sustainable Development, OECD, 2015. <https://www.oecd.org/pcd/TOOLKIT FRAMEWORK FOR PCSD.pdf>.
- [57] Independent Group of Scientists appointed by the Secretary-General, Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development, United Nations, 2019. doi:10.1016/S0262-4079(12)60125-0.
- [58] J.H.P. Dawes, Are the Sustainable Development Goals self-consistent and mutually achievable?, *Sustain. Dev.* (2019) 1–17. doi:10.1002/sd.1975.
- [59] R. Wong, J. van der Heijden, Avoidance of conflicts and trade-offs: A challenge for the policy integration of the United Nations Sustainable Development Goals, *Sustain. Dev.* (2019) 838–845. doi:10.1002/sd.1944.