Understanding the Spillovers and Transboundary Impacts of Public Policies

IMPLEMENTING THE 2030 AGENDA FOR MORE RESILIENT SOCIETIES

OECD

European Commission

Understanding the Spillovers and Transboundary Impacts of Public Policies

IMPLEMENTING THE 2030 AGENDA FOR MORE RESILIENT SOCIETIES

Please cite this publication as:
OECD/EC-JRC (2021), *Understanding the Spillovers and Transboundary Impacts of Public Policies: Implementing the 2030 Agenda for More Resilient Societies*, OECD Publishing, Paris, *https://doi.org/10.1787/862c0db7-en*.

ISBN 978-92-64-93513-6 (print)
ISBN 978-92-64-76550-4 (pdf)

The European Union
ISBN 978-92-78-42412-1 (print)
ISBN 978-92-78-42411-4 (PDF)

Catalogue number
OA-02-21-080-EN-C (print)
OA-02-21-080-EN-N (PDF)

Photo credits: Cover © everything possible/shutterstock.com.

Corrigenda to publications may be found on line at: *www.oecd.org/about/publishing/corrigenda.htm*.

Foreword

The 2030 Agenda for Sustainable Development offers a blueprint for a better world. Achieving the Sustainable Development Goals (SDGs) requires designing and implementing policies that benefit all people in all countries. In today's interconnected world, this means policies that systematically take into account the interactions among the social, economic and environmental dimensions of sustainable development as well as the impacts of policies beyond national borders. This is critical not least for addressing an increasing number of global transboundary challenges shaped by, for instance, large volumes of international trade and financial flows, demographic pressures and migration, and pollution and climate change.

The COVID-19 pandemic has further demonstrated the interconnectedness of our societies and economies, resulting in disruptions of global supply chains and limited movement of people between countries. Ensuring a sustainable recovery and systematically addressing spillovers and transboundary impacts in domestic policy making requires strengthened governance mechanisms and capacities to overcome fragmented action. Institutional mechanisms and tools for policy coherence for sustainable development (PCSD), a key component of the OECD's work on SDG governance, can boost governments' capacity to account for policy impacts across sectors and borders.

This book brings together country experiences in promoting policy coherence and governance mechanisms for the SDGs (Chapters 1-4) and new tools for assessing and measuring spillovers and transboundary impacts (Chapters 5-11). Its goal is to help policy makers become more 'globally competent' by improving their ability to understand, anticipate and address unintended impacts of their policies. It provides them with a collection of tools and good practices for designing coherent and co-ordinated policies to implement the SDGs based on evidence.

The book is the result of a collaborative effort by the Organisation for Economic Co-operation and Development (OECD) and the European Commission Joint Research Centre (EC-JRC). It presents the findings of OECD and EC-JRC analysis along with those of independent researchers and scientists, to stimulate international dialogue on how to build a more inclusive and resilient society that leaves no one behind.

Acknowledgements

This report represents a collaborative effort by the Policy Coherence for Sustainable Development Goals Division in the Public Governance Directorate of the Organisation for Economic Co-operation (OECD) and the European Commission-Joint Research Centre (EC-JRC).

The report was coordinated by Apollonia Miola (EC-JRC), in collaboration with Carina Lindberg and Ernesto Soria Morales (OECD). Strategic guidance was provided by Tatyana Teplova (OECD) and Giampiero Genovese (EC-JRC). The report benefits from the contributions of several OECD Directorates, EC-JRC and an international community of scientists and practitioners through a call for papers launched in April 2020.

The authors are grateful to Daniela Wirth and Koen Jonkers (EC-JRC) for overseeing the editorial and review process, and to Melissa Sander (OECD) and Meral Gedik (External consultant) for preparing the report for publication.

Table of contents

FIGURES

TABLES

Abbreviations and acronyms

1.5DG	1.5 °C scenario
2DG	2 °C scenario
ASviS	Alleanza Italiana per lo Sviluppo Sostenibile (Italian Multi-stakeholder Alliance)
AUS	Australia
AUT	Austria
BAU	Business as Usual
BEL	Belgium
BHR	Business and Human Rights
CAN	Canada
CB	Conference Board
CBA	Consumption-based accounting
CGC	Center for Global Commons at the University of Tokyo
CGE	Computable General Equilibrium model
CHE	Switzerland
CHL	Chile
CIDE	Center for Research and Teaching in Economics, for its acronym in Spanish
Col.	Collateral
CONEVAL	National Council for the Evaluation of Social Development Policy, for its acronym in Spanish
COVID	Coronavirus Disease
CSR	Corporate social responsibility
CZE	Czech Republic
DAC	Development Assistant Committee
DEU	Germany
DG DEVCO	Organisation for Economic Co-operation and Development
DMC	Domestic Material Consumption
DNK	Denmark
DPSIR	Drivers, Pressures, State, Impacts, Responses
DTP3	Diphtheria-tetanus-pertussis
EEA	European Environment Agency
EEIOA	Environmentally-Extended Input-Output Assessment
EF	Environmental Footprint
EGD	European Green Deal
EPI	Environmental Performance Index
ESP	Spain
EST	Estonia
EU	European Union
EU-27	27 member states of the EU
EU-28	28 member states of the EU
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FIN	Finland
FRA	France

GBR	United Kingdom
GCS	Global Commons Stewardship
GDP	Gross Domestic Product
GDP	Gross Domestic Product
GE	General Equilibrium model
GECO	Global Energy and Climate Outlook
GHG	Greenhouse Gas Emissions
GNI	Gross National Income
GPI	Gender Parity Index
GRC	Greece
GTAP	Global Trade Analysis Project
GVCs	Global Value Chains
HIV	Human immunodeficiency virus
HLPF	High-Level Political Forum
HUN	Hungary
IAEG-SDGs	Inter-Agency and Expert Group on Sustainable Development Goals Indicators
ICIO	Inter-Country Input-Output
ILO	International Labour Organization
IMCO	Instituto Mexicano de Competitividad (Mexican Institute for Competitiveness)
INEGI	Instituto Nacional de Estadística y Geografía (National Institute of Statistics and Geography)
Ins.	Instrumental
IO	Input-Output
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
IRL	Ireland
ISL	Iceland
ISR	Israel
ITA	Italy
JPN	Japan
KOR	Korea
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LNPP	National Laboratory for Public Policy, for its acronym in Spanish
LUX	Luxembourg
LVA	Latvia
MAGNET	Modular Applied GeNeral Equilibrium Tool
MAMS	Maquette for MDG Simulations
MCV2	Measles-containing vaccine second dose
MDGs	Voluntary National Reviews
MFA	Material Flow Analyses
MRIO	Multi-Regional Input-Output
NCPs	National Contact Points
NLD	Netherlands
NOR	Norway
NZL	New Zealand
ODA	Official Development Assistance
OEC	Observatory of Economic Complexity
OECD	Organisation for Economic Co-operation and Development
PBA	Production-based accounting
PCSD	Policy Coherence for Sustainable Development
PIK	Potsdam Institute for Climate Impact Research
PM	Particulate Matter

POL	Poland
PPI	Policy Priority Inference
PPISD	Policy Priority Inference for Sustainable Development
PPP	Purchasing Power Parity
PRT	Portugal
R&D	Research and Development
RBC	Responsible Business Conduct
RBLAC	Regional Bureau on Latin America and the Caribbean
RME	Raw Materials Equivalent
RoW	Rest of the World
SCP	Sustainable Consumption and Production
SDGs	Sustainable Development Goals
SDSN	Sustainable Development Solutions Network
SEI	Stockholm Environment Institute
SOER 2020	The European Environment – State and Outlook 2020
SSA	Sub-Saharan Africa
SSPs	Shared Socioeconomic Pathways
SVK	Slovak Republic
SVN	Slovenia
SWE	Sweden
TI	Transparency International
TiVA	Trade in Value Added
TUR	Turkey
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UN DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGPs	UN Guiding Principles on Business and Human Rights
UNICEF	United Nations International Children's Emergency Fund
UNICEF	United Nations Children's Fund
USA	United States of America
VNR	United Nations' High Level Political Forum [on Sustainable Development]
WB	World Bank
WEF	World Economic Forum
WHO	World Health Organization
WRI	World Resources Institute
WTO	World Trade Organization
WTTC	World Travel and Tourism Council

Executive summary

The multidimensional and intergenerational nature of the 2030 Agenda for Sustainable Development implies complex interlinkages among all 17 Sustainable Development Goals (SDGs). The progress made in a particular social, economic or environmental area or an individual Goal could generate synergies and trade-offs across dimensions (spillover effects), and interconnections among countries could lead to positive or negative impacts beyond national borders (transboundary effects).

Failure to address such impacts could significantly undermine countries' efforts to implement the 2030 Agenda. Moreover, governments cannot afford policies and actions with unintended and costly consequences at home or abroad – particularly when they are struggling to finance a sustainable recovery from the COVID-19 pandemic. National processes, systems and structures for managing and co-ordinating policy at all levels could help overcome this challenge.

However, establishing mechanisms that account for policy interactions as well as social, economic and environmental externalities beyond borders has proven challenging for all countries. Data are limited, causal linkages are hard to establish, and political interests and priorities are diverse and, in many cases, competing.

Policy coherence for sustainable development (PCSD) provides a comprehensive standard for ensuring that appropriate mechanisms and tools exist and function effectively throughout the policy cycle. It calls for institutional mechanisms for integrated planning and strategic visioning, for co-ordination and collaboration across sectors and levels of government, and for monitoring, evaluating and reporting on the impacts of domestic policies and actions (Chapter 1).

While there is no one-size-fits-all solution, countries are increasingly seeing the value of using public governance tools to mainstream the SDGs into policy making and to design and implement policies that consider the impacts of policies 'here and now', 'elsewhere', and 'later'. This book, a compilation of independently authored chapters, presents a collection of governance and analytical tools that can help governments anticipate, assess and measure spillovers and transboundary impacts. It provides a toolbox for integrated policy making in a highly globalised world.

One such tool is impact assessments, including an "impact pathways" approach to devise an integrated assessment strategy based on cross-sector and cross-country collaboration (Chapter 2). Other solutions could be to align development co-operation programmes with national commitments, strategies and plans for implementing the SDGs (Chapter 3); or to leverage platforms for stakeholder engagement to consider the interests of all people in all countries, and ensuring that multinational businesses abide by international principles and codes of conduct (Chapter 4).

In tandem with the emergence of governance tools and approaches for identifying and addressing spillovers and transboundary impacts, new analytical and technical tools – or extensions of existing ones – are being developed by researchers around the world. As shown throughout this book, these tools provide innovative methodologies and approaches for organising, interpreting and using vast amounts of data from different national and international sources, with a view to detecting and limiting negative spillovers and transboundary impacts in SDG implementation.

For example, using data to explore transboundary dynamics according to different flows – financial flows, movement of people, trade, environmental flows, and knowledge transfers – yields a conceptual framework for analysing transboundary inter-relationships in the context of the 2030 Agenda (Chapter 5). Input-output tables can be used to track transboundary impacts along international value chains (Chapter 6); and multi-region multi-commodity models offer unique insights into the synergies and trade-offs involved when several policy instruments and other drivers are operating simultaneously (Chapter 7).

Systemic approaches are necessary for analysing the complex interrelations at the core of persistent environmental and sustainability challenges and are increasingly used to identify and assess policy effects across different regions and countries (Chapter 8). A lifecycle perspective is helpful for understanding and evaluating the transboundary effects of consumption in a given territory (Chapter 9); and production- and consumption-based accounting can shed light on countries' impacts on the Global Commons (Chapter 10).

The application of computational tools and agent-based modelling can also help address the complexities of the budgeting prioritisation process for sustainable development, assess the coherence of government action, and account for context-specific interlinkages between development indicators and policy dimensions (Chapter 11). The testing and piloting of new tools and methodologies, in different countries and regions of the world, is critical for ensuring that they generate the evidence policy makers need.

One year into the Decade of Action, governments will need to step up their efforts if the 2030 Agenda is to be achieved. At the same time, they are grappling with the devastating impacts of the COVID-19 pandemic. Balancing short-term recovery measures with long-term sustainability objectives, and ensuring that those measures do not generate unintended negative effects across sectors and countries, is critical for success. This book shows that strong institutional mechanisms, coupled with sound governance tools and cutting-edge research, can be the levers needed to help put the world back on a sustainable path.

1 Linking the domestic and international implementation of the SDGs: Governance mechanisms and tools for addressing spillovers and transboundary impacts

Carina Lindberg and Ernesto Soria Morales,
OECD Public Governance Directorate

Achieving sustainable development represents a complex governance challenge. It involves ensuring that domestic policies contribute to global sustainability, while avoiding negative economic, social and environmental externalities between sectors and beyond national borders. Mechanisms and tools for policy coherence can support this process. This chapter includes examples from OECD countries, since the adoption of the 2030 Agenda in 2015, in developing, strengthening and using such mechanisms and tools. It provides the overall institutional context for this book and illustrates how the innovative tools and methodologies presented in subsequent chapters can strengthen policy coherence throughout the policy cycle.

Introduction

Effectively addressing the universal, integrated and intergenerational nature of the 2030 Agenda for Sustainable Development, and the Sustainable Development Goals (SDGs), represents a formidable governance challenge. It implies a need for governments to design domestic policies that systematically consider the impacts of those policies on the economy, society and environment here and now, later, and elsewhere. Moreover, if the global aspirations of the 2030 Agenda are to be achieved on time, progress in implementing the SDGs must not only be maintained, it must be accelerated. For that to happen, there is need to boost the capacity of governments to ensure that domestic policies contribute to global sustainability, while avoiding negative economic, social and environmental externalities between sectors and beyond national borders.

This is not easy in a global context where the COVID-19 pandemic risks halting or even reversing progress made thus far on achieving the SDGs. In such complex context, immediate economic and social pressures often crowd out longer term strategic policy initiatives and goals, and domestic interest often prevail over global aspirations and agendas.

Experience from OECD countries has shown that a more systematic consideration of the global effects of domestic policies is dependent on the underlying processes through which those policies are designed and implemented. This calls for strong institutional mechanisms for strategic visioning and planning, for coordination and collaboration, and for assessing, monitoring and evaluating the impacts of policies and actions taken. However, governments are presented with a number of challenges in this regard, ranging from difficulties in balancing short- and long-term priorities, lack of robust methodologies and data to estimate transboundary impacts and complex interactions to aligning policies across sectors and levels of government. Internalising and accounting for policy interactions and transboundary impacts across the policy cycle has proven particularly challenging.

Ensuring that domestic policies, national action plans and strategies for achieving the SDGs take into account more systematically transboundary impacts and spillovers across sectors, requires an organisational support that overcomes fragmented government action. Policy coherence for sustainable development (PCSD) offers the means for overcoming fragmented action. While there is no one-size-fits-all approach for ensuring that policies account for transboundary impacts, experience shows that the ability to consistently develop and implement coherent policies in all areas is dependent on the processes, systems, structures and tools used by governments to manage and co-ordinate policy at all levels.

Drawing on the OECD Recommendation on Policy Coherence for Sustainable Development (PCSD), adopted in 2019, this chapter explores how OECD countries can reduce their footprint in other countries (‘elsewhere’), while also promoting sustainable development outcomes at home (‘here and now’) and for future generations (‘later’). It argues that strong institutional mechanisms and evidence-based analytical tools are critical for success, not least in the context of a rapidly changing and uncertain world.

Spillovers and transboundary impacts in an increasingly complex world

The COVID-19 pandemic has further demonstrated the interconnectedness of our societies and economies. It has also reminded us that in a highly interconnected world, the transmission channels are numerous – for example through financial flows, imports and exports of goods and services, migration or knowledge transfers – and countries’ policies necessarily impact on one another. Since the onset of COVID-19, disruptions of global supply chains and limited movement of people across borders have triggered a number of negative transboundary impacts, including shortages of essential goods like medical products. Countries that are heavily dependent on tourism, such as small island developing states (SIDS); inflows of remittances; or official development assistance, have been particularly hard hit, and risk seeing their progress in implementing the SDGs reversed (OECD, 2020[1]).

The pandemic has heightened countries' awareness of the need to apply international rules and governance standards in policy areas that generate spillovers and transboundary effects, and to ensure coherence between national, regional and global responses as well as between different international agreements such as the 2030 Agenda for Sustainable Development, the Paris Climate Agreement and the Sendai Framework for Disaster Risk Reduction.

Addressing the underlying causes of vulnerability in our systems, which stem from inequalities, weak governance and institutions, inadequate public services and infrastructure, and depletion of natural resources, will be essential for ensuring a sustainable global recovery from COVID-19 – one where the actions of one country do not negatively impact on another. In fact, many recovery responses present an opportunity to further align public policies and institutional mechanisms with the SDGs and to address the root causes of policy trade-offs and negative policy impacts at home and abroad. Recent work by the OECD identifies four main reasons as to why now is an opportune time to act and accelerate progress towards the SDGs, building resilience against future global shocks (OECD, 2020[1]):

- The scale of the COVID-19 shock entails historic levels of public expenditures with more flexible fiscal frameworks.
- The general public today is more aware of the strong impact of our lifestyle on the environment.
- Societies have demonstrated their ability to act in alignment with public health measures, and to adapt and change habits and behaviours.
- The crisis has shown that no individual country is immune to global risks nor can they successfully fight them alone.

The role of policy coherence for sustainable development

An effective and SDG-conscious response to the crisis requires mutually supportive and integrated policies that balance economic, social and environmental objectives, while avoiding costly spillovers and transboundary impacts. However, implementing the SDGs as an integrated set represents a major challenge for all governments. The obstacles to coherent whole-of-government approaches are well known. For example, immediate economic and social pressures often crowd out longer term strategic policy initiatives. Public budgets and accountability systems are usually aligned with departmental structures and have difficulty tracking outcomes that occur in multiple policy areas and across multiple levels of government. An unprecedented range of public and private actors will need to be consulted and participate in both policy formulation and implementation of the SDGs (Governance as an SDG Accelerator, (OECD, 2019[2]).

Identifying, assessing and monitoring spillovers and transboundary impacts present particular challenges due to their pervasive nature. Challenges include limited or no data at appropriate stages of the policy-making process; capacity to interpret the data and establish clear causal links between actions in one country and effects in another country where often externalities are not linear; and national (political) interests that do not necessarily consider the circumstances and needs of countries in other parts of the world. Recent OECD analysis finds that as many as 97 SDG targets can be described as having transboundary elements (57% of all 169 targets); 50 of these are "means of implementation" targets, most of which relate to financing and supporting developing countries in achieving the SDGs. Transboundary targets are heavily concentrated in the Planet goals, where they account for 76% of the total, and in the Implementation goal (95%) (Measuring Distance to the SDG Targets, (OECD, 2019[3]).

Policy coherence for sustainable development, recognised as a means of implementation in SDG Target 17.14, provides governments with a solution for addressing these challenges and overcoming sectoral and fragmented action. While the concept of policy coherence has evolved over time, it is understood today as an approach and policy tool for integrating the economic, social and environmental dimensions of

sustainable development at all stages of policy-making (Box 1.1). In practice, this entails fostering synergies across policy areas; balancing domestic and international objectives; and addressing the transboundary and long-term impacts of policies.

Box 1.1. Policy coherence – an evolving concept in a changing world

The issue of transboundary impacts has been at the core of the policy coherence debate since the early 1990s. The concept of Policy Coherence for Development (PCD) emerged in the context of aid effectiveness, with discussions primarily taking place among donors on a sector-by-sector basis to ensure coherence between aid and non-aid policies. PCD was introduced in EU law by the Maastricht Treaty (1992), and further reinforced by the Treaty of Lisbon (2009). It was reiterated in the new European Consensus on Development (2017). Building on the 2030 Agenda, the European Consensus on Development reaffirmed the EU commitment to PCD and recognised it as a crucial element of the strategy to achieve the SDGs in partner countries. The Consensus foresees that PCD will be applied across all policies and all areas covered by the 2030 Agenda (https://ec.europa.eu/international-partnerships/european-consensus-development_en).

At OECD-level, the OECD Public Governance Committee has been helping countries to develop and strengthen key tools and mechanisms for policy coherence in general since the early 1990s, particularly in relation to the greater use of effective policy-making tools such as regulatory impact analysis. Such tools can help to better embed a 'whole-of-government' perspective by those involved with policy formulation, requiring more detailed consideration of how policy changes can impact across all levels and sectors of society.

Assessing means to promote and ensure policy coherence *for development*, in turn, has been an integral part of the Development Assistance Committee's (DAC) peer reviews since 2002. A synthesis of peer review findings in 2003-2007 helped determine best practices and experiences in institutional arrangements for PCD and informed the preparation of the 2008 OECD Ministerial Declaration on Policy Coherence for Development. With the adoption of this Declaration, member countries committed to 'continue our efforts to ensure that development concerns are taken into account across relevant policies inter alia through improved impact analyses and better policy coordination both at country level and within the OECD, taking into account in particular the impact on the international development objectives of our environmental, agricultural, fisheries, economic and financial policies, as well as our policies in the areas of trade, migration, security, energy, science and technology' (OECD, 2008[4]).

The work by the PGC and the DAC also paved the way for the 2010 OECD Recommendation of the Council on Good Institutional Practices in Promoting Policy Coherence for Development, where member countries recognised 'that the increasingly complex environment in which policies generally are formulated creates challenges for all governments and governance systems to ensure policy coherence for development and that policy makers increasingly need to be aware of the impact that policies developed at times in seemingly unrelated areas may have on development issues' (OECD, 2010[5]). The Recommendation aimed at helping governments to better mainstream and integrate consideration of development issues by policy makers when they design and establish national frameworks for more coherent policies.

The adoption of the 2030 Agenda for Sustainable Development further underlined the importance of policy coherence and recognised the need to broaden the concept of PCD to reflect a more complex global landscape. This awareness, in turn, culminated in the adoption of the Recommendation of the Council on Policy Coherence for Sustainable Development in December 2019.

Institutional mechanisms and tools for addressing spillovers and transboundary impacts throughout the policy cycle

Countries are much more interconnected today than they were only a few decades ago. The PCSD Recommendation provides countries with a comprehensive standard to equip policy makers with the necessary mechanisms and tools to address integrated economic, social and environmental goals and challenges as well as impacts on other countries and future generations. It defines transboundary impacts as 'any effect – intended or not – originated in one country that crosses national borders through flows of capital, goods, human and natural resources, and that is able to affect positively or negatively the sustainable development prospects of another country.'

The Recommendation presents a set of eight interrelated guiding principles for promoting PCSD, which are organised under three main pillars (Figure 1.1):

- a strategic vision underpinned by a clear political commitment and institutional leadership to enhance policy coherence;
- effective and inclusive institutional and governance mechanisms to address policy interactions across sectors and align actions between levels of government; and
- a set of responsive and adaptive tools to anticipate and address domestic, transboundary and long-term impacts of policies.

Figure 1.1. Eight guiding principles for enhancing PCSD

Source: OECD (2019[6]), Recommendation of the Council on Policy Coherence for Sustainable Development.

The institutional mechanisms promoted by these eight principles can all contribute to reducing negative spill-overs and impacts on other countries: *the consideration of policy interactions and transboundary impacts needs to be fostered throughout the policy cycle*, from political commitment and planning through coordination and policy integration to monitoring and reporting. The following sections highlight OECD good practices to this end, and show how governance and coordination mechanisms (Chapters 1-4) together with analytical tools (Chapters 5-11) might accompany and support policy-makers in this process.

Political commitment, vision and leadership

Some countries are making explicit reference to transboundary impacts as part of their political commitment to the SDGs and PCSD, for example through national SDG action plans and strategies. This is the case in Sweden, for instance, where the task to identify potential transboundary and intergenerational effects in policies is a part of the action plans that all ministries have drawn up. The Netherlands includes transboundary effects in its national Action Plan on Policy Coherence for Development, which links the country's five priority themes to the SDGs. Clear government commitment to the SDGs can also help countries to steer integrated planning and implementation. In Japan, for example, the SDGs Promotion Headquarters adopted the SDGs Implementation Guiding Principles with a view to mobilise all ministries and government agencies to integrate the SDGs into their plans, strategies, policies and activities, as well as follow-up and review. **Spain's** programmatic Action Plan for the implementation of the 2030 Agenda promotes public policies' alignment with the SDGs and identifies policy levers and transformative measures. A number of countries are also using the budget to promote policy integration, e.g. **Norway** and **Mexico**.

This indicates a willingness and commitment to consider policy impacts and integration systematically across the government and, if accompanied by a solid monitoring mechanism, can contribute to strengthening accountability and transparency for addressing spillovers and transboundary effects.

Chapter 3 looks specifically at to what extent OECD members are using the SDGs as a critical lever at home to promote policies that are coherent with sustainable development objectives and abroad to deliver consistent support to sustainable development in partner countries. It notes that while many OECD governments and other donor agencies are making progress in incorporating the SDG framework into their strategies, programmes and projects, there is still scope to mainstream the SDGs into development co-operation. In many cases, delivery is still limited due to the compounding effects of technical, organisational and political obstacles. To translate political commitment to the SDGs into partner-friendly policies, the chapter encourages *inter alia* continuous debate, clearly spelled out government responsibilities, and use of multilateral frameworks to build mutual commitments.

Coordination mechanisms and tools to address policy impacts and interactions

Collaboration and coordination within and between countries, across economic, social and environmental dimensions, across levels of government, and with other stakeholders (e.g. civil society and business) are key features of PCSD. Countries are using different mechanisms to coordinate their domestic policies and actions in line with the SDGs, which can all contribute to reducing negative spillovers or transboundary impacts. Some have assigned this coordination function to the Ministry of Foreign Affairs or Development, the Ministry of Environment, the Ministry of Finance, or the Ministry of Planning (e.g. **Ireland**, **Hungary**, and **Poland**); while others have put in place a new interdisciplinary body or committee (e.g. **Slovenia**, **Lithuania** and **Israel**). A number of countries have also strengthened the institutional and financial capacity of their Centres of Government (CoG) to ensure coherent SDG implementation that benefits people not only domestically, but globally (e.g. **Colombia**, **Finland** and **Estonia**).

Chapter 2 proposes an integrated governance tool and operational procedure that adopts a 'pathway of impacts' approach, whereby the interdependencies existing between countries are identified based on evidence and collaboration. The proposed framework could support the design of whole-of-government policies and pursue policy coherence for sustainable development both in sectors and in geographical areas.

International regulatory co-operation (IRC) provides a concrete tool for coordinating between countries. It helps to ensure the resilience of value chains and to guarantee the interoperability of transboundary services. This has proven ever so important in responding to the COVID-19 crisis. While the pandemic has exposed some weaknesses in the international system, it has also shown how IRC can enable the

availability of key COVID-19 supplies by limiting export restrictions and unnecessary regulatory frictions (OECD, 2020[1])[1]. For example, early lessons in **Canada** related to Personal Protective Equipment (PPE) such as respirators indicate that, domestically, employers and organised labour groups need to know that the domestic standard and certification is of high quality; and, internationally, IRC partners need to understand the impact that unilateral decisions have on the global supply chain.

The 2012 OECD Council Recommendation on International Regulatory Co-operation acknowledges that countries cannot act in isolation, but need to embed IRC in their domestic policy-making. It calls on Adherents to "give consideration to all relevant international standards and frameworks for co-operation in the same field and, where appropriate, their likely effects on parties outside the jurisdiction", when developing regulatory measures.[2] A forthcoming OECD report on 'Best Practice Principles on International Regulatory Co-operation' will explore this issue in more detail. It will recommend ways for considering more systematically international impacts of regulation as part of RIA processes, using international instruments as a reference for national legislation, and consulting foreign stakeholders.

Mechanisms that enable active stakeholder engagement with e.g. civil society and business provide another entry point for dealing with spillovers and transboundary impacts in a coherent and coordinated way. This is highlighted in **Chapter 4**, which underlines the important role that the private sector can play in reducing negative transboundary impacts. For example, implementation of responsible business conduct standards, such as the OECD Guidelines for Multinational Enterprises, the UN Guiding Principles for Business and Human Rights, and ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, can help companies to "operationalise" the SDGs and ensure that positive impacts on people and planet are prioritised and negative impacts are avoided or limited.

Effective coordination across sectors and levels of government increasingly requires scientific support and models, even more so in the context of the complex and interlinked challenges. **Chapter 11** introduces the Policy Priority Inference model (PPI). This computational tool helps to identify complex spillover networks between development issues, which allows it to estimate the impact of a variety of policy decisions on development indicators – ultimately informing the policy and budgeting prioritisation process.

The Modular Applied GeNeral Equilibrium Tool (MAGNET), presented in **Chapter 7**, in turn, is a global simulation model that reconciles multiple market drivers with finite resource, technology and sustainability conditions within a single coherent closed global system. Ongoing model developments to include footprints for land, water, energy and emissions are expected to also improve the understanding of transboundary environmental impacts, for instance through food consumption.

Assessing, measuring and monitoring policy impacts

Perhaps the most challenging aspect of limiting adverse spillovers and transboundary impacts is the ability to assess, measure and monitor them. The number of interactions between the SDGs is large and causal relationships are difficult to establish. The majority of chapters in this book focus on precisely this issue.

A good practice seen in a number of OECD countries is to introduce regular assessments into the policy cycle to identify and assess potential positive and negative impacts on sustainable development, including transboundary impacts, building on existing tools. Regulatory Impact Assessments (RIA), for example, allows countries to assess international impacts of their legislation: in 2014 and 2017, roughly three quarters of OECD countries considered impacts on markets openness and on trade as part of their RIAs, and half of them considered impacts on foreign jurisdictions (OECD, 2018[7]).

Germany requires that all new laws and regulations are subjected to a Sustainability Impact Assessment (SIA), which is based on indicators, targets and management rules that include intergenerational and transboundary dimensions. In the **Netherlands**, the 'Integraal Afwegingskader' (IAK, integral assessment framework for new policy, laws and regulations) includes an element that is aligned with national SDG-ambitions, with a compulsory quality check for 'effects on developing countries'. **Luxembourg**'s regulatory

sustainability check, *Nothaltegkeetscheck*, aims at better understanding potential national and transnational effects of policies on sustainable development, and responds to a call on the government in the National Plan for Sustainable Development to "contribute at global level to poverty eradication and policy coherence for sustainable development" as one of its ten priorities (OECD, 2019[6]).

To help EU members assess sustainability more systematically, the European Environment Agency (EEA), introduces in **Chapter 8** an approach that can support the identification and assessment of spillovers and transboundary effects between the EU and the rest of the world. The approach is operationalised by focusing on three complementary analytical lenses that help identify transboundary impacts: (i) drivers of change and global megatrends assessments, (ii) environmental footprint approaches, and (iii) systems assessments, with a particular focus on the food system.

With a focus on SDG 12, **Chapter 9** explores the transboundary effects due to EU consumption patterns and the supply chains in different world regions of imported goods and services to the EU. It discusses the relevance of Life Cycle Assessment as a method to assess such transboundary effects within the environmental assessment of consumption. Specifically, the chapter employs the Consumption Footprint indicator, developed for assessing the environmental impacts of EU consumption, to illustrate how transboundary effects embedded in trade can be evaluated from supply chain and consumption perspectives.

Most OECD countries are also aligning their monitoring and reporting systems with the 2030 Agenda and the SDGs, and expanding their monitoring and reporting systems to consider the international or transboundary dimensions of sustainable development. **Finland**'s national sustainability monitoring system includes an indicator basket that focuses on global responsibility and policy coherence with indicators such as ODA, contribution to international crisis management, performance in the Commitment to Development Index, and export and import of raw materials. Other indicator baskets include indicators that relate to global responsibility, such as carbon footprint of private consumption and number of quota refugees. In **Switzerland**, the MONET indicator system for monitoring sustainable development was expanded in 2018 to monitor the achievement of the SDGs. It captures sustainability in a holistic manner and measures the quality of life of the present generation, as well as fairness of distribution geographically and over time. The **Netherlands**' Monitor of Well-being & the Sustainable Development Goals recognises that Dutch society has an influence on the rest of the world, which is reflected in the well-being category 'elsewhere'. Central to this are the flows of income and resources between the Netherlands and other countries in the areas of 'trade and aid' and 'the environment and resources' (OECD, 2019[8])

Within both national and international measurement frameworks for SDGs, measurement is primarily focused on domestic performance and indicators. **Chapter 5** presents a conceptual approach for measuring transboundary impacts using five flows: trade, knowledge, people, finance and environmental. These flows are all channels by which countries are connected to each other, and can impact on other countries' well-being outcomes or capital resources. This conceptual approach is operationalised by a limited set of indicators, demonstrating how it can be used for assessing transboundary impacts at national, regional or global level.

Chapter 6 attempts to merge Input-Output tables – tables commonly used by national statistical offices to describe the relationship between producers and consumers within an economy at sector level – and other related data (i.e. CO_2 data) with the SDGs to estimate the transboundary impacts worldwide. The analysis suggests considering the OECD Inter-Country Input-Output (OECD-ICIO) infrastructure as a tool to measure these transboundary impacts in a comprehensive manner in the context of the 2030 Agenda, in areas ranging from climate change to child labour linked to trade. It provides a proof of concept on how to combine multiple datasets in order to build indicators that can assess transboundary aspects related the SDGs and their targets.

Finally, **Chapter 10** argues that the world community needs metrics that cover all aspects of sustainable consumption and production (SCP) and track countries' impacts on the Global Commons. It proposes an

approach for measuring the environmental impacts of human activity at country level including both domestic impacts and the transboundary spillover of harms. The new Pilot Global Commons Stewardship Index aims to improve sustainability metrics and policy accountability by: (1) providing a better framework for tracking SDG 12; (2) ensuring that environmental impacts are tracked comprehensively and include the attribution of the production impacts for imported goods as well as the physical spillovers of harm beyond the borders of the producing nation; (3) generating comprehensive and reliable measures of decoupling economic growth from environmental impacts at country level.

As illustrated above, a range of institutional mechanisms and analytical tools can contribute in different ways to strengthening governments' understanding and capacity to deal with spillovers and transboundary impacts. They need to be leveraged throughout the policy cycle with a view to identify and exploit synergies and reduce negative policy impacts domestically as well as globally.

Lessons learned

Countries have accumulated important experiences in identifying policy interactions and anticipating, assessing and monitoring transboundary impacts as part of their efforts to enhance policy coherence for sustainable development. Guidelines and legislation for limiting adverse spillovers and transboundary impacts, in particular on the most vulnerable countries, exist in many countries. They are complemented and reinforced by international co-operation, agreements and commitments that foster sustainable development globally. These experiences, guidelines and commitments now deserve renewed attention by all stakeholders: they can help to inform a sustainable recovery from COVID-19 that leaves no one behind.

In a highly interconnected world, the transmission channels for spillovers and transboundary impacts are numerous – for example through financial flows, imports and exports of goods and services, migration or knowledge transfers – and countries' policies necessarily impact on one another. Governments therefore need to put in place strong institutional and governance mechanisms with built-in checks and balances for considering spillovers and transboundary impacts systematically throughout the policy cycle.

Such mechanisms help to improve the overall quality of the policy-making cycle, by *(i)* highlighting how policy proposals contribute to priorities laid out in National Sustainable Development Strategies and the achievement of global commitments, such as the SDGs and the Paris agreement; *(ii)* promoting active stakeholder participation in policy-making to reflect the different needs and aspirations of people everywhere; *(iii)* improving transparency in the decision-making process through an analysis of the transboundary effects of policy proposals, so that contributions to global sustainability are disclosed; and *(iv)* ensuring evidence-based policy making that takes into account domestically-generated footprints (e.g. water and carbon) in other countries, with a view to limiting any negative impacts.

Governments also need to facilitate effective communication and interaction across the administration and levels of government to raise awareness of spillovers and transboundary impacts and the necessity to ensure positive contributions to global sustainability. They need to strengthen civil service skills and capacity for using available evidence and data to reduce negative spillovers and cross-border flows, and understanding the implications (and costs) of not doing so.

In many cases, nationally-based approaches to sustainable development offer only limited insights into transboundary policy effects or the impact of countries' actions on global sustainability. At national level, there is a wide range of regularly produced indicators, by the OECD and others, of economic (e.g. linked to official development assistance, tariff rates and agricultural support measures); social (e.g. linked to data on migration and remittances); and environmental (e.g. linked to carbon and water footprints) externalities imposed beyond national borders that can be used to capture transboundary impacts in the

context of the SDGs and PCSD (OECD, 2017[9]). These can be better harnessed to inform the design and implementation of coherent policies that benefit more people in more countries.

Efforts are also being made internationally to identify, assess and monitor spillovers and transboundary impacts. These efforts are closely aligned with and informed by the OECD's eight principles for PCSD: the global methodology for SDG indicator 17.14.1 assesses countries' progress based on their ability to put in place mechanisms "that allow relevant public institutions to systematically assess the policy effects and cross-sectoral linkages throughout the policy and planning processes in the spirit of the integrated approach of the SDGs."

Yet, challenges remain, in particular as it relates to generating and translating evidence into sound policy advice and recommendations. This book is timely therefore. As highlighted throughout this chapter, it introduces a number of innovative analytical tools and methodologies that can support countries in this endeavour and, at the same time, recover and build back better from the COVID-19 crisis.

Looking ahead

Improved data collection and a growing number of analytical tools provide the evidence-base needed for ensuring coherent decision- and policy-making. Practical guidance (OECD forthcoming) will support countries further in the implementation of the PCSD Recommendation and its eight principles. It will include a comprehensive overview of best practices and concrete policy recommendations for designing and implementing coherent policies that take into account the spillovers and transboundary impacts of domestic policies. By turning the principles into actionable policy tools, this forthcoming OECD Guidance Note could help countries "walk the talk" and make sustained progress in limiting adverse spillovers and transboundary impacts. The Guidance Note will also be complemented by a PCSD Self-Assessment Tool, which will enable countries to self-assess the effectiveness of the mechanisms they have put in place to identify, address and monitor spillovers and transboundary impacts.

Furthermore, at the time of writing, UN Environment, the custodian of indicator 17.14.1, has initiated a data collection drive to test the global methodology for assessing progress in enhancing PCSD, with a view to upgrading it from a Tier II to a Tier I methodology as per the guidelines of the United Nations Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs). The final methodology will be accompanied by illustrative case studies and good practices to provide countries with additional insights on how to advance coherent policy making that considers the interest of people here and now, elsewhere and later.

References

OECD (2020), *Building a coherent response for a sustainable post-COVID-19 recovery*, http://www.oecd.org/coronavirus/policy-responses/building-a-coherent-response-for-a-sustainable-post-covid-19-recovery-d67eab68/. [1]

OECD (2019), *Governance as an SDG Accelerator*, OECD, http://dx.doi.org/10.1787/0666b085-en. [2]

OECD (2019), *Measuring Distance to the SDG Targets 2019: An Assessment of Where OECD Countries Stand*, OECD Publishing, Paris, https://dx.doi.org/10.1787/a8caf3fa-en. [3]

OECD (2019), *Policy Coherence for Sustainable Development 2019: Empowering People and Ensuring Inclusiveness and Equality*, OECD Publishing, Paris, https://dx.doi.org/10.1787/a90f851f-en. [8]

OECD (2019), *Recommendation of the Council on Policy Coherence for Sustainable Development*, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0381 (accessed on 9 June 2020). [6]

OECD (2018), *OECD Regulatory Policy Outlook 2018*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264303072-en. [7]

OECD (2017), *Tracking progress on policy coherence for sustainable development at the national level: What and how to measure?, Coherence for Development Report*, http://www.oecd.org/gov/pcsd/Coherence%20for%20Development_Issue_9.pdf. [9]

OECD (2010), *Recommendation of the Council on Good Institutional Practices in Promoting Policy Coherence for Development (revised in December 2019)*, (OECD/LEGAL/0381), OECD, Paris, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0381. [5]

OECD (2008), *Declaration on Policy Coherence for Development*, (OECD/LEGAL/0364), OECD, Paris, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0364. [4]

Notes

[1]http://www.oecd.org/coronavirus/policy-responses/no-policy-maker-is-an-island-the-international-regulatory-co-operation-response-to-the-covid-19-crisis-3011ccd0/

[2] http://www.oecd.org/gov/regulatory-policy/49990817.pdf

2 SDGs integrated impact assessment strategy: A governance tool for identifying and managing the spillover effects and transboundary impacts in the 2030 Agenda

Apollonia Miola, European Commission Joint Research Centre

Valeria Andreoni, Management School, University of Liverpool, UK

This chapter proposes an SDGs integrated impact assessment strategy as a key governance tool for the identification and management of spillover effects and transboundary impacts in the context of the 2030 Agenda. The strategy is based on an operational procedure adopting an impact pathways approach, where the interdependencies existing between countries are identified based on evidence. In line with the cross-border nature of the SDGs, and the global partnership required by SDG 17, the chapter introduces transboundary collaboration as a key element to support the evaluation of potential drawback and acceleration effects.

The 2030 Agenda for Sustainable Development, adopted in 2015 by 193 Member States of the United Nations, establishes a universal sustainability framework to be implemented by developed and developing countries. Composed of 17 Sustainable Development Goals (SDGs), 169 operational targets, the 2030 Agenda includes a large set of actions aiming to 'improve people's lives and to protect the planet for future generations'. Based on the idea that economic development, environmental protection and human well-being are interdependent elements that cannot be addressed separately, the SDGs have been specifically designed to have a global, multidimensional and intergenerational perspective.

The main objective is to accelerate the transition toward a more sustainable future by supporting the design of policies that pursue inter and intragenerational equity, and that account for possible spill-over and transboundary effects, respectively defined as impacts across dimensions and geographical areas. That is because the improvements achieved in a particular socio-economic or environmental element could generate a large set of side-effects, with possible synergies and trade-offs across targets and goals. In addition, the large interconnections existing between countries and the global nature of the 2030 Agenda, contributes to amplify the cross-regional effects generated by policies.

The analyses of the interrelating factors and impacts in the 2030 Agenda have been a matter of extensive academic and political debate and a large number of studies have been oriented to investigate the design of integrated and consistent policies (Miola et al., 2019[1]).

The recent crisis generated by the containment measures of Covid-19 has further enriched the political and scientific debate highlighting the great uncertainty surrounding the magnitude of the short- and long-term effects generated by the COVID-19 crisis due to the large complexity of the global economic connections and the limited understanding of the transmission networks (UNECE, 2013[2]).

Within this context, an integrated analysis and management of the possible impacts of policies is a fundamental element for a consistent achievement of the SDGs and a recovery from the COVID 19 crisis. Coordinated policies across countries and dimensions will then be needed to accelerate the transition toward a more sustainable and resilient future.

Most of the existing studies analysing the interdependencies across sectors and regions, which influence the policies and activities taking place in different world areas, mainly investigates some specific transmission mechanisms and the impacts of particular policies and agreements (Miola et al., 2019[1])

When considering the Sustainable Development Goals, previous studies already identified the interlinkages existing among goals and targets and the impacts generated at local, national and global level (OECD, 2015[3]) (OECD, 2016[4]) (Eurostat, 2020[5]) (ICSU, 2017[6]) (UN, 2019[7]). The main contribution of these studies is to improve the understanding of the interactions among SDGs. By highlighting the importance of coherence among sustainability strategies they provide important contribution to the integrated vision of the 2030 Agenda often suggesting a screening process led by the country implementing the policy (OECD, 2016[4]). They do not focus on the potential acceleration effects that collaborations among countries could generate in the design of integrated policies for sustainable development.

The UN Committee for Development Policy (UN, 2020[8]) indicates the review of the model of multilateralism and cooperation between countries as a cornerstone to accelerate the achievements of the Sustainable Development Goals[1]. This is an increasingly urgent review to design an effective and sustainable recovery plan for the Covid-19 crisis, which has further highlighted the significant interconnection of the world, where national policy making is constrained by decisions made beyond borders.

Against this backdrop, this chapter proposes a country impact assessment strategy as a key governance tool for the identification and management of the spillover effects and transboundary impacts in the context of the 2030 Agenda and for the adoption of internal and external policy coherence for a sustainable development approach.

The proposal consists of an operational procedure adopting an impact pathway approach, where the interdependencies existing between countries are identified on the basis of evidence and multilateral collaboration between countries. In coherence with the principles established in SDG 17[2], the proposed framework could generate the design of integrated policies for sustainable development and the design of coherent policies in both sectors and geographical areas.

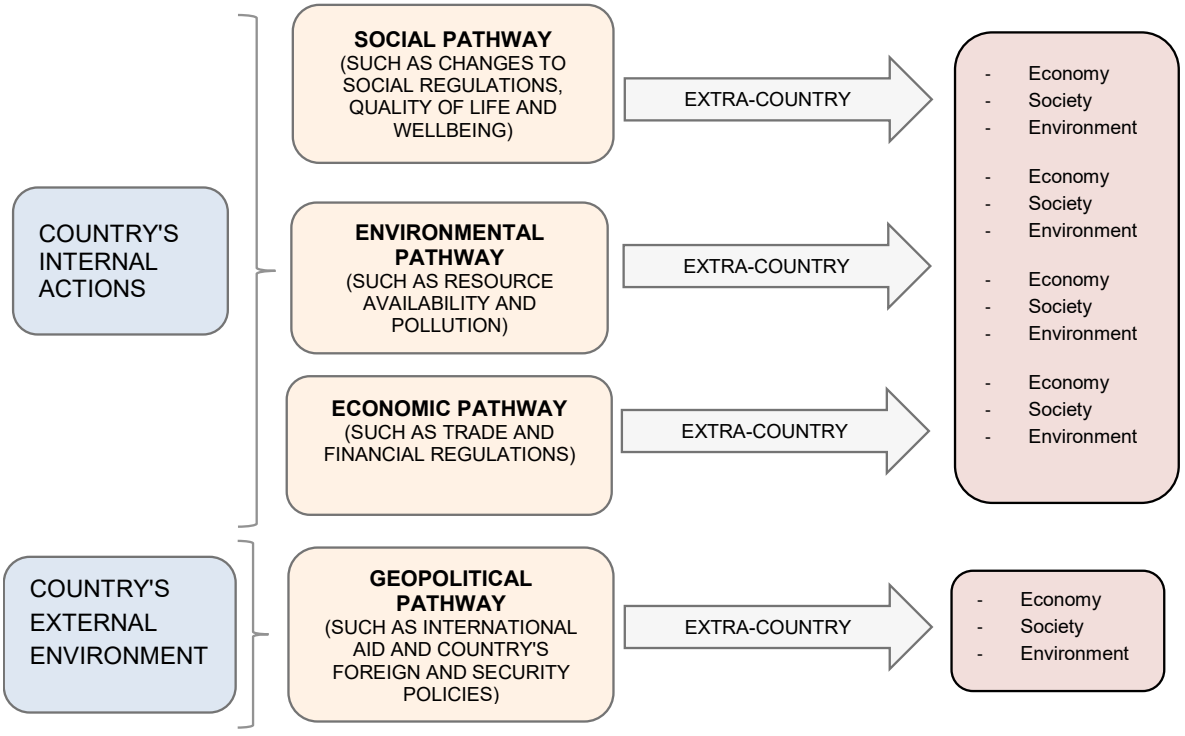
Impact pathways

The spillover and transboundary effects generated by specific policy instruments could compromise the sustainability achievements of the goals and targets included in the 2030 Agenda. Following the approach adopted by previous literature (OECD, 2017[9]) (OECD, 2018[10]) the spillover effects are broadly defined in this chapter as the cross-dimensional impacts related to the implementation of national and international policies. In a similar way, the transboundary impacts refer to 'any effect – intended or not – originating in one country that crosses national borders through flows of capital, goods, human and natural resources, and that is able to affect positively or negatively the sustainable development prospects of another country' (OECD, 2019[11]).

A clear understanding of the way in which the policy effects can migrate across dimensions and geographical areas is then a fundamental factor for an effective implementation of policies. With this in mind, SDG 17 'Strengthen the means of implementation and revitalise the global partnership for sustainable development' specifically requires a clear understanding of the main transmission channels and a considerable coordination between policies and countries.

By extending the approach previously used by other studies (Benzie, Wallgren and Davis, 2013[12]) (Benzie and John, 2015[13]) (Moser and Hart, 2015[14]) (Benzie, Hedlund and Carlsen, 2016[15]), this section introduces and discusses the impact pathway concept. The economic, social, environmental and geopolitical pathways are defined as the main transmission channels contributing to transfers of the side effects of policies across dimensions and geographical areas

Figure 2.1. Impact pathways for national internal and external polices



Source: Author's elaborations

The **social pathway** transmits the socio-economic and environmental impacts via changes to social regulations, political stabilities, quality of life and well-being. The international agreements and the national policies oriented to increase security and democracy have demonstrated their ability to play a fundamental role in the achievement of the socio-economic and environmental developments.

As reported in a (Stiftung, 2018[16]), the countries characterised by democracy and a high standard of good governance are more likely to achieve sustainable policy objectives. The Nordic areas, Switzerland and Germany, for example, being characterised by high a level of political stability and democracy are excelling in sustainability practices. In Japan, from the 1960s to the 1980s, the robust economic growth was based on huge improvements in health and education standards (UN, 2020[17]).

The **environmental pathway** transmits the socio-economic and environmental impacts via changes to resource availability, ecosystem's services and pollution. The transboundary and spillover effects generated by environmental issues have been largely analysed by international literature (Helm, 1996[18]) (ODI, 2018[19]). The impacts of climate change and the debates around environmental justice have, for example, highlighted how, in most of the cases, those with the lowest climate change responsibilities suffer the largest negative consequences (McCauley and Heffron, 2018[20]).Extreme weather events, or the increasing migrations driven by agricultural and natural resource constraints, are examples of how short- and long-term environmental impacts can affect regions all over the world. In addition, the great uncertainty associated with the increase in vulnerability, resilience and adaptation make it difficult to design policies able to consider the large set of cascading effects generated across the socio-economic and the environmental scales (Ravetz, 2006[21]).

Different studies have also been specifically focused on the cross-border impacts of climate change, such as (Lung, Fussel and Eichler, 2017[22]) for Europe, (Hilden et al., 2016[23]) for Finland, (PwC, 2013[24]) for the United Kingdom and (Vonk et al., 2015[25]) for the Netherlands. A Transnational Climate Impacts Index, oriented to quantify the national vulnerabilities of cross-border impacts of climate change, has been developed as part of the Adaptation Without Borders project (Benzie, Hedlund and Carlsen, 2016[15]) and identifies four risk pathways of transmissions – biophysical, trade, people and finance. In addition, (Wenz and Levermann, 2016[26]) (Liu et al., 2014[27]) investigated the cascading effects across sectors and the propagation mechanisms via global networks. In line with the principles of the 2030 Agenda, most of these studies highlight the need to integrate cross-border and trans-dimensional perspectives.

Within this context, greenhouse gases (GHG) have been one of the most studied international spillover effects. The import of emission intensive products, for example, constitutes a negative externality not just in one country but on the entire global ecosystem. To correct this effect, authors have proposed consumption-based measures of emissions and carbon intensity allocations (Kander et al., 2015[28]), (Domingos, Zafrilla and Lopez, 2016[29]). The carbon leakage and the related mechanisms based on which countries can reduce their carbon emissions by shifting from domestic production to importing CO_2 intensive products have also been largely analysed (Peters, 2008[30]) (Cole, 2004[31]).

When considering the use of resources and the emission of pollutants, the concept of footprint has been largely used to quantify the transnational impacts of production and consumption and the possible effect of technologies and developments. The material, the water, the carbon, the energy and the biodiversity footprint, for example, have been recently included in the climate change negotiations and in the international debate around natural resources' allocation (Pothen and Welsch, 2019[32]) (Arto et al., 2012[33]).

The **economic pathway** transmits the socio-economic and environmental effects via global market and international trade. Economic growth is generally considered an important driver of trade and development (Bond, Jones and Ping, 2005[34]). In 1980, Nobel Prize winner W. A. Lewis investigated the impacts of GDP and market size, and identified positive returns in terms of specialisation and growth. Since then, a large number of studies have been oriented towards analysing the conditions of development and the possibility of reducing the economic gap of countries through the use of trade and aggregate demand. Large investments in physical capital and technology have also been considered as elements contributing to increasing the efficiency of production with consequent impacts on GDP and consumption. In addition, technological transfer across countries has been identified as an important factor contributing to the economic development of different geographical areas (Barro and Sala-i-Martin, 1997[35]).

The global financial markets and the economic crisis of 2008 highlighted the large interconnections existing between markets and the propagation mechanisms across financial and economic sectors. (Huang and Chen, 2018[36]) and (Chen and Zhao, 2019[37]) and (Alessandri and Mumtaz, 2019[38]), for example, analysed the risk of contagion and identified the main instabilities of the financial markets. (Bucci et al., 2019[39]) (Asteriou and Spanos, 2018[40]) investigate the relationships between financial contagion and development and discuss the role of trade and financial integration in the economic growth of countries.

When considering the socio-environmental impacts, however, the relationships between trade and growth have been largely controversial, and recent studies have highlighted the multiple and complex relationships existing between pollution, inequalities and natural resource exhaustion (Alola, 2019[41]). The possible impacts of technological development and efficiency increases have, for example, been largely debated both in terms of absolute and relative decoupling. On the one hand, efficiency increase can reduce the quantity of natural resources used per unit of production. On the other hand, the related reduction in price could increase the overall demand and related environmental impact (Kemp-Benedict, 2019[42]). Efficiency improvements could also impact on the quantity and quality of employment, with consequent transformations in the structure of society (Ergul and Goksel, 2019[43]).

To summarise, the economic pathway can primarily be disaggregated into the trade and in the financial channels. The main channels existing in the trade and the financial flows are summarised in Table 2.1.

Table 2.1. Trade and Financial Flows Channels

Trade Channel	The **Demand Effect:** this includes income variations and policies affecting production and aggregated import demand. Spillover effects tend to increase with the intensity of trade. The trade agreements existing between countries can impact on the amplification or stabilisation of shocks.
Financial Channel	The **Confidence Effect:** this refers to changes in consumer and producer behaviour related to perception or anticipation of changes in the economic situations of the domestic or cross-border environment. Examples of the confidence effect are provided by the recent financial crisis that reduced consumer confidence in the euro area with negative spillover effects in the overall confidence of extra-EU demand.

Source: Author's elaborations

Finally, the **geopolitical pathway** describes the impacts on third countries generated by country policies as international players.

Impacts beyond national borders

When considering the policies implemented by countries, two main categories of actions can be related to the impact pathways generating effects beyond the national borders, namely:

1. the external policy actions with intended extra-country impacts;
2. the domestic policies with indirect and unintended impacts outside a country (OECD, 2017[9]) (OECD, 2018[10]).

External policy external actions with intended extra-country impacts, by definition, have an international and external-country focus, such as the international aid and the country's foreign and security policies – geopolitical pathway in Figure 2.1; and

- the international aid provided by the country to support the socio-economic and environmental development of external countries (such as the foreign direct investments or the international and humanitarian aid); and
- the country's foreign and security policies that deal with trade, commercial policies and peacekeeping activities. Both of them are specifically oriented to achieve socio-economic and environmental objectives by fostering democracy and development. Within this context, the role that investment and trade can play in the external policies is a clear example of the importance attributed to trade as a factor for development. The European External Investment Plan, for example, which includes guarantees to lower the risk profile of investments in developing countries, has been specifically designed to increase the financial flows provided by the private sector to the development of countries. In addition, the EU trade agreements with different geographical areas are also considered as important elements for fostering the participation of the most vulnerable countries in the global market systems. Presently, large sets of trade agreements have been established or are pending probation (for a detailed list see: EC, 2020a), and three main types of agreements are used to regulate the exchanges taking place between EU and extra-EU countries, namely:
    - Customs Unions (eliminate customs duties in bilateral trade; establish a joint customs tariff for foreign importers).
    - Association Agreements, Stabilisation Agreements, (Deep and Comprehensive) Free Trade Agreements and Economic Partnership Agreements (remove or reduce customs tariffs in bilateral trade).
    - Partnership and Cooperation Agreements (provide a general framework for bilateral economic relations).

An overview of the main cross-border flows taking place between EU and the rest of the world is provided in Table 2.2.

Table 2.2. Extra EU trading flows (imports and exports) (Billion euros), 2019-2020

	Extra EU Exports			Extra EU Imports			Trade Balance	
	Jan-Jul 19	Jan-Jul 20	Growth	Jan-Jul 19	Jan-Jul 20	Growth	Jan-Jul 19	Jan-Jul 20
Total	1 241.1	1 089.7	-12.2%	1 139.3	990.0	-13.1%	101.8	99.7
Primary goods:	185.8	162.2	-12.7%	333.5	247.8	-25.7%	-147.7	-85.6
Food & drink	91.7	94.5	3.1%	68.8	66.6	-3.2%	22.8	27.8
Raw materials	33.1	30.0	-9.4%	48.2	46.0	-4.6%	-15.1	-16.0
Energy	61.0	37.8	-38.0%	216.5	135.1	-37.6%	-155.4	-97.4
Manufactured goods:	1 030.4	902.7	-12.4%	788.5	722.4	-8.4%	241.9	180.3
Chemicals	237.9	247.0	3.8%	140.9	141.0	0.1%	97.0	106.0
Machinery & vehicles	506.9	415.4	-18.1%	367.2	325.7	-11.3%	139.7	89.8
Other manufactured Goods	285.5	240.3	-15.8%	280.4	255.8	-8.8%	5.1	-15.4
Other	24.9	24.8	-0.4%	17.3	19.8	14.5%	7.6	5.0

Source: Eurostat (2020[5])

For example, by increasing the exports from developing areas, the EU trade policy and the trade agreements existing between countries can contribute to the economic dimension of the 2030 Agenda. When considering the social and environmental dimensions, however, the picture is much more complex. The implementation of trade-oriented policies and the related production of goods and waste can increase the pressure on the environment and promote an unequal distribution of resources. Examples are provided by the fact that Europe is one of the top importers of commodities associated with a risk of deforestation (such as palm oil, soy, rubber and coffee) and one of the larger exporters of non-hazardous waste (such as iron, steel and copper). According to data provided by the (EC, 2020[44]), in 2016 the EU accounted for 20% of the global export of non-hazardous waste with consequent impacts on pollution, displacement and recovery. To reduce the negative impacts generated by trade, the EU has developed a number of policy instruments, such as the Trade and Sustainable Development (TSD) provision, that commits the EU and its trade partners to take into account the international labour and environmental agreements; and the Sustainability Impact Assessments (SIAs) that are carried out to evaluate the sustainability impacts of the negotiated trade agreements with non-EU countries. These instruments have previously been used in trade agreements and policies and can also be applied in a context of SDG implementation strategies.

The domestic policies with indirect and unintended impacts outside a country include the domestic policies impacting, for example, on:

- the socio-economic and the environmental elements of third countries; and
- the quality and the provision of global public goods (such as water quality or air pollution, where two or more countries share the use and the exploitation of the natural resource). The large-scale transboundary projects that are implemented in at least two countries can also be included in this category.

For example, the multitude of EU internal policies, the large degree of autonomy of Member States and the different approaches adopted by countries can result in a wide range of side effects, with positive and negative impacts on the achievements of the SDGs.

Coordination strategies then need to be defined not just at EU level, but also at national and regional levels. Table 2.3 provides an overview of some of the main policy categories with large-scale potential transboundary impacts.

Table 2.3. Examples of policy categories with large-scale potential transboundary impacts

	Knowledge, research and innovation
	Transport and connectivity
	Sustainability and environmental issues
	Labour and legal issues
	Trade and commercial agreements
	Enterprise collaboration and multinational companies
	Financial markets
	Culture and heritage
	Territorial development issues and regional planning
	Energy
	Well-being, quality of life and migration
	Political stability and military conflicts
	Agriculture policy

Source: Author's elaborations

Side effects of policies

According to the impact pathways reported in Figure 2.1, the implementation of policies within countries borders can affect three main sustainable development areas, namely the environment, society and the economy. Each of them can generate multiple cross-border effects across geographical areas and dimensions. For example, the promotion of legume production included in the 2014–2020 European Union Common Agriculture Policy (CAP) reform could contribute to reducing EU dependency on vegetable protein imports from livestock feed (mainly from Argentina, Bolivia, Paraguay and Uruguay) with consequent reduction on negative socio-environmental impacts (such as biodiversity loss, displacement of small farmers, land use and pollution). The positive transboundary effects on environment may contribute to the achievement of the SDGs related to environmental protection and climate change. However, the reduction of EU demand could affect the production of exporting countries with negative impacts on income generation, inequality and poverty.

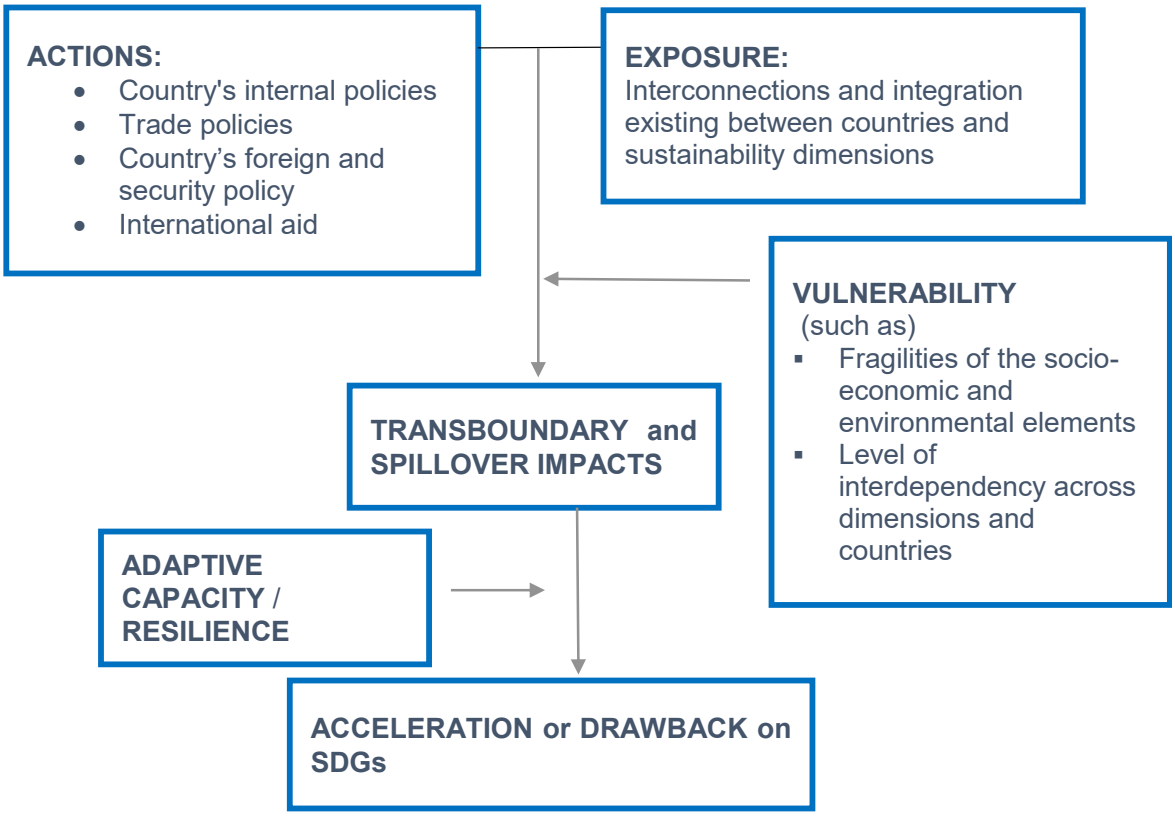
In a similar way, the EU Tobacco Products Directive adopted in 2016 in line with SDG 3, and oriented to promote healthy living and well-being through a reduction in the use of cigarettes, can reduce the import of tobacco with negative impacts on employment and GDP (Lecours et al., 2012[45]). Moreover, the ambitious EU 2030 Climate Target Plan (EC, 2020[46]) to achieve climate neutrality in Europe by 2050 is one of the pillars of the EU Green Deal strategy. This may contribute to the achievement of the SDGs related to climate change (SDG 7 and SDG 13). It also includes a large set of side effects, for example: the reduction in extra-EU oil dependency, lower energy costs for citizens and companies, employment generation and better living conditions. In relation to the economic impacts related to this plan, the EU Staff Working Document on the Impact Assessment accompanying the Communication clearly indicates a negative impact on some economic sectors such as fossil fuel extractors or carbon intensive sectors (EC, 2020[46]).

When considering the side effects of policies, however, there is great uncertainty in the identification of the magnitude of impacts. As highlighted by (Hewitson et al., 2014[47]) the analysis of cross-regional and cross-dimensional phenomena requires 'knowledge of critical but geographically remote associations and of dynamic cross-boundary flows'. In particular, the distribution and magnitude of the spillover and transboundary effects generated by internal and external-country actions are strongly influenced by:

- the level of exposure, defined by the interconnections existing between countries and sustainability dimensions;
- the vulnerability, defined by interdependencies and fragilities;
- the adaptive capacity and resilience of the system, defined as the ability to recover from a shock.

According to this approach, provides a graphical overview of some of the main factors and links influencing the magnitude of the spillover and transboundary effects.

Figure 2.2. Factors and links influencing the magnitude of the spillover and transboundary effects



Source: Author's elaborations

Within this context, specific information related to the internal characteristics of countries and to the cross-border relationships existing between geographical areas is needed to identify the potential impacts and the socio-economic and environmental dimensions. In addition, in order to analyse how specific policies can externalise effects from one country to another, the main cross-border transmission channels would need to be considered and analysed. In line with that, in the next section an integrated assessment methodology, oriented to identify the main pathways of impacts, together with the specific factors influencing the magnitude of effects, is proposed by involving the participation of the countries affected by policies and impacts.

Towards an SDGs integrated impacts assessment framework

The integrated nature of goals and targets included in the 2030 Agenda requires an interrelated and coherent implementation across dimensions and countries. The definition of domestic and international policies and the possible drawbacks across the different sustainability areas could undermine the progress towards a consistent achievement of the goals. For this reason, an integrated framework oriented to evaluate the possible spillover and transboundary effects should be used in the design of policies and in the evaluation of implementation strategies.

The impact assessment has been included in the legislation of a large number of countries. It is often composed of a set of logical steps to be followed in designing policies. Its scope of analysis varies, with a main focus on the impacts on economy, environment and the public sector such as the public budget. Less attention is paid to impacts on income inequality and poverty. It is also one of the key pillars of the European Commission Better Regulation Agenda (Box 2.1).

Box 2.1. European Commission Impact Assessment

The European Commission Impact Assessment (IA) was introduced in 2003 as an inter-institutional agreement on better-law-making where the European Parliament, the Council of the European Union and the European Commission made commitments to undertake impact assessments to support legislative proposals and substantive amendments. It plays a central role in the context of the EU Better Regulation Agenda, whose aim is the transparent design and evaluation of EU policies and laws, with evidence, and involving citizens and stakeholders.

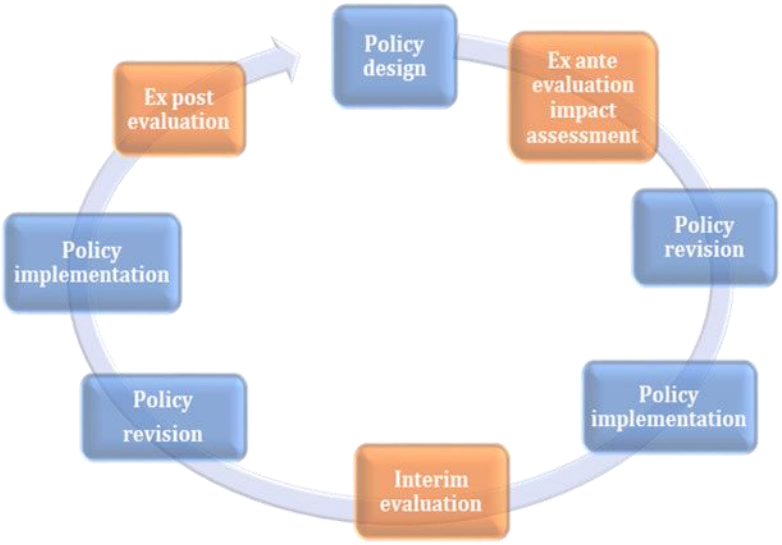
The EC Impact assessment is requested for any legislative and non-legislative act which is expected to have significant economic, social or environmental impacts. The Better Regulation toolbox defines the principles of better regulation and provides the guidelines for developing the impact assessment from the identification of impacts per sector with the choice of methods and models to be used for the identification and estimations of impacts.

In particular, **Tool #34** on impacts on developing countries provides specific guidance on how to identify those measures that can have impacts on developing countries and, hence, beyond EU borders.

Source: EU Policy Cycle: Source: EC Better Regulation ToolBox. Tool# 1 https://ec.europa.eu/info/sites/info/files/better-regulation-guidelines-better-regulation-commission.pdf Tool# 34 https://ec.europa.eu/info/sites/info/files/file_import/better-regulation-toolbox-34_en_0.pdf

The main objective of an impact assessment strategy should be to evaluate the potential impacts and to support the decision-makers in identifying the best policy options. An overview of the main steps for policy evaluation and design in line with the adoption of an impact assessment strategy is shown in Figure 2.3.

Figure 2.3. Steps for Policy Evaluation and Design



Source: Author's elaborations based on Impact Assessment Guidance of European Commission. Available at: http://ec.europa.eu/governance/docs/comm_impact_en.pdf and https://ec.europa.eu/info/sites/info/files/better-regulation-guidelines-impact-assessment.pdf

The discussion included in this section is oriented to support the definition of an SDGs integrated impact assessment strategy to be used as a key governance tool in the identification and management of the possible side effects generated by SDG-related policies.

As in Figure 2.3, reports, the dynamic process that should characterise the design of policies requires integrated evaluations to be performed across different stages of policy and project intervention, namely:

- Ex ante evaluation: taking place during the policy or project design stage. This includes the identification of the potential spillover and transboundary effects, together with the impacts generated in the short and the long term.
- Interim evaluation: taking place during the policy or project implementation stage. This aims to make any necessary adjustments to ensure that the objectives are achieved.
- Ex post evaluation: taking place at the end of the policy intervention or project. This includes the assessment of the spillover and transboundary effects and the identification of strengths and weaknesses that could be used to improve the design and the implementation of future policies and projects.

To gain a better understanding of the cross-border and cross-dimensional impacts generated by the SDG policies, an approach is proposed here based on the extension and re-elaboration of the principles and operational procedures included in:

- the *impact assessment procedures developed to account for the effects of cross-border projects*[3]. The impact assessment of large cross-border projects and the policy coherence for development, established by the European Commission in line with the Lisbon Treaty and the Better Regulation Package, includes the involvement of stakeholders and expert analysis in the identification of the possible impacts generated by policies and projects. The use of a large set of indicators, such as socio-economic and environmental variables embodied in trade, has also been considered to evaluate the interactions existing between countries;

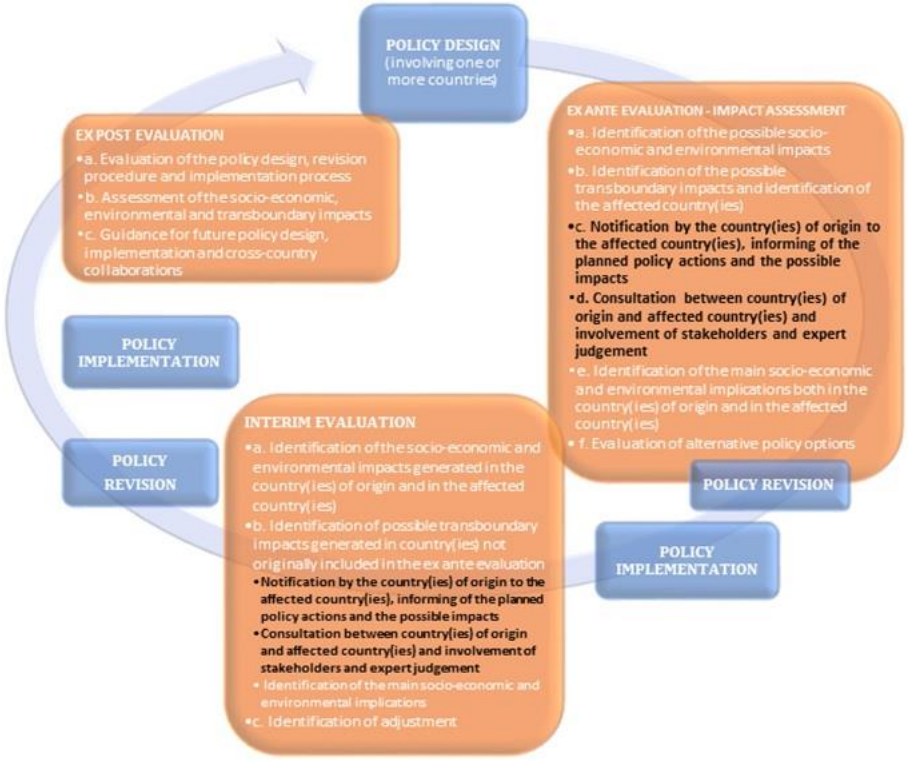
- the *integrated assessment developed in a sustainability context* (such as the Environmental Impact Assessment Directive 2011/92/EU and the 1991 UNECE Convention on Environmental Impact Assessment in a Transboundary Context (UN, 1991[48]), known as the Espoo Convention); and
- the *Strategic Framework on Human Rights and Democracy*, oriented to incorporate human rights in all impact assessments conducted by the EU. It also includes a 'methodology to aid consideration of the human rights situation in third countries in connection with the launch or conclusion of trade and/or investment agreements.'

The cross-border nature of the SDGs, and the global partnership required by SDG 17, however, add an additional pillar to the traditional assessment procedures and requires the inclusion of transboundary collaboration as a fundamental factor supporting the evaluation of potential drawback and acceleration effects. For this reason, the implementation of an integrated impact assessment procedure would then require:

- broad collaborations between experts from different disciplinary backgrounds together with
- cross-country collaborations.

Within this context, different actions would need to be put in place to perform a consistent and integrated evaluation of the main spillover and transboundary effects. Based on the guidelines proposed by the cross-border impact assessment procedure, the main actions and steps should involve the phases as reported in Figure 2.4.

Figure 2.4. Steps for policy evaluation and design including transboundary considerations



Source: Author's elaboration

In an SDG context, the impact assessment procedure should consider the national and the international policies, together with the global partnership defined in line with SDG 17 of the 2030 Agenda, that are specifically required to 'Strengthen the means of implementation and revitalise the global partnership for sustainable development'.

Bringing together national governments, the international community, civil society, private sector and other actors, SDG 17 challenges the implementation of the impact assessment evaluation. On the one hand, the involvement of the different stakeholders can facilitate the identification of the possible spillover and transboundary effects.

On the other hand, however, the inclusion of a large set of perspectives and priorities could require extensive negotiations for the identification of a sustainability agreement. In addition, the definition of global partnerships oriented to implement sustainability strategies across governments, international institutions, public and private sectors and civil society makes it difficult to identify effective and consistent policies to be implemented across the partners.

By proposing integrated collaborations between countries and sustainability elements, the SDGs have been able to move away from the traditional 'silo approach'.

However, a further step would be needed: the identification of clear operational procedures oriented to support governments in the analysis of the spillover and transboundary effects generated by policies. This would constitute a fundamental element in supporting the implementation of the global partnership required by SDG 17.

Box 2.2. Examples of the main challenges characterising the impact assessment procedures

The elements of collaboration between countries add complexity to the well-known constraints characterising the impact assessment procedures (Bonvoisin and Horberry, 2005[49]; Schrage and Bonvoisin, 2008[50]), namely:

1. data availability, particularly when related to transboundary impacts;
2. uncertainties related to the affected dimensions, the time-scale of impacts and uncertainties related to vulnerability, adaptive capacity and resilience;
3. difficulties in estimating the magnitude of the effects, particularly if characterised by a time lag between sources and impacts;
4. difficulties in isolating the effects generated by external policies from the effects generated by local drivers;
5. lack of a clear and widely accepted conceptual framework to measure the spillover and transboundary effects;
6. limited information and ability to predict the interrelationships existing between countries and dimensions;
7. possibility of political tensions related to the fact that assigning spillover and transboundary effects to policies implemented by one specific country could mean assigning responsibility for damages and impacts;
8. problems and costs related to the identification and involvement of relevant stakeholders, translation of documents and consultation activities;
9. limited access to policy documents or limited contribution from civil society and stakeholders;
10. different perceptions on the nature and magnitude of the impacts, different priorities and different use of evaluation languages;

11. disagreements over who should cover the cost of the procedure (including expert judgements, stakeholder participation and public involvement and information);
12. disagreements and uncertainty related to who and how to cover the possible short- and long-term costs generated by the negative impacts of policies or projects;
13. difficulties in evaluating the long-term impacts and impacts on future generations;
14. possible political trade-offs with national or stakeholder interests interfering with the impact assessment procedure;
15. different priorities in the policy objectives of countries.

Source: Author's elaborations

Conclusion

The increased globalisation and the large interconnections existing between sectors and countries create a layer of interdependencies that can result in side effects of policies accelerating or compromising the sustainability achievements of countries.

When considering the implementation process that has taken place since the definition of the 2030 Agenda, a general lack of coordination seems to emerge across the policies and the evaluation mechanisms established by countries. The not legally binding nature of the 2030 Agenda, leave governments relatively free to establish national frameworks for achievements. Countries are expected to incorporate the targets into national policies but integrated strategies among areas and goals are not specifically required. Within this context, a lack of coordination among the different priorities of national policies could result in negative effects compromising the achievement of the overall sustainability agenda. In addition, the complex relationships existing between the social, economic and environmental dimensions makes difficult to design implementation strategies minimizing the negative impacts across targets and countries. On top of that, the mechanisms to track the progresses towards the SDGs include the use of indicators that best fit the national realities, with possible inconsistencies in the comparisons of countries performances' and in the analysis of the global interconnections (UN, 2017[51]) (Miola and Schiltz, 2019[52]).

The legally non-binding nature of the 2030 Agenda, together with the lack of clarity on how the global partnership should work, could however compromise the overall sustainability achievements. In addition, the great uncertainties related to the identification of the main spillover and transboundary effects of policies make it difficult to design effective sustainability strategies.

Without clear and commonly agreed guidelines, the achievement of integrated sustainability objectives could be compromised. For this reason, operational procedures would need to be defined in line with the integrated and holistic approach included in SDG 17. The adoption of an SDGs integrated impact assessment strategy could be a governance tool for managing the spillover and transboundary impacts related to policies. It could generate the design of integrated policies for sustainable development in both sectors and geographical areas. This chapter proposes an operational procedure based on cooperation between countries. Its implementation could be contextualised in the larger debate on a new approach for multilateralism and cooperation between countries as indicated by the UN Committees for Development and re-launched by many institutions in the aftermath of the Covid-19 crisis.

Within this context, the definition of clear guidance around cross-country collaborations and impact evaluation could facilitate the implementation of the global and holistic partnership required by the 2030 Agenda and accelerate a sustainable and resilient recovery from the Covid-19 crisis.

References

Alessandri, P. and H. Mumtaz (2019), "Financial regimes and uncertainty shocks", *Journal of Monetary Economics 101*, pp. 31-46. [38]

Alola, A. (2019), "The trilemma of trade, monetary and immigration policies in the United States: Accounting for environmental sustainability", *Science of the Total Environment*, Vol. Vol. 658, pp. pp. 260-267. [41]

Arto, I. et al. (2012), *Global resources use and pollution: production, consumption and trade (1995-2008)*, European Commission - JRC Scientific and Policy Report 2012. [33]

Asteriou, D. and K. Spanos (2018), *The relationships between financial development and economic growth during the recent crisis: Evidence from the EU*. [40]

Barro, R. and Sala-i-Martin (1997), "Technological diffusion, convergence and growth', Journal of Economic Growth", Vol. Vol. 2(1), pp. pp. 2-26. [35]

Benzie, M., J. Hedlund and H. Carlsen (2016), "Introducing the Transnational Climate Impacts Index: Indicators of country-level exposure - methodology report", *Stockholm Environment Institute*, Vol. Working Paper No. 2016-17, p. p. 44. [15]

Benzie, M. and A. John (2015), *Reducing vulnerability to food price shocks in a changing climate*, https://www.sei.org/publications/reducing-vulnerability-to-food-price-shocks-in-a-changing-climate/. [13]

Benzie, M., O. Wallgren and M. Davis (2013), *Adaptation without Borders? How understanding indirect impacts could change countries' approach to climate risks*, https://www.sei.org/publications/adaptation-without-borders. [12]

Bond, E., R. Jones and W. Ping (2005), "Economic Takeoffs in a Dynamic Process of Globalization',", *Rev. Int. Econ.*, Vol. Vol. 13(1), pp. pp. 1-19. [34]

Bonvoisin, N. and J. Horberry (2005), *Transboundary SEA: position paper, IAIA Conference on International experience and perspectives in SEA*, 26–30 September 2005, Prague,, http://www.iaia.org/Non_Members/Conference/SEAPrague/TopicPapers/A9TransboundarySEA.doc (accessed on 1 July 2008). [49]

Bucci, A. et al. (2019), "Financial contagion and economic development: An epidemiological approach", *Journal of Economic Behavior and Organization*. [39]

Chen, X. and H. Zhao (2019), "Modelling, analysis and mitigation of contagion in financial systems", Vol. Economic Modelling 76, pp. 281-292. [37]

Cole, M. (2004), *Trade, the pollution haven hypothesis and the environment Kuznets curve: examining the linkages.*. [31]

Domingos, T., J. Zafrilla and L. Lopez (2016), *Consistency of technology-adjusted consumption-based accounting. Nature Climate Change 6(8), 729*. [29]

EC (2020), *Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste {SWD(2020) 27 final}*, https://ec.europa.eu/environment/waste/shipments. [44]

EC (2020), “Stepping up Europe’s 2030 climate ambition: Investing in a climate-neutral future for the benefit of our people”, European Commission - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. [46]

Ergul, O. and T. Goksel (2019), *The effects of technological development on the labor share of national income*, Economic Modelling. [43]

Eurostat (2020), *Sustainable development in the European Union: Monitoring report on progress towards the SDGs in an EU context*. [5]

Helm, C. (1996), “Transboundary environmental problems and new trade rules”, *International Journal of Social Economics*, Vol. Vol. 23(8), pp. pp. 29-45. [18]

Hewitson, B. et al. (2014), *Regional context. In: Climate Change 2014 – Impacts, Adaptation, and Vulnerability – Part B: Regional Aspects – Contribution*. [47]

Hilden, M. et al. (2016), *Cross-border effects of climate change in Finland.*. [23]

Huang, W. and Z. Chen (2018), “Modelling contagion of financial crises,”, *The North American Journal of Economics and Finance (in press)*. [36]

ICSU (2017), *A Guide to SDG Interactions: from Science to Implementation*, [D.J. Griggs, M. Nilsson, A. Stevance, D. McCollum (eds)], International Council for Science, Paris. [6]

Kander, A. et al. (2015), “National greenhouse-gas accounting for effective climate policy on international trade”, *Nature Climate Change*, Vol. Vol. 5(5), pp. pp. 431-435. [28]

Kemp-Benedict, E. (2019), “Dematerialization, Decoupling and Productivity Change”, *Ecological Economics*, Vol. Vol. 150, pp. pp. 204-216. [42]

Lecours, N. et al. (2012), “Environmental health impacts of tobacco farming: a review of the literature’,”, *Tobacco Control*, Vol. Vol. 21(2), pp. pp. 191-196. [45]

Liu, J. et al. (2014), *International trade buffers the impact of future irrigation shortfalls*. [27]

Lung, T., H. Fussel and L. Eichler (2017), “Europe’s vulnerability to climate change impacts outside Europe. In: Climate change, impacts and vulnerability in Europe 2016. An indicator-based report.”, Vol. EEA Report No 1/2017. European Environmental Agency. [22]

McCauley, D. and R. Heffron (2018), “Just transition: Integrating climate, energy and environmental justice”, *Energy Policy*, Vol. Vol. 119, pp. pp. 1-7. [20]

Miola, A. and F. Schiltz (2019), “Measuring sustainable development goals performance: how to monitor policy action in the 2030 Agenda implementation”, *Ecological Economics*, Vol. Vol. 164, p. p. 106373. [52]

Moser, S. and J. Hart (2015), “The long arm of climate change: societal teleconnections and the future of climate change impact studies”, Vol. Vol. 129,, pp. pp. 13-26. [14]

ODI (2018), *Meeting the global challenge of adaptation by addressing transboundary climate risk*, https://www.odi.org/publications/11096-meeting-global-challenge-adaptation-addressing-transboundary-climate-risk. [19]

OECD (2019), *Recommendation of the Council on Policy Coherence for Sustainable Development*, https://www.oecd.org/gov/pcsd/oecd-recommendation-on-policy-coherence-for-sustainable-development.htm (accessed on 19 June 2020). [11]

OECD (2018), *Measuring Distance to the SDG Targets 2017: An Assessment of Where OECD Countries Stand*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264308183-en. [10]

OECD (2017), *Policy Coherence for Sustainable Development 2017: Eradicating Poverty and Promoting Prosperity*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264272576-en. [9]

OECD (2016), *Better Policies for Sustainable Development 2016: A New Framework for Policy Coherence*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264256996-en. [4]

OECD (2015), *Government at a Glance: 2015*, Organization for Economic Cooperation & Development, Paris, France, http://www.oecd.org/gov/government-at-a-glance-2015.htm. [3]

Peters, G. (2008), *From production-based to consumption-based national emission inventories*. [30]

Pothen, F. and H. Welsch (2019), *Economic development and material use. Evidence from international panel data.*. [32]

PwC (2013), *International threats and opportunities of climate change for the UK*. [24]

Ravetz, J. (2006), "Post-Normal Science and the complexity of transitions towards sustainability',", *Ecological Complexity*, Vol. Vol. 3(4),, pp. pp. 275–284. [21]

Report, J. (ed.) (2019), *Interlinkages and policy coherence for Sustainable Development Goals implementation. An operational method to identify trade-offs and co-benefits in a systemic way*. [1]

Schrage, W. and N. Bonvoisin (2008), "Transboundary impact assessment: frameworks, experiences and challenges", *Impact Assessment and Project Appraisal*, Vol. 26/4, pp. 234-238, http://dx.doi.org/10.3152/146155108x366004. [50]

Stiftung, B. (2018), *Policy performance and governance capacities in the OECD and EU*, https://www.bertelsmann-stiftung.de/en/publications/publication/did/policy-performance-and-governance-capacities-in-the-oecd-and-eu-2018/. [16]

UN (2020), *Committee for Development Policy, Policy note - Development Policy and Multilateralism after COVID-19*, UN Department of Economic and Social Affairs, https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/CDP-Covid. [17]

UN (2020), *United Nations, Committee for Development Policy (2020)', Report on the twenty-second session*, Economic and Social Council, Official Records. [8]

UN (2019), "The Future is Now – Science for Achieving Sustainable Development", in *Independent Group of Scientists appointed by the Secretary-General, Global Sustainable Development Report 2019*, United Nations, New York, 2019. [7]

UN (2017), *Resolution adopted by the General Assembly on 6 July 2017*. [51]

UN (1991), *UNECE Convention on Environmental Impact Assessment in a Transboundary Context*, https://www.unece.org/fileadmin/DAM/env/eia/documents/legaltexts/Espoo_Convention_authentic_ENG.pdf. [48]

UNECE (2013), *Framework and suggested indicators to measure sustainable development*, https://unece.org/fileadmin/DAM/stats/documents/ece/ces/2013/SD_framework_and_indicators_final.pdf. [2]

Vonk, M. et al. (2015), *Worldwide climate effects: Risks and opportunities for the Netherlands.*, PBL Netherlands Environmental Assessment Agency. [25]

Wenz, L. and A. Levermann (2016), *Enhanced economic connectivity to foster heat stress-related lossesl Science Advances 2*. [26]

Notes

[1] Economic and Social Council, Official Records, Supplement No. 13, *E/2020/33*, page 11.

[2] SDG 17 'Strengthen the means of implementation and revitalise the global partnership for sustainable development.

3 The path to policy coherence: How OECD members (could) use the SDGs at home and abroad to better support developing countries

Alejandro Guerrero-Ruiz, Santhosh Persaud and Chantal Verger[1],
OECD Development Co-operation Directorate

The COVID-19 crisis underlines the need to pay greater attention to the impact that domestic actions have not just on the country in which they occur, but on others who are affected by policy choices. This chapter focuses on the untapped potential of the SDGs in articulating transboundary effects of domestic policies on developing countries. It explores the extent to which OECD members are using the SDGs as a critical lever at home to promote policies that are coherent with sustainable development objectives and abroad to deliver consistent support to sustainable development in partner countries.

Crafting and updating domestic policies in OECD countries in a way that accounts for their transboundary impacts in developing countries is very challenging. As a universal platform, the Sustainable Development Goals (SDGs) should guide the efforts of OECD countries in ensuring all their policies remain coherent with that global objective and in supporting developing countries to deliver results.

The SDGs can enhance co-ordination mechanisms for identifying and managing transboundary impacts, supporting whole-of-government and whole-of-society commitments, and informing debate and follow-up at government level and in partner countries. Development co-operation actors in OECD countries have a key role to play to ensure the positive effects of domestic policies in developing countries, actively promoting and engaging in these co-ordination mechanisms – at home and abroad.

This chapter focuses on the role of the 2030 Agenda and the SDGs in articulating the transboundary effects of domestic policies on developing countries and explores the extent to which OECD countries are using the SDGs as a critical lever to enhance sustainable development in developing countries. It first sets out the potential of the SDGs as a common platform to help address transboundary impacts. Drawing on and presenting good practices from the OECD and OECD Development Assistance Committee members[2] (from here on referred to as OECD members), the paper then addresses two questions:

- How do OECD members use the SDGs to promote national policies that are coherent with sustainable development objectives in developing countries?
- How effectively do OECD members use the SDGs to deliver consistent and coordinated support to sustainable development in partner countries?

The SDGs as a common platform to help address transboundary impacts

The 2030 Agenda and the Sustainable Development Goals (SDGs) have reinforced national commitments to foster sustainable development at home and abroad. The 17 SDGs and their 169 targets, measured by 232 indicators, provide a common framework for all actors, public and private, working towards sustainable development. This is increasingly the case as the SDG framework has been significantly strengthened in the past two years. Ninety per cent of all SDG indicators are now ready to use.[3] As a result, OECD members are actively and increasingly referring to the SDGs in their national policies and applying SDG indicators in their results frameworks. This applies in particular to development co-operation policies.

A number of goals specifically target the effects of domestic policies on developing countries, notably on trade, access to medication or scholarships in higher education. A much wider set of SDGs include transboundary dimensions, many of high relevance to developing countries, such as climate change, sustainable consumption, environmental protection, illicit financial flows, the cost of remittances or agricultural export subsidies. Under target 17.14, countries should enhance policy coherence for sustainable development. This requires reflecting the transboundary impacts of policies, in particular on developing countries (OECD, 2019[1]).

Providers of development co-operation are increasingly applying SDG targets and indicators in their country strategies. Recent global monitoring exercises indicate that the use of the SDGs to guide the design of development co-operation strategies in partner countries is already widespread (Figure 3.1). Around three-quarters of country strategies include SDG goals for defining priority areas or sectors. Furthermore, almost 60% of country strategy documents approved in 2018 apply SDG indicators in their results frameworks (OECD/UNDP, 2019[2]).

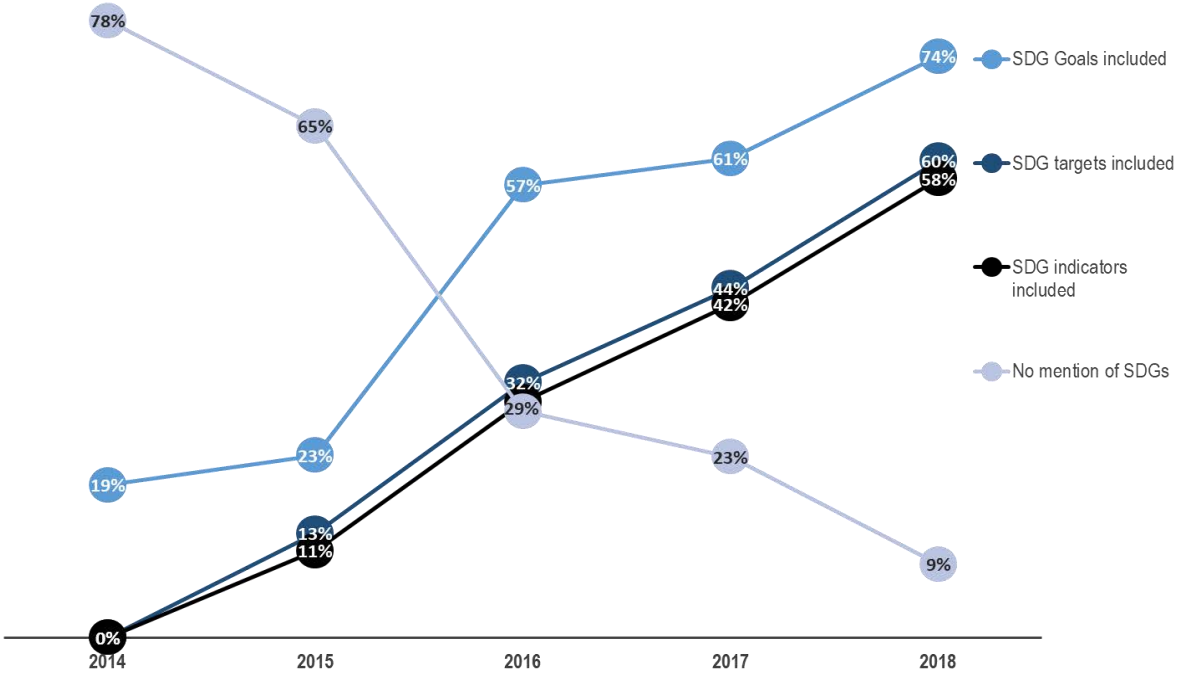
Partner countries are also increasingly adopting the SDGs in their national strategies. A recent assessment of 90 partner countries indicates that 70% of countries are orienting their national strategies towards the 2030 Agenda for Sustainable Development, with almost half of all national results frameworks already using SDG indicators. Trends indicate that, as the remaining countries move to the next planning cycle, most of them will have domesticated SDG indicators in the next three to four years.

Progress is also being made in supporting data generation in the SDGs. A majority of countries are regularly collecting data for 116 SDG indicators (50% of total indicators) (OECD, 2019[3]). There are still gaps in crucial areas as well as in tracking who is being left behind – which stresses the need to join forces with partner countries and use the SDGs as an effective framework for shared results, focusing efforts on collecting data on the indicators that are most needed.

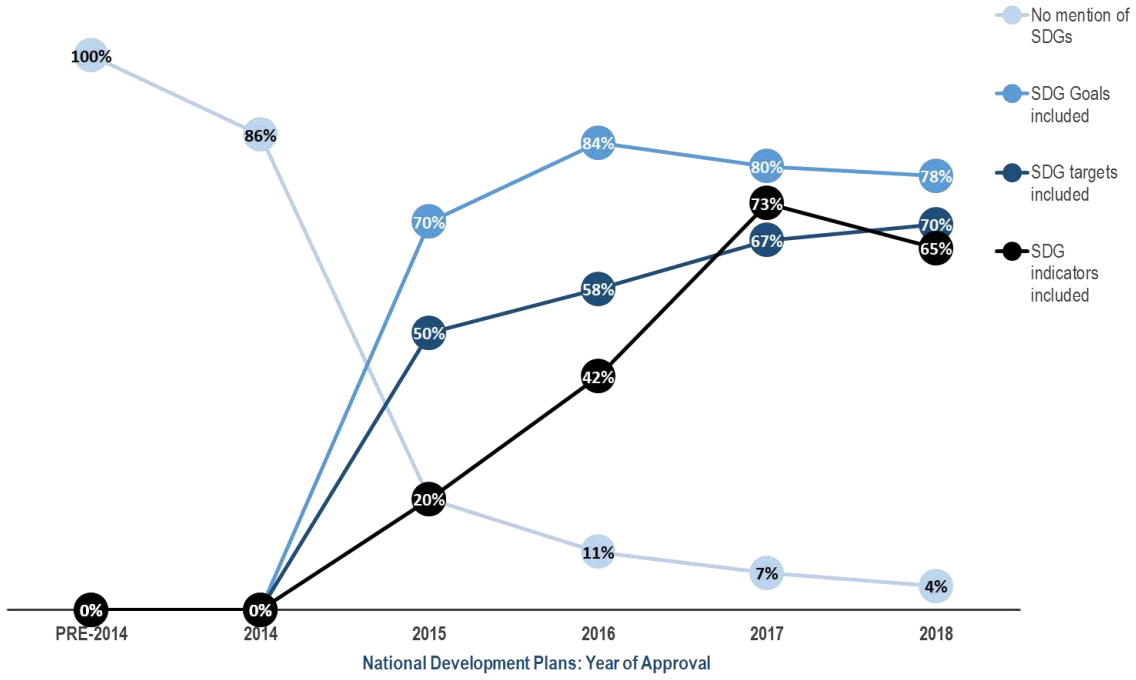
As regards the COVID-19 pandemic, the SDG indicators can help track efforts to develop vaccines, increase health financing and strengthen the capacity of developing countries for early warning, risk reduction and management of national and global health risks.[4] The SDG indicators can also help to limit the spread of the pandemic. Frequent and proper hand hygiene is one of the most important measures that can be used to prevent infection with the COVID-19 virus. Obtaining updated data on the proportion of the population with basic handwashing facilities on premises (SDG indicator 6.2.1b) is crucial to help target development programmes in areas where handwashing facilities are lacking. This data is however missing in many countries.[5]

Figure 3.1. Growing use of the SDGs by both providers and partner countries

Percentage of providers' country-level strategies that reflect the SDGs, in varying degrees.



Percentage of partner countries' national development strategies that reflect the SDGs, in varying degrees.



Note: Sample includes the national development plans of 90 developing countries and 815 country strategy documents of development co-operation providers. All these planning documents and their associated results frameworks were an active reference in 2019.
Source: (OECD, 2019[3]).

The progressive improvement of the global SDG framework, coupled with the growing SDG alignment of OECD and developing countries' policies, paves the way for a deeper understanding of the interconnectedness of the SDGs and the potential effects of domestic policies on progress towards sustainable development in developing countries. In turn, this should help OECD members to identify synergies and multipliers, avoid (or mitigate) negative externalities and maximise the development impact of their efforts at home and abroad. However, this potential has not yet been realised, as the following sections show.

Opportunities to do more: using the SDGs to reflect policy effects on developing countries

OECD members have made progress but are not yet fully seizing the SDGs' potential to adapt their national policies in a way that also supports developing countries in making progress towards the SDGs (from here on referred to as 'partner-friendly'[6]). This relates to their political commitment and attention (Section 3.1), assessments and monitoring (Section 3.2) and institutional mechanisms (Section 3.3), which are all necessary to design and implement partner-friendly policies. Building a greater political will to support partner-friendly policies is therefore critical, using the 2030 Agenda as a basis (Section 3.4).

The mixed effect of the SDGs on commitment to partner-friendly policies

The 2030 Agenda has put the need for partner-friendly policies right at the centre of the government. Most OECD members are investing in making progress against the SDGs at home and abroad: they devise national plans, involve all parts of the government, coordinate action and report progress. In many countries, these efforts are even steered by the prime minister's office or equivalent, such as in Finland, Italy and Japan.[7] As a result, the many goals and targets that directly and indirectly address how national policies should be partner-friendly are now on the agenda of entire cabinets, rather than being the sole preserve of development co-operation ministries. This is significant progress compared to the Millennium Development Goals (MDGs).[8]

Moreover, many OECD members explicitly commit to partner-friendly national policies as part and parcel of their work on the SDGs. For instance, Luxembourg's third sustainable development plan makes poverty eradication and the coherence of policies for development abroad one of its ten priority actions (Government of Luxembourg, 2019[4]), while others like Spain make coherence for sustainable and global development a key principle (Government of Spain, 2018[5]). This adds weight to similar commitments in development co-operation strategies and foreign policy statements.[9] However, some national SDG action plans of OECD members reflect developing countries only with regard to development co-operation and SDG 17.

However, heightened visibility of the need to implement the SDGs domestically has come at the expense of dedicated attention to partner-friendly policies. Facing the challenge to design policies that balance a broad range of objectives and challenges at home, abroad and for future generations (policy coherence for sustainable development, PCSD), the effects on developing countries are often forgotten. In its most recent report on policy coherence for development (PCD), the European Commission expressed the fear that 'in some European Union (EU) Member States, PCD has been partially or totally subsumed by PCSD, rather than including PCD as a contribution to the broader PCSD concept' (European Commission, 2019[6]). DAC peer reviews have also underscored the need to raise awareness to better reflect policies' effects on developing countries.[10] Low awareness increases the risk that countries pursue domestic progress to the detriment of developing countries, as recent peer reviews have underlined for migration policies.[11] Responses to the COVID-19 pandemic might raise similar concerns should developed countries fail to consider the impact of their actions on developing countries, for instance through climate change if recovery investments lead to a 'lock-in of high-emissions activities' (OECD, 2020[7]).

Translating the general commitment for partner-friendly policies into concrete action plans is driven by specific issues. Only the Netherlands and Sweden have a general action plan that identifies priorities, objectives and actions for adjusting policies to enhance their positive impact and avoid negative impacts on developing countries (Government of the Netherlands, 2018[8]) (Government of Sweden, 2017[9]). However, OECD members have adopted numerous issue-based action plans, often within specific multilateral frameworks. Examples are action plans for climate objectives (under the Paris Agreement), responsible business conduct (following the UN Guiding Principles on Business and Human Rights; OECD Action Plan to Strengthen National Contact Points) or the reduction of the cost of sending remittances (G20 members within the work of the Global Partnership for Financial Inclusion). Discussions around these action plans often use the SDGs as a general backdrop since the SDGs reaffirm their objectives. At the same time, many of these work streams preceded the 2030 Agenda. The SDGs thus provide a useful supportive framework and narrative but are likely not the main driving force for progress in these areas.

Box 3.1. Linking domestic and global action for coherent health policies

The 2020-23 Swedish Strategy to Combat Antibiotic Resistance highlights the interlinkages between domestic and global health (Government of Sweden, 2020[10]). It usefully combines Sweden's efforts to protect its own population, its action to prevent the development and spread of resistant strains for the benefit of all countries - highlighting in particular the risks for developing countries and its international engagement through both diplomacy (leading by example) and development co-operation.

OECD development co-operation peer reviews also recognised efforts by other countries such as the United States, whose international leadership helped in creating the multi-stakeholder Global Health Security Agenda (OECD, 2016[11]), and Ireland, which is taking steps to address the consequences of health worker migration (OECD, 2020[12]). For better access to medication in developing countries, the Netherlands' advocacy helped secure the agreement of the EU to continue exemptions of pharmaceuticals under what is known as the TRIPS agreement[12] (OECD, 2017[13]).

Increased but not yet systematic assessment and monitoring

A growing number of OECD members are integrating a development dimension into their regulatory impact assessments[13], but application remains limited. This good practice requires all line ministries to assess if and how their planned legislation and policies affect developing countries and to consider the options. This should be complemented by guidance (Box 3.2). However, even in the EU, where such assessments are a long-standing practice, a recent evaluation showed that a third of the sample cases had not looked at effects on developing countries, with most of them considered missed opportunities, while the overall quality of assessments was mixed (Núñez-Borja, Baudelet and Picarello, 2018[14]). Findings for Belgium are similar (CNCD 11.11.11, 2017[15]), and those for the Czech Republic and Poland underlined the need for dedicated capacity (OECD, n.d.[16]) (OECD, 2017[17]). Commissioning research on opportunities or targeted assessments on specific issues – as Norway recently did and as Finland, Ireland, the Netherlands and New Zealand had done several years ago – remains rare good practice.[14]

Box 3.2. Addressing challenges in regulatory impact assessments

The EU's better regulation tool #34 provides an overview of key links between EU policies and developing countries, a typology of possible effects and examples that illustrate how to conduct assessments and design mitigating measures (European Commission, 2017[18]). The Dutch guidance also suggests focusing on the effects on the most vulnerable and recommends consulting civil society in the Netherlands and in developing countries (Government of the Netherlands, 2018[19]).

As a pragmatic starting point, OECD members could consider to what extent a proposed policy reflects international standards,[15] as these often promote partner-friendly policies. For instance, where it is challenging to assess the precise impact of a trade barrier for very diverse developing economies, SDG target 17.12 clearly indicates that it should not apply to least developed countries. This approach would also ensure OECD members lead by example and encourage others to follow. Finally, OECD members can also draw on existing analyses of policies and their impact, including by the OECD.[16]

SDG-progress reporting to the UN contains important information on partner-friendly policies. Almost all OECD members have submitted voluntary national reviews (VNRs) to the UN. In VNRs, they report progress against goals with important transboundary dimensions, in particular regarding environment and climate change. However, VNRs show that the effects of domestic policies on developing countries beyond

development co-operation often receive very limited attention.17 Positive examples are Germany, distinguishing domestic action, global responsibility and third-country support (Government of Germany, 2016[20]), and Sweden with a discussion of challenges for partner-friendly domestic policies (Government of Sweden, 2017[21]). In 2020, Slovenia also reflected on its contribution to each SDG as a responsible global citizen (Government of Slovenia, 2020[22]), while Finland discussed the challenges of measuring spillovers (Government of Finland, 2020[23]).

National reporting in OECD member countries could better reflect links to developing countries. In fact, national indicator frameworks often do not include indicators that link to developing countries, focusing on progress at home and excluding indicators measured internationally. However, this ignores that global progress (e.g. the share of least developed countries in global trade) and relies on country and regional action (e.g. granting trade preferences). Positive examples come from Finland and Switzerland that explicitly collate indicators on spillovers and their global responsibility (Prime Minister's Office of Finland, n.d.[24]) (Federal Statistical Office, Switzerland, n.d.[25]).[18] However, reporting on status indicators alone does not allow for an understanding of what actions were successful and where challenges lie (Steinemann et al., 2019[26]) (Fellesson and Román, 2016[27]). It is therefore good practice that a number of OECD members continue dedicated reporting on both actions and progress for partner-friendly policies to their parliaments and the public.[19]

Evaluations are still rare good practice. The EU, Norway and Sweden have recently evaluated their overall approach to policy coherence for development (Núñez-Borja, Baudelet and Picarello, 2018[14]) (Fafo Research Foundation and Peace Research Institute Oslo (PRIO), 2018[28]) (Statskontoret, 2014[29]).[20] In addition, the EU has also evaluated its system of trade preferences (European Commission, 2018[30]). The new DAC evaluation criterion of 'coherence'[21] provides an opportunity to discuss how other policies interact with development co-operation objectives, for instance in country strategy or thematic evaluations. For example, the EU evaluation policy includes coherence with other interventions (European Commission, n.d.[31]) so that evaluations also touch upon links with other external policies, while Finland's recent evaluation on forced displacement highlighted issues of policy coherence with internal migration policy (Zetter et al., 2019[32]).

Greater opportunities for debate but limited uptake in government co-ordination

New consultation mechanisms provide opportunities to flag effects on developing countries. OECD members consult widely on their SDG implementation strategies and VNRs. Some have dedicated multi-stakeholder advisory councils[22] and policy fora[23] (OECD, n.d.[16]). By associating stakeholders with development expertise, notably from civil society, these mechanisms can contribute to discussions of how national policies affect developing countries. For instance, Germany's sustainability council provided advice on global value chains (Rat für Nachhaltige Entwicklung, 2020[33]), while discussions at Ireland's SDG stakeholder forum raised fair trade and migrant worker rights as issues (Department of Communications, Climate Action & Environment, Ireland, 2019[34]).

However, establishing SDG government co-ordination mechanisms does not guarantee they will discuss partner-friendly policies. Most OECD members have dedicated committees to discuss the implementation of national SDG action plans. Some have mechanisms to specifically discuss policies' effects on developing countries. However, peer reviews often find that neither general nor specific mechanisms are well used to debate how to make policies more partner-friendly,[24] and where they do, that follow-up is unclear.[25] Impact assessments that would inform government debate frequently do not address development (see Section 3.2) and the EU evaluation found that DG DEVCO had not participated in almost half of the assessments covered by the evaluation (Núñez-Borja, Baudelet and Picarello, 2018[14]).

Making all ministries responsible for partner-friendly policies is therefore critical. Foreign ministries have an important role to play, but they do not have the same technical capacity and stakeholder networks as line ministries, and are not always consulted early on (if at all). Peer reviews have therefore stressed that

line ministries need to be aware of and address the effects of 'their' policies in developing countries, in co-ordination across government.[26] Similarly, the EU evaluation recommended making the role of commission services explicit (Núñez-Borja, Baudelet and Picarello, 2018[14]), and the Norway evaluation recommended a focus on partner-friendly policies in all parts of government (Fafo Research Foundation and Peace Research Institute Oslo (PRIO), 2018[28]). Good practices in this regard include appointing focal points[27] and obliging ministries to undertake impact assessments. Sweden shows particular leadership, requiring all ministries to develop action plans on how they contribute to the SDGs globally (OECD, 2019[35]). However, despite this good practice, an independent study from Sweden underscored the importance of resources so that ministries can deliver (Fellesson and Román, 2016[27]).

Resources and capacity need to underpin mandates. Focal points and impact assessments require time, knowledge, skills and financial resources. All evaluations therefore stressed the need for dedicated human and financial resources. Useful support to line ministries can include the secondment of staff with development expertise (United Kingdom) and specific training (Portugal) (ICAI, 2019[36]) (OECD, 2015[37]). It is also good practice to draw on valuable expertise and views from stakeholders. Many foreign ministries already discuss partner-friendly policies with civil society but also with Diasporas and representatives of developing countries.[28] However, more OECD members should consider the consultation of embassies on partner-friendly policies (as the EU and Sweden do) (Núñez-Borja, Baudelet and Picarello, 2018[14]) (OECD, 2019[35]). Peer reviews have also praised multi-stakeholder coalitions on value chains, including the private sector.[29]

Building the necessary political will with the help of the 2030 Agenda

Recent reviews and evaluations underscored that political will and shared understanding are critical. The evaluation from Norway finds that the most difficult coherence dilemmas occur 'when national sector interests are in opposition to global development objectives and the assumed domestic costs of a given policy change are high and immediate' (Fafo Research Foundation and Peace Research Institute Oslo (PRIO), 2018[28]). The Swedish study similarly sees conflicts of interests as the most important reason for a lack of motivation to pursue coherent policies (Fellesson and Román, 2016[27]). High-level commitments and good institutional mechanisms cannot compensate for this. A study of multiple EU members had found that no state had managed 'to overcome the negative impact of the loss of political momentum for PCD on the effectiveness of institutional mechanisms' (Galeazzi et al., 2013[38]). The EU evaluation stressed that political will was, from the onset, the decisive influence for more coherent policies, rather than specific mechanisms (Núñez-Borja, Baudelet and Picarello, 2018[14]).

Political decisions rely on stakeholder support, but not all stakeholders support more coherent policies. The situation in developing countries affects the attitude of stakeholders to a lesser extent than domestic issues, so that decision-makers are less likely to make partner-friendly decisions. Three challenges explain this: 1) domestic stakeholders are not fully aware and do not sufficiently understand the potential positive and negative effects on developing countries; 2) stakeholders that promote sustainable development in developing countries have less voice in debates on national policies beyond development co-operation; and 3) negative effects on developing countries are often externalities, while changes to national policy affect domestic stakeholders directly. Many of the actions outlined above help address these challenges, but OECD members can do more to build stakeholder support.

The 2030 Agenda provides opportunities to create an enabling environment for partner-friendly policies at home and internationally. OECD members successfully use the 2030 Agenda and its narrative of shared prosperity to inform their populations about their role in global development as political actors, consumers and activists (Box 3.3). This builds public support for partner-friendly policies and sets incentives for policy makers and businesses. Civil society organisations use the SDGs to consistently remind States of their commitments, suggest alternative courses of action to decision-makers and inform the public of negative effects. For instance, Concord Europe regularly publishes policy papers on the global effects of EU

policies,[30] while the Center for Global Development is currently updating its Commitment to Development Index on partner-friendly policies (Center For Global Development, n.d.[39]). To improve incentives, OECD members can also take more targeted action. For instance, with the introduction of a public label for textile production, Germany enables consumers to reward better corporate due diligence. Agreements at multilateral level can also help address a major obstacle to political will by establishing a level playing field, i.e. ensuring that competitors from other countries abide by the same partner-friendly rules. For instance, the OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting sets common rules and actions to reduce tax avoidance, also benefiting developing countries (OECD, 2020[40]).

Box 3.3. Promoting the development-awareness of the population

Investing in future generations of development-aware citizens, OECD members such as Portugal and Korea integrate global citizenship and 'development' into school curricula (Government of Portugal, 2019[41]) (OECD, 2018[42]). In 2018, the OECD Programme for International Student Assessment (PISA) integrated for the first time a module on global competence (OECD, 2020[43]). The results can help States assess the effectiveness of their approaches and monitor the attitudes of students, teachers and parents.

A comprehensive approach that combines formal and non-formal education at all ages is critical. Ireland provides a good example of such an approach to development education (OECD, 2020[12]). Partnerships include government, civil society organisations and local communities, and partners can learn from one another through the Irish Development Education Association. Ireland has a clear performance framework to track activities and outcomes such as increased knowledge and attitude change.

To raise awareness of the SDGs in a way that speaks to target audiences, the Italian multi-stakeholder alliance ASviS runs an annual sustainable development festival (OECD, 2019[44]), while Japanese character Hello Kitty partners with the United Nations (United Nations, 2019[45]) and Germany with combined street art and social media campaigning (Mäntele, 2020[46]). Development co-operation actors boast numerous good practices and insights in communicating effectively with their public, including with regard to COVID-19 (OECD Development Communication Network (DevCom), n.d.[47]).

This section has illustrated that the SDGs are helping to create opportunities for more partner-friendly policies but that OECD members need to make greater efforts to fully tap into this potential. The next section shows that a very similar conclusion can be drawn when it comes to mainstreaming the SDGs to better steer and coordinate development co-operation on the ground.

Aligning development co-operation to the SDGs in developing countries: progress and challenges

The 2030 Agenda offers an opportunity to increase transboundary policy co-ordination and coherence in the delivery of development co-operation. In aligning their strategies to the SDGs in less developed countries, OECD governments can also address transboundary impacts more effectively: the SDG framework offers a means to visualise the interconnectedness of the economic, social and environmental dimensions. It therefore enables OECD governments to rely more on system thinking as they design their development co-operation programmes. This facilitates the development of integrated strategies that avoid sector silo approaches and integrate transboundary impacts.

Many OECD governments and other donor agencies are making progress in incorporating the SDG framework into their strategies, programmes and projects. Yet case studies in seven developing countries

suggest that SDG mainstreaming in development co-operation delivery is still limited due to the compounding effects of several technical, organisational and political obstacles (OECD, 2019[3]; OECD, Forthcoming[48]).

Progress in mainstreaming the SDGs in development co-operation delivery

Across OECD members, development co-operation policies embraced the 2030 Agenda for Sustainable Development earlier and more explicitly than other policy areas. Amongst European countries, the 2030 Agenda became a shared reference framework for development policies with the approval of the "European Consensus on Development". With this "Consensus", the EU and its member states placed the substantive focus on achieving the SDGs through greater use of all financial resources, broader partnerships and better policy coherence for development (EU Consilium, 2017[49]). Similar shifts in development policy were registered in other non-European OECD capitals, with a progressive updating of development policies and results-based management instruments to match the ambition of the 2030 Agenda. The OECD contributed to this gradual alignment by providing guidance and evidence, and facilitating peer learning (Engberg-Pedersen and Zwart, 2018[50]) (OECD, 2018[51]). Nevertheless, the actual transformation to adopt integrated approaches that take into account inter-relationships between SDGs as well as their transboundary effects is still a work in progress.

There is growing evidence that commitment to aligning development co-operation efforts to the SDGs and supporting their implementation in developing countries has progressively trickled down to programme and project design. By 2020, a vast majority of development co-operation providers reported including SDG indicators as targeted results for at least some development projects (89% of donors) or for their overall bilateral partnership frameworks agreed with developing countries (81%).[31] Eleven OECD governments[32] and most multilateral development agencies have also integrated the SDG targets and indicators into the results framework for their overall development co-operation programmes, and regularly collate country-level SDG data to report on their contribution to the achievement of the SDGs in the developing countries that receive their support.

Contextual factors limiting the use of the SDGs in development co-operation

Adopting the SDG framework comes at a cost

It has taken the international community several years to agree upon the whole set of SDG indicators[33], which limited their immediate applicability for strategic planning and monitoring purposes. While the proportion of ready-to-use indicators has grown to 90% in 2020, it was only 60% in 2016. This seems to have slowed down the extent of adoption of the SDG framework, delaying the potential benefits of widely-adopted standard planning and measurement approaches for some policy areas.

Moreover, integrating sustainability dimensions into the SDG framework represented a positive – but costlier – departure from some traditional sector performance standards. While the targets and indicators capture sustainability and interlinkages within the SDGs more effectively than was the case for the Millennium Development Goals (MDGs), the previous investments in embedding MDG targets and the complexity of some SDG indicator methodologies have increased the cost of transition to the SDGs at country level (OECD/UNDP, 2019[2]; OECD, 2019[3]). Similarly, when the SDG targets and indicators represented a stark departure from well-established indicators for sector policy performance to capture sustainability dimensions, comparative evidence collected by the OECD suggests that there is significant measurement inertia as the cost of transition requires investments and coordinated action by all levels of government and the international community.

Developing countries strive to align their institutions to the SDGs

As is the case in many OECD governments, developing country governments often lack a coherent mechanism to define their SDG priorities beyond sectors. While most developing countries are taking steps to create cross-government co-ordination structures to integrate the SDGs in national policy-making (OECD/UNDP, 2019[2]), only a few have established already robust vertical and horizontal governance mechanisms to enable national and local governments to address cross-cutting and complex sustainability issues; create links across sectors and actors to strengthen interlinkages between SDGs and targets, and with other agendas; and to drive budgetary processes and monitoring and evaluation systems under that lens (Allen, Metternicht and Wiedmann, 2016[52]). As a result, the degree of "SDG domestication" is rather uneven and it does not yet significantly affect national policies and strategies as envisioned in the 2030 Agenda paradigm (OECD, Forthcoming[48]).

The above factors have encouraged individual responses that rely on indicators not fully aligned to the SDG indicator definitions for sector monitoring. This has limited the overall availability of SDG data and prevented a shared understanding of the effects of development programmes and policies across sectors or borders.

Development co-operation practices affecting the use of SDGs at country level

Fragmentation of development co-operation delivery is coupled with siloed approaches

Development co-operation experienced a significant transformation within OECD governments since 2010, which resulted in greater fragmentation of development co-operation delivery within and across donors (OECD, 2019[53]). While individual cases vary, overall trends point to a shrinking proportion of official development finance directly disbursed and reflected in developing countries' own budgets; greater reliance on non-state actors to deliver development co-operation such as civil society organisations and private sector firms; and more OECD ministries and entities autonomously involved in planning and delivering development co-operation. While the multiplication of stakeholders involved can be an asset, it requires more co-ordination to avoid siloed approaches and inconsistent use of the SDGs.

Data needs for planning, decision-making and accountability also changed in the last decade, with greater pressure to show development co-operation results. This pressure led to a greater focus on short-term results attributable to the development co-operation provider, driven by a need to demonstrate value-for-money and serve for accountability and communication purposes (Vähämäki and Verger, 2019[54]). However, the SDG indicator framework does not always fit to meet that need. While the framework offers a variety of outcome and output indicators to measure development results and impacts, these represent less than two-thirds of the SDG targets and indicators, and many of them are expressed as country-wide results (e.g. carbon emissions). As a result, providers of development co-operation have resorted to using programme- and project-specific indicators that could better capture the attributable results of these interventions, while development co-operation investments in capacity building for national statistics and data in less developed countries has remained marginal (Lange, 2020[55]). Specific SDG monitoring at project level may frequently be less effective in recognising possible cross-sector effects of development co-operation than sector-wide or whole-of-government monitoring approaches.

At a higher level, development co-operation providers consolidated instruments to bring cross-sector coherence to their country level. In particular, to prevent proliferation and atomisation of development co-operation efforts, most OECD providers define medium-term strategy documents or partnership frameworks with developing countries that receive a significant share of their development co-operation support. These planning instruments are meant to improve selectivity and prioritisation of areas of support – even if a diversity of approaches is used by various OECD governments in terms of how much these are negotiated with the developing country government and formulated based on evidence.

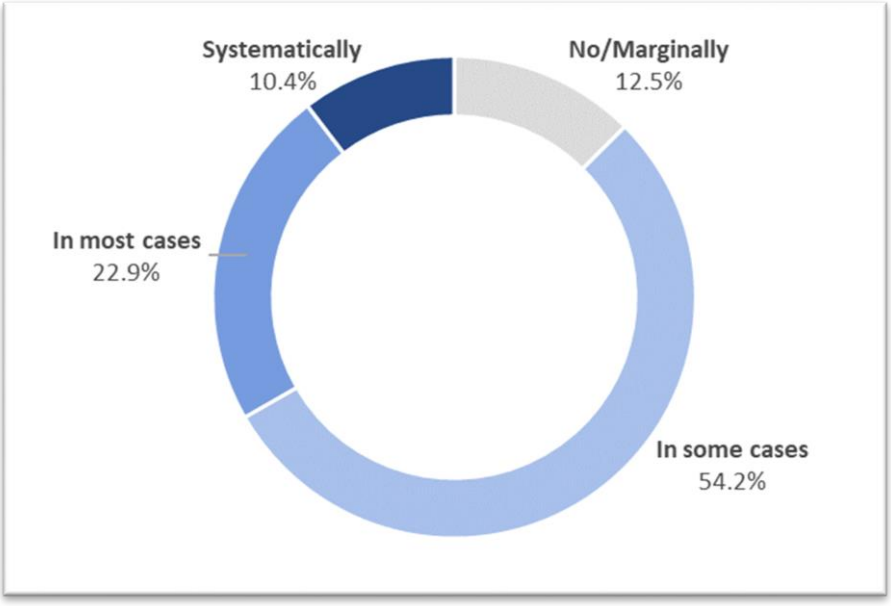
Still, moving away from sector silos to adopt integrated approaches to development co-operation at country level remains a challenge. While adopting a country-level perspective on development co-operation delivery has the potential to bring coherence and build on synergies across policy areas, most OECD ministries and agencies in charge of development co-operation make limited use of cross-sector and integrated approaches in formulating their country-level approaches (Figure 3.2).

There are however some positive examples, such as joint planning and programming in 50 developing countries by the EU and its member states or the United States' use of "Journey to Self-Reliance Country Roadmaps". In some cases, the adoption of some SDG targets and indicators capturing a combination of economic/environmental/social dimensions also led to more integrated approaches to sector policy responses.

Those that integrate the SDG targets and indicators to a greater extent in country-level planning also report greater use of cross-sector, integrated approaches at that level.[34] Positive examples include Austria, Luxembourg, Spain and Sweden as well as various multilateral donor agencies. This underlines the synergetic relationship between SDG uptake and adopting coherent policies and planning practices for sustainable development – even if a majority of development co-operation providers are not yet well equipped to perform such sophisticated country strategic planning.

Figure 3.2. The use of integrated approaches in development co-operation is still limited

Overall, out of 50 ministries and agencies providing development co-operation in 2020, only 5 systematically rely on cross-sector approaches for planning, measurement, learning and reporting in line with the integrated nature of the SDGs



Source: (OECD, Forthcoming[56]).

Synchronised planning cycles and joined-up approaches enhance overall coherent development co-operation support at country level

As developing countries finalise processes to incorporate the SDGs into their national plans and policies, some providers are seizing the opportunity to create adequate linkages with the SDGs. Evidence from comparing donor behaviours in seven developing countries[35] suggests that the adoption of SDG indicators has been more successful in countries where development co-operation providers have synchronised their

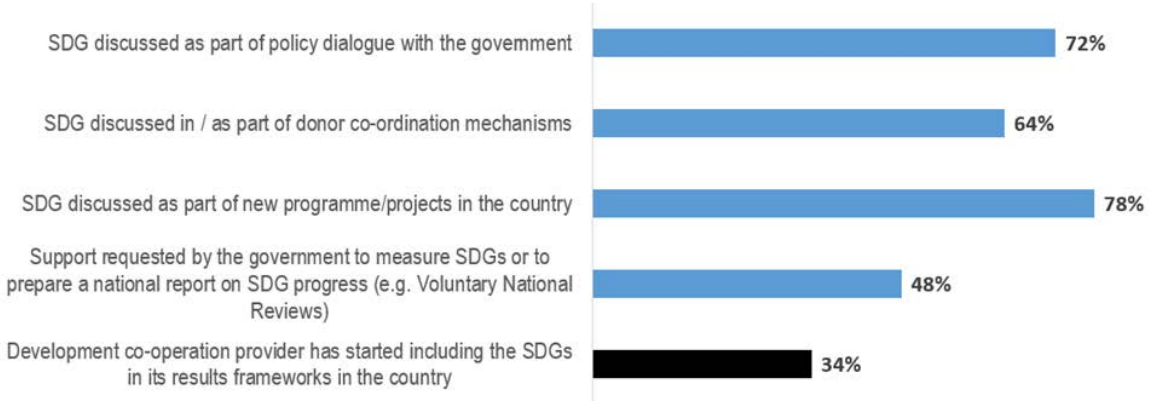
SDG planning cycle with the developing country government, and where sector-wide and joined-up approaches were used for SDG alignment and monitoring at country level. Greater collaboration has also been more effective in generating SDG disaggregated data on locally relevant dimensions to ensure that no one is left behind (OECD, 2019[3]; OECD, Forthcoming[48]).

Greater development co-operation support to build countries' capacity to measure the SDGs would enhance joined-up SDG monitoring approaches. While estimates on the cost of strengthening national statistical capacity for the SDGs oscillate, development co-operation support for this area has remained at an average of USD 600 million in recent years – or 0.33% of all official development assistance (PARIS21, 2019[57]). Expanding the availability and use of SDG data for policy-making will require matching statistical needs with sufficient development co-operation support.

Traditional donor co-ordination structures constrain cross-sector work

Many government-donors' co-ordination mechanisms have emerged in all developing countries since the 2000s, but these still operate through a sector division of labour. Recent evidence for 2019 suggests that, while the SDGs are starting to be discussed at country level (Figure 3.3), traditional donor co-ordination mechanisms at country level have not evolved sufficiently so as to ensure cross-sector coherence or integrate other policy dimensions as required by the 2030 Agenda – save for exceptional cases discussed in Section 2 and involving trade, security or migration issues (OECD/UNDP, 2019[2]; OECD, Forthcoming[48]). Yet field interviews conducted as part of several OECD case studies suggest that, in most cases, the SDGs are discussed within donor co-ordination mechanisms in general terms, and as part of the dialogue to establish a sectoral division of labour among donors.

Figure 3.3. Degree of influence of the SDGs in development co-operation delivery at country level



Note: Sample of 67 development co-operation providers. Survey of field managers in Uganda, Peru and Samoa.
Source: (OECD, Forthcoming[48]).

Potential to strengthen connections between development co-operation and other policies at home

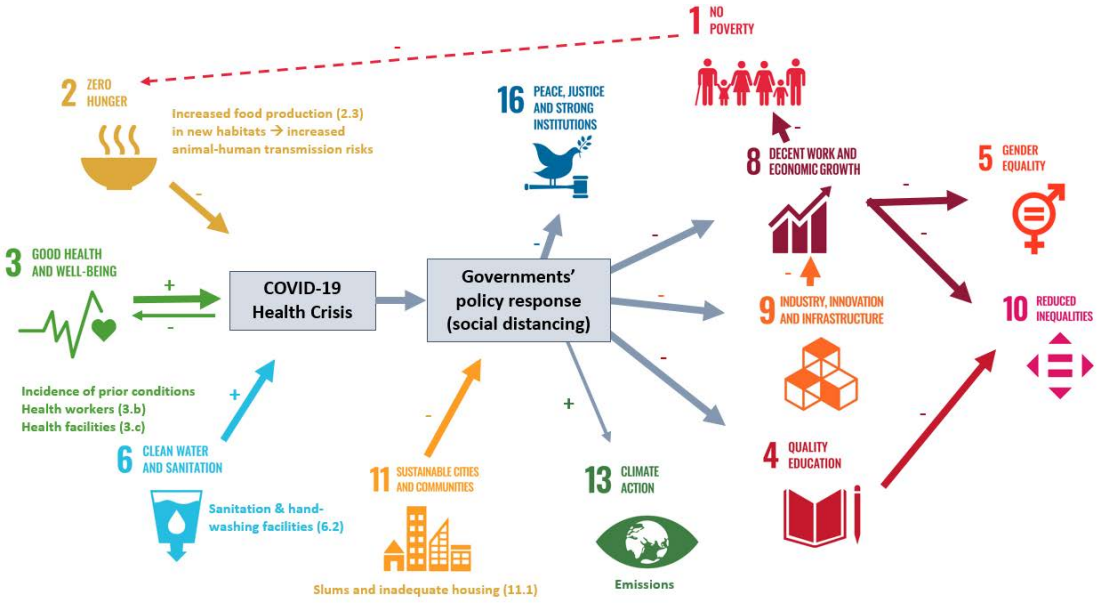
Beyond development co-operation, OECD members are increasingly developing whole-of-government strategies for their engagement at partner country level, emphasising the importance of co-ordination and coherence. Examples include New Zealand and its integrated approach for the Pacific, Ireland's African engagement (OECD, 2020[58]), and the United States integrated country strategies (US State Department, 2020[59])

Integrated strategies are good practice as they make links between different policy areas.[36] This enables the discussion of potential incoherence ahead. When supported by an articulated policy vision and strong structures, they can lead to effective results in partner countries. The United Kingdom whole-of-government work on corruption and trade in Kenya, driven by the United Kingdom's 5-year anti-corruption strategy published in 2017, is a good example of success (HM Government, 2017[60]). In improving alignment between domestic and international policy, the New Zealand "Pacific reset" launched in 2018 led to positive outcomes on issues as diverse as pension portability, adoptions and healthcare, whilst strengthening co-ordination with Australia in the region (New Zealand, 2018[61]).

Using the SDGs would enable OECD members to develop broader integrated strategies. Up until now, not all integrated strategies have been framed around the SDGs. Beyond development co-operation, these strategies rather reflect bilateral relations around trade, migration, education, foreign policy or security objectives. Using the SDGs would enable OECD members to rely more on systems thinking in developing these integrated strategies, explicitly recognising the interconnected factors that drive – or impede – development, including the transboundary impacts of domestic policies.

The SDG framework offers a way to visualise the interconnectedness of the pandemic effects with other economic, social and environmental dimensions (Box 4.1). Whether OECD governments decide to step up support to the health sector in developing countries, or to focus on the negative socio-economic impacts on the crisis, they may want to consider holistic approaches to their development programme that explicitly recognise other interconnected factors to influence or be influenced by the health crisis. This includes reflecting on the transboundary impacts of their own immediate responses to suppress the spread of the pandemic (OECD, 2020[62]).

Figure 3.4. Using the SDGs to visualise COVID-19 effects across sectors



Source: Authors' own elaboration based on: International Science Council (2017) A Guide to SDG Interactions: from Science to Implementation. https://council.science/wp-content/uploads/2017/03/SDGs-interactions-3-healthy-lives.pdf; (Lange, 2020[55]).

OECD governments would benefit from better articulating their national and international efforts in tracking progress towards the SDGs. In many OECD countries, there is a disconnect between policy makers and statisticians on the one hand, and between the entities in charge of designing and monitoring effects of national SDG strategies and the development co-operation department on the other.[37] While there might

be value in comparing the respective level of alignment of domestic and development co-operation policies, bridging these gaps could create opportunities on both sides: it will strengthen the use of data for evidence-based decision-making at domestic level, and will maximise the use of domestic resources (e.g. national statistical offices' capacities) to improve the methodological approach to data collection in less developed, non-OECD countries. Australia's approach in supporting other small island nations in the Pacific during the 2010s offers an example of how to operate strengthening capabilities for managing transboundary effects on both sides. It involves engaging other ministries and the national statistics office in capacity building for evidence-based decision-making abroad.

Conclusion: the way forward

As a universal platform, the SDGs can guide the efforts of OECD members in ensuring all their policies are consistent and support sustainable development at home and abroad. Despite progress, OECD members need to make greater efforts to reap the full benefits the SDGs can offer, enhancing co-ordination mechanisms for managing transboundary impacts – identifying synergies and multipliers, and avoiding (or mitigating) negative externalities.

They have a particular opportunity to do so now. Indeed, experience shows that high-profile events such as the COVID-19 pandemic can be a powerful spur to enabling a shift towards policies that are more compatible with sustainable development in developing countries.[38]

To increase positive and avoid negative impacts of their policies on developing countries, OECD members should therefore strengthen their efforts to:

- enable continuous debate: putting policy challenges on the agenda of dialogue with developing countries, parliaments and key stakeholders at home, based on insights from quality reporting and assessments;
- ensure readiness of line ministries: giving ministries a clear responsibility, resources and capabilities to assess the direct and indirect effects of their policies on developing countries, combined with co-ordination and consultation mechanisms;
- work collectively: using multilateral frameworks, including at the OECD, to build mutual commitments and joint ways forward for more partner-friendly policies;
- use the SDGs as a driver for whole-of-government engagement in developing countries: strengthening connections between development co-operation and other policies at home to promote integrated approaches to development co-operation at country level;
- coordinate development co-operation with all development partners: aligning to partner country indicators, synchronising planning cycles with partner countries' own cycles and using co-ordination structures to ensure cross-sector coherence;
- support data for development: building national monitoring and statistical capacity in developing countries to identify, analyse and integrate policy synergies and trade-offs.

References

Allen, C., G. Metternicht and T. Wiedmann (2016), "National pathways to the Sustainable Development Goals (SDGs): A comparative review of scenario modelling tools", *Environmental Science and Policy*, Vol. 66. [52]

Center For Global Development (n.d.), *Commitment to Development Index*, https://www.cgdev.org/topics/commitment-development-index (accessed on 6 June 2020). [39]

CNCD 11.11.11 (2017), *Rapport 2017 sur l'aide belge au au développement: Priorité à la mobilisation du secteur privé*, CNCD 11.11.11, https://www.cncd.be/rapport-2017-aide-belge-au-developpement (accessed on 8 June 2020). [15]

CONCORD (2019), *A Litmus Test for EU Leaders How Will You Work For Sustainable Development?*, CONCORD, Brussels, https://concordeurope.org/what-we-do/sustainable-development/ (accessed on 6 June 2020). [96]

Department of Communications, Climate Action & Environment, Ireland (2019), *2019 Forums*, https://www.dccae.gov.ie/en-ie/environment/topics/sustainable-development/sustainable-development-goals/stakeholder-forum--/2019-forums/Pages/default.aspx (accessed on 8 June 2020). [34]

Department of Finance, G. (2015), *IBFD Spillover Analysis: Possible Effects of the Irish Tax System on Developing Economies*, Department of Finance, Government of Ireland, http://www.budget.gov.ie/Budgets/2016/Documents/IBFD_Irish_Spillover_Analysis_Report_pub.pdf (accessed on 6 June 2020). [77]

Engberg-Pedersen, P. and R. Zwart (2018), "The 2030 Agenda and Development Co-operation Results", *OECD Development Policy Papers* 9, http://dx.doi.org/10.1787/24140929. [50]

EU Consilium (2017), *European Consensus on Development*. [49]

European Centre for Development Policy Management (ecdpm) and Economic and Social Research Foundation (ESRF) (2015), *Assessing Policy Coherence for Development: A Pilot Study on the Impacts of OECD Countries' Policies on Food Security in Tanzania*, ecdpm. [76]

European Commission (2019), *2019 EU report on Policy Coherence for Development*, European Commission, Brussels, https://ec.europa.eu/international-partnerships/policy-coherence-development_en (accessed on 6 June 2020). [6]

European Commission (2018), *Midterm evaluation of the GSP Regulation*, European Commission, Brussels, https://trade.ec.europa.eu/doclib/docs/2018/august/tradoc_157270.pdf (accessed on 7 June 2020). [30]

European Commission (2017), *Better Regulation Toolbox tool #34: Developing Countries*, European Commission, Brussels, https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox/better-regulation-toolbox_en (accessed on 6 June 2020). [18]

European Commission (n.d.), *Evaluation Matters: The Evaluation Policy for European Union Development Co-operation*, European Commission, https://ec.europa.eu/international-partnerships/our-impact/monitoring-and-evaluation_en (accessed on 7 June 2020). [31]

European Union (2017), *The New European Consensus on Development 'Our World, Our Dignity, Our Future': Joint Statement by the Council and the Representatives of the Governments of the Member States meeting within the Council, the European Parliament and the European Commission*, European Union, Brussels, https://ec.europa.eu/international-partnerships/system/files/european-consensus-on-development-final-20170626_en.pdf (accessed on 6 June 2020). [75]

Fafo Research Foundation and Peace Research Institute Oslo (PRIO) (2018), *Evaluation of Norwegian Efforts to Ensure Policy Coherence for Development*, Norad Evaluation Department, Oslo, https://norad.no/en/toolspublications/publications/2018/evaluation-of-norwegian-efforts-to-ensure-policy-coherence-for-development/ (accessed on 6 June 2020). [28]

Federal Statistical Office, Switzerland (n.d.), *Spillover and responsibilities of Switzerland*, https://www.bfs.admin.ch/bfs/en/home/statistics/sustainable-development/monet-2030/spillover-responsibilities.html (accessed on 7 June 2020). [25]

Fellesson, M. and L. Román (2016), *Sustaining a Development Policy: Results and Responsibility for the Swedish Policy for Global Development*, Expertgruppen för biståndsanalys (EBA), Government of Sweden, http://www.eba.se (accessed on 6 June 2020). [27]

Galeazzi, G. et al. (2013), *Insights from Developments in National Policy Coherence for Development Systems: Key Cross Cutting Issues and Dilemmas*, European Centre for Development Policy Management (ecdpm), http://www.ecdpm.org/dp144 (accessed on 7 June 2020). [38]

Government of Denmark (2017), *Denmark's implementation of the 2030 Agenda for Sustainable Development*, Government of Denmark, https://sustainabledevelopment.un.org/vnrs/index.php (accessed on 6 June 2020). [74]

Government of Finland (2020), *Voluntary National Review 2020 Finland: Report on the Implementation of the 2030 Agenda for Sustainable Development*, https://sustainabledevelopment.un.org/index.php?page=view&type=30022&nr=1680&menu=3170. [23]

Government of Germany (2016), *Report of the German Federal Government to the High-Level Political Forum on Sustainable Development 2016*, Government of Germany, Berlin, https://sustainabledevelopment.un.org/vnrs/index.php (accessed on 6 June 2020). [20]

Government of Italy (2017), *Voluntary National Review: Italy National Sustainable Development Strategy*, Government of Italy, https://sustainabledevelopment.un.org/vnrs/index.php (accessed on 6 June 2020). [73]

Government of Luxembourg (2019), *Luxembourg 2030: 3 ème Plan National pour un Développement Durable*, Government of Luxembourg, Luxembourg, https://environnement.public.lu/dam-assets/documents/developpement-durable/PNDD.pdf (accessed on 6 June 2020). [4]

Government of New Zealand (2018), *New Zealand in the Pacific: Redacted Cabinet Paper*, Government of New Zealand, Wellington, https://www.mfat.govt.nz/assets/OIA/Redacted-Cabinet-Paper-for-web-publication-New-Zealand-in-the-Pacific-.._.pdf (accessed on 6 June 2020). [72]

Government of Portugal (2019), *Twenty-fifth anniversary of the Fourth World Conference on Women and adoption of the Beijing Declaration and Platform for Action (1995) National-level reviews: Portugal*, Government of Portugal, https://www.unece.org/fileadmin/DAM/Gender/Beijing_20/Portugal.pdf (accessed on 7 June 2020). [41]

Government of Slovenia (2020), *Implementation of the Sustainable Development Goals: Second Voluntary National Review, Slovenia 2020*, https://sustainabledevelopment.un.org/index.php?page=view&type=30022&nr=1689&menu=3170. [22]

Government of Spain (2018), *Plan de acción para la implementación de la Agenda 2030: Hacia una Estrategia Española de Desarrollo Sostenible*, Government of Spain, Madrid, http://www.exteriores.gob.es/Portal/es/SalaDePrensa/Multimedia/Publicaciones/Documents/PLAN%20DE%20ACCION%20PARA%20LA%20IMPLEMENTACION%20DE%20LA%20AGENDA%202030.pdf (accessed on 6 June 2020). [5]

Government of Sweden (2020), *Swedish Strategy to Combat Antibiotic Resistance 2020-2023*, Government of Sweden, Stockholm, https://www.government.se/499178/globalassets/government/dokument/socialdepartementet/amr_strategi_eng_web.pdf (accessed on 6 June 2020). [10]

Government of Sweden (2017), *Policy for global development in the implementation of the 2030 Agenda*, https://www.government.se/legal-documents/2018/03/policy-for-global-development-in-the-implementation-of-the-2030-agenda/ (accessed on 6 June 2020). [9]

Government of Sweden (2017), *Sweden and the 2030 Agenda - Report to the UN High Level Political Forum 2017 on Sustainable Development*, Government of Sweden, Stockholm, https://sustainabledevelopment.un.org/vnrs/index.php (accessed on 6 June 2020). [21]

Government of the Netherlands (2018), *Effecten op ontwikkelingslanden (Effects on developing countries)*, https://www.kcwj.nl/kennisbank/integraal-afwegingskader-beleid-en-regelgeving/verplichte-kwaliteitseisen/effecten-op-ontwikkelingslanden (accessed on 6 June 2020). [19]

Government of the Netherlands (2018), *Revised action plan and annual progress review on policy coherence for development*, Government of the Netherlands, https://www.government.nl/documents/parliamentary-documents/2018/07/13/revised-action-plan-and-annual-progress-review-on-policy-coherence-for-development (accessed on 6 June 2020). [8]

HM Government (2017), *UK anti-corruption strategy 2017 to 2022*, Government of the United Kingdom, https://www.gov.uk/government/publications/uk-anti-corruption-strategy-2017-to-2022. [60]

ICAI (2019), *How UK aid learns A rapid review*, http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3, (accessed on 10 January 2020). [36]

Lange, S. (2020), "Key trends in development co-operation for national data and statistical systems", *OECD Development Policy Papers*, No. 31, OECD Publishing, Paris, https://dx.doi.org/10.1787/1ce044d2-en. [55]

Macintyre, P., D. Moore and E. Hendriks (2014), *Opportunities to Improve New Zealand's Policy Coherence for Development*, Ministry of Foreign Affairs and Trade , Wellington, https://www.mfat.govt.nz/assets/Aid-Prog-docs/Research/Opportunities-to-Improve-NZ-Policy-Coherence-for-Development.pdf (accessed on 9 June 2020). [71]

Mäntele, C. (2020), *17 Projections: Guerrilla SDG marketing in Germany*, https://sdg-communicator.org/2020/08/30/guerrilla-sdg-marketing-in-germany-17-projections/ (accessed on 6 March 2020). [46]

Ministry of Foreign Affairs of the Czech Republic (2017), *Development Cooperation Strategy of the Czech Republic: 2018-2030*, Ministry of Foreign Affairs of the Czech Republic, Prague, https://www.mzv.cz/file/2710363/CZ_Development_Cooperation_Strategy_2018_2030.pdf (accessed on 6 June 2020). [70]

New Zealand (2018), *The Pacific reset: The First Year*, Cabinet Paper, https://www.mfat.govt.nz/assets/OIA/R-R-The-Pacific-reset-The-First-Year.PDF. [61]

Ngwenya, L. (2018), *International tax agreements and domestic resource mobilisation: Norway's treaty network with low-income countries in Africa*, Norad Evaluation Department, http://www.norad.no (accessed on 6 June 2020). [69]

Núñez-Borja, C., E. Baudelet and T. Picarello (2018), *External Evaluation of the European Union's Policy Coherence for Development*, European Commission, Brussels, https://ec.europa.eu/international-partnerships/policy-coherence-development_en (accessed on 6 June 2020). [14]

OECD (2020), *An inclusive, green recovery is possible: The time to act is now*, https://read.oecd-ilibrary.org/view/?ref=131_131293-wp41ole2c5&title=An-inclusive-green-recovery-is-possible-The-time-to-act-is-now (accessed on 6 June 2020). [7]

OECD (2020), *COVID-19 and Global Value Chains: Policy Options to Build More Resilient Production Networks*, https://read.oecd-ilibrary.org/view/?ref=134_134302-ocsbti4mh1&title=COVID-19-and-Global-Value-Chains-Chains-Policy-Options-to-Build-More-Resilient-Production-Networks (accessed on 3 June 2020). [43]

OECD (2020), *DAC peer learning series - COVID-19: Preparing, Learning, Absorbing and Responding*, http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DCD/DAC(2020)41&docLanguage=En. [58]

OECD (2020), "Managing for sustainable results in development co-operation in uncertain times", *OECD COVID-19 Policy Briefs*, p. 20, http://www.oecd.org/coronavirus/policy-responses/managing-for-sustainable-results-in-development-co-operation-in-uncertain-times-c94f0b59/. [62]

OECD (2020), *OECD Development Co-operation Peer Reviews: Austria 2020*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/03b626d5-en. [92]

OECD (2020), *OECD Development Co-operation Peer Reviews: Ireland 2020*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/c20f6995-en. [12]

OECD (2020), *OECD/G20 Inclusive Framework on BEPS: Progress report July 2019 – July 2020*, OECD, https://www.oecd.org/tax/beps/oecd-g20-inclusive-framework-on-beps-progress-report-july-2019-july-2020.htm. [40]

OECD (2019), *Development Co-operation Report 2019: A Fairer, Greener, Safer Tomorrow*, OECD Publishing, http://dx.doi.org/10.1787/9a58c83f-en. [53]

OECD (2019), *OECD Development Co-operation Peer Reviews: Italy 2019*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/b1874a7a-en. [44]

OECD (2019), *OECD Development Co-operation Peer Reviews: Norway 2019*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/75084277-en. [83]

OECD (2019), *OECD Development Co-operation Peer Reviews: Sweden 2019*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9f83244b-en. [35]

OECD (2019), *Policy Coherence for Sustainable Development 2019: Empowering People and Ensuring Inclusiveness and Equality*, OECD Publishing, Paris, https://dx.doi.org/10.1787/a90f851f-en. [79]

OECD (2019), *Recommendation of the Council on Policy Coherence for Sustainable Development*, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0381 (accessed on 9 June 2020). [1]

OECD (2019), *Sustainable Results in Development: Using the SDGs for Shared Results and Impact*, OECD Publishing, Paris, https://dx.doi.org/10.1787/368cf8b4-en. [3]

OECD (2018), *Development Co-operation results for the 2030 Agenda: A Guide for Applying the Sustainable Development Goals, Targets and Indicators in Results Frameworks*, https://www.oecd.org/dac/results-development/docs/guide-dev-cop-2030-agenda-results.pdf. [51]

OECD (2018), *OECD Development Co-operation Peer Reviews: Australia 2018*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264293366-en. [93]

OECD (2018), *OECD Development Co-operation Peer Reviews: European Union 2018*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264309494-en. [89]

OECD (2018), *OECD Development Co-operation Peer Reviews: France 2018*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264302679-en. [87]

OECD (2018), *OECD Development Co-operation Peer Reviews: Korea 2018*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264288829-en. [42]

OECD (2018), *Policy Coherence for Sustainable Development 2018: Towards Sustainable and Resilient Societies*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264301061-en. [80]

OECD (2017), *OECD Development Co-operation Peer Reviews: Finland 2017*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264287235-en. [88]

OECD (2017), *OECD Development Co-operation Peer Reviews: Iceland 2017*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264274334-en. [85]

OECD (2017), *OECD Development Co-operation Peer Reviews: Luxembourg 2017*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264284364-en. [84]

OECD (2017), *OECD Development Co-operation Peer Reviews: Poland 2017*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264268869-en. [17]

OECD (2017), *OECD Development Co-operation Peer Reviews: Slovenia 2017*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264279308-en. [82]

OECD (2017), *OECD Development Co-operation Peer Reviews: The Netherlands 2017*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264278363-en. [13]

OECD (2017), *Policy Coherence for Sustainable Development 2017: Eradicating Poverty and Promoting Prosperity*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264272576-en. [81]

OECD (2016), *OECD Development Co-operation Peer Reviews: Czech Republic 2016*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264264939-en. [91]

OECD (2016), *OECD Development Co-operation Peer Reviews: Denmark 2016*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264259362-en. [90]

OECD (2016), *OECD Development Co-operation Peer Reviews: United States 2016*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264266971-en. [11]

OECD (2015), *Better Policies for Development 2015: Policy Coherence and Green Growth*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264236813-en. [94]

OECD (2015), *OECD Development Co-operation Peer Reviews: Germany 2015*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264246133-en. [86]

OECD (2015), *OECD Development Co-operation Peer Reviews: Portugal 2016*, OECD Development Co-operation Peer Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264248571-en. [37]

OECD (2014), *Better Policies for Development 2014: Policy Coherence and Illicit Financial Flows*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264210325-en. [95]

OECD (2013), *Better Policies for Development In Focus: Policy Coherence for Development and Global Food Security*, OECD, http://www.oecd.org/gov/pcsd/PoliCoh_PDFforWeb_270513.pdf (accessed on 11 June 2020). [68]

OECD (Forthcoming), *Aligning to the SDGs: Stepping Up Action*, OECD Publishing. [48]

OECD (n.d.), *Country Profiles: Institutional mechanisms for PCSD*, http://www.oecd.org/gov/pcsd/pcsd-country-profiles.htm (accessed on 6 June 2020). [16]

OECD (Forthcoming), "Managing for Sustainable Development Results: Findings from a Baseline Survey", *OECD Development Co-operation Working Papers*. [56]

OECD (forthcoming), *Using the SDGs as a Shared Framework for Results: Comparative Findings from Four Country Case Studies*, OECD Publishing. [78]

OECD Development Communication Network (DevCom) (n.d.), *The SDG Communicator: Stories and Advice to Engage Citizens for Sustainable Development*, https://sdg-communicator.org/ (accessed on 11 June 2020). [47]

OECD/DAC Network on Development Evaluation (2019), *Better Criteria for Better Evaluation: Revised Evaluation Criteria Definitions and Principles for Use*, OECD, http://www.oecd.org/dac/evaluation (accessed on 6 June 2020). [67]

OECD/UNDP (2019), *Making Development Co-operation More Effective: 2019 Progress Report*, OECD Publishing, Paris, https://dx.doi.org/10.1787/26f2638f-en. [2]

PARIS21 (2019), *Financing challenges for developing statistical systems: A review of financing options*, PARIS21 Discussion Paper, No. 14, https://paris21.org/sites/default/files/2019-01/Financing%20challenges%20for%20developing%20statistical%20systems%20%28DP14%29.pdf. [57]

Policy and Operations Evaluation Department (IOB) (2014), *Autonomy, partnership and beyond: A counterfactual analysis of policy coherence for Ghana*, Policy and Operations Evaluation Department (IOB), Ministry of Foreign Affairs of the Netherlands, http://www.oecd.org/derec/netherlands/Autonomy-partnership-and-beyond.pdf (accessed on 6 June 2020). [66]

Prime Minister's Office of Finland (n.d.), *Global responsibility and policy coherence*, https://kestavakehitys.fi/en/global-responsibility-and-policy-coherence (accessed on 8 September 2020). [24]

Rat für Nachhaltige Entwicklung (2020), *Stellungnahme des Rates für Nachhaltige Entwicklung zu einer wirksamen Verankerung von Nachhaltigkeit und Menschenrechten in globalen Lieferketten (Statement of the Council for Sustainable Development on the Effective Integration of Sustainability and Human Rights in Global Value Chains)*, https://www.nachhaltigkeitsrat.de/wp-content/uploads/2020/05/20200513_RNE-Stellungnahme_Nachhaltige_Lieferketten.pdf (accessed on 8 June 2020). [33]

Service public fédéral Affaires étrangères (Royaume de Belgique) (2018), *Beyond Chocolate*, https://diplomatie.belgium.be/fr/newsroom/nouvelles/2018/beyond_chocolate (accessed on 19 June 2020). [65]

Statistisches Bundesamt (2018), *Nachhaltige Entwicklung in Deutschland - Indikatorenbericht 2018 (Sustainable Development in Germany - Indicator report 2018)*, https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Nachhaltigkeitsindikatoren/Publikationen/_publikationen-innen-nachhaltigkeit-indikatorenbericht.html;jsessionid=DB80E444C5EB84C63C6EEDB89A170B40.internet8711 (accessed on 9 June 2020). [64]

Statskontoret (2014), *Sweden's Policy for Global Development. The Government's joint responsibility? (2014:1)*, http://www.statskontoret.se/In-English/publications/2014---summaries-of-publications/swedens-policy-for-global-development.-the-governments-joint-responsibility-20141/ (accessed on 19 June 2020). [29]

Steinemann, M. et al. (2019), *Evaluation der Strategie Nachhaltige Entwicklung 2016-2019 (Evaluation of the strategy for sustainable development 2016-2019)*, INFRAS, Zurich, https://www.are.admin.ch/are/de/home/nachhaltige-entwicklung/politik-und-strategie/strategie-nachhaltige-entwicklung-2016-2019.html (accessed on 7 June 2020). [26]

United Nations (2019), *United Nations and Sanrio Launch Strategic Collaboration to Promote the Sustainable Development Goals*, https://www.un.org/sustainabledevelopment/blog/2019/09/united-nations-and-sanrio-launch-strategic-collaboration-to-promote-the-sustainable-development-goals/ (accessed on 19 June 2020). [45]

US State Department (2020), *https://www.state.gov/integrated-country-strategies/*, https://www.state.gov/integrated-country-strategies/. [59]

Vähämäki, J. and C. Verger (2019), "Learning from Results-Based Management evaluations and reviews"*, OECD Development Co-operation Working Papers*, No. 53, OECD Publishing, Paris, https://dx.doi.org/10.1787/3fda0081-en. [54]

Weyzig, F. (2013), *Evaluation issues in financing for development Analysing effects of Dutch corporate tax policy on developing countries*, Policy and Operations Evaluation Department, Ministry of Foreign Affairs of the Netherlands, http://www.iob-evaluatie.nl (accessed on 6 June 2020). [63]

WHO/UNICEF (2020), *WHO-UNICEF Joint Monitoring Programme: Hygiene Baselines pre-COVID-19 - Global Snapshot*, https://washdata.org/sites/default/files/documents/reports/2020-05/JMP-2020-COVID-global-hygiene-snapshot.pdf (accessed on 10 June 2020). [97]

Zetter, R. et al. (2019), *Evaluation on Forced Displacement and Finnish Development Policy*, Ministry Foreign Affairs of Finland, http://formin.finland.fi/developmentpolicy/evaluations (accessed on 6 June 2020). [32]

Notes

[1] This paper was prepared by Alejandro Guerrero-Ruiz, Santhosh Persaud and Chantal Verger, under the strategic guidance of Rahul Malhotra, Head of Division, Reviews, Results, Evaluation and Development Innovation (RREDI) at the Development Co-operation Directorate (DCD).

It draws on the OECD DAC Peer Reviews conducted since 2015 and selected policy documents of DAC member countries, as well as on a series of case studies conducted by the DCD team with the support of the OECD/DAC Results Community members in Ethiopia, Kenya, Myanmar, Peru, Uganda and Samoa and monitoring data from the Global Partnership for Effective Development Co-operation.

This paper benefited from careful review by Mags Gaynor and John Egan of the DAC Peer Review team. Kadambote Sachin contributed with desk research and data analysis, and Katia Grosheva and Autumn Lynch edited the paper. The authors are very grateful for all the useful comments and suggestions. Any possible error remains the exclusive responsibility of the authors.

Last but not least, the OECD is also deeply grateful to the governments of Ethiopia, Kenya, Myanmar, Peru, Uganda and Samoa for their hospitality and engagement during the country case studies.

[2] The Development Assistance Committee (DAC) is an international forum of many of the largest providers of development co-operation. Its 30 members (with the exception of the European Union) are all OECD members. Some OECD member countries are not members of the DAC. This paper extensively draws upon findings from OECD DAC development co-operation peer reviews that DAC members undergo every 5–6 years.

[3] According to the updated tier classification for the Global SDG indicators developed by the Inter-agency and Expert Group on SDG Indicators, as of 17 April 2020, there are 115 Tier I indicators, 95 Tier II indicators and 2 indicators that have multiple tiers (different components of the indicator are classified into different tiers). There are 19 indicators with tiering pending a data availability review. The number of SDG indicators with an internationally established methodology therefore surged from 138 in 2016 to 210. The United Nations classifies SDG indicators as Tier I and II when they have clear definitions, metadata and data collection methods. Tier I indicators also meet an additional requirement related to widespread data availability collected on a regular basis. See https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/ for more information.

[4] These are SDG indicators 3b, 3c and 3d: indicator 3.b: 'Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all'. Indicator 3.c: 'Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States'. Indicator 3.d: 'Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.'

[5] In particular, as stated by the WHO/UNICEF Joint Monitoring Program, the international community '[does] not know the proportion of health care facilities in the world that have functional hand hygiene facilities with soap and water or hand sanitizer' (WHO/UNICEF, 2020[97]).

[6] The term 'partner-friendly' might be helpful to avoid confusion between the concepts of 'policy coherence for development, PCD' and 'policy coherence for sustainable development, PCSD'. PCD aims to ensure that internal and external policies of donors support the objectives of development co-operation. PCSD as the wider concept encompasses PCD: it aims for an integrated implementation of the 2030 Agenda, including by addressing transboundary impacts of policies that are likely to affect developing countries. For a definition of both terms, see the OECD Recommendation of the Council on Policy Coherence for Sustainable Development (OECD, 2019[1]).

[7] For a quick overview, the OECD has published profiles of institutional mechanisms for policy coherence to sustainable development (OECD, n.d.[16]).

[8] The MDGs also reflected partner-friendly policies such as environmental and climate change issues under MDG 7, and trade and support to agriculture under MDG 8.

[9] For instance, the entire European Union as well as individual Member States like the Czech Republic have reaffirmed their commitment in new development co-operation strategies (European Union, 2017[75]) (Ministry of Foreign Affairs of the Czech Republic, 2017[70]). New Zealand commits to apply a 'How will this affect the Pacific Islands region?'-filter for its domestic policies where appropriate (Government of New Zealand, 2018[72]).

[10] The need for greater awareness was highlighted in the development co-operation peer reviews of Australia, Austria, Czech Republic and the United States, while efforts to raise awareness were praised in the reviews of Luxembourg, Poland and Slovenia (OECD, 2018[93]) (OECD, 2020[92]) (OECD, 2016[91]) (OECD, 2016[11]) (OECD, 2017[84]) (OECD, 2017[17]) (OECD, 2017[82]).

[11] This includes the development co-operation peer reviews of Austria, Denmark, the European Union, France and Italy (OECD, 2020[92]) (OECD, 2016[90]) (OECD, 2018[89]) (OECD, 2018[87]) (OECD, 2019[44]).

[12] Trade-Related Aspects of Intellectual Property Rights.

[13] For instance, Denmark, Germany, Luxembourg, the Netherlands, Poland and Spain have recently introduced or are introducing a global development dimension in their regulatory impact assessments (OECD, 2017[81]) (OECD, 2018[80]) (OECD, 2019[79]), while Belgium and the EU already had such requirements before.

[14] Norway, Ireland and the Netherlands all assessed tax-related issues (Ngwenya, 2018[69]) (Department of Finance, 2015[77]) (Weyzig, 2013[63]), while Finland and the Netherlands undertook country-specific assessments (European Centre for Development Policy Management (ecdpm) and Economic and Social Research Foundation (ESRF), 2015[76]) (Policy and Operations Evaluation Department (IOB), 2014[66]). New Zealand commissioned a study to identify opportunities to make its policies more coherent with development in partner countries (Macintyre, Moore and Hendriks, 2014[71]).

[15] This is also in accordance with the 2012 OECD Recommendation of the Council on Regulatory Policy and Governance and forthcoming Best Practice Principles on International Regulatory Co-operation.

[16] For instance, reports from the Better Policies for Development series presented research on food security, illicit financial flows and green growth (OECD, 2013[68]) (OECD, 2014[95]) (OECD, 2015[94]).

[17] Denmark and Italy are examples (Government of Denmark, 2017[74]) (Government of Italy, 2017[73]).

[18] Interestingly, Germany has added a specific indicator that is partner-friendly: membership in the flagship 'Partnership for Sustainable Textiles' serves as a proxy indicator for responsible business conduct (Statistisches Bundesamt, 2018[64]).

[19] This includes the European Union that also publishes reporting from its member states, the Netherlands, Norway and Sweden (OECD, 2018[89]) (OECD, 2017[13]) (OECD, 2019[83]) (OECD, 2019[35]).

[20] In addition, an independent study assessed the implementation of Sweden's Policy for Global Development in 2016 (Fellesson and Román, 2016[27]).

[21] Defined as 'The compatibility of the intervention with other interventions in a country, sector or institution. Note: The extent to which other interventions (particularly policies) support or undermine the intervention, and vice versa. […]' (OECD/DAC Network on Development Evaluation, 2019[67]).

[22] For instance Finland and Germany.

[23] Ireland holds a regular national SDG stakeholder forum.

[24] This was, for instance, highlighted in the peer reviews of Austria, Italy, and Ireland (OECD, 2020[92]) (OECD, 2019[44]) (OECD, 2020[12]).

[25] Peer reviews of Luxembourg and Norway made specific recommendations in this regard (OECD, 2017[84]) (OECD, 2019[83]).

[26] These aspects were raised, for instance, in the peer reviews of Austria, the Czech Republic, Finland, Iceland and Slovenia (OECD, 2020[92]) (OECD, 2016[91]) (OECD, 2017[88]) (OECD, 2017[85]) (OECD, 2017[82]).

[27] Poland and Portugal have such focal points (OECD, 2017[17]) (OECD, 2015[37]).

[28] The potential to draw upon stakeholders was underlined in the peer reviews of the Czech Republic, Poland and the United States, as well as the evaluation of Norway (OECD, 2016[91]) (OECD, 2016[11]) (OECD, 2017[17]) (Fafo Research Foundation and Peace Research Institute Oslo (PRIO), 2018[28]). Norway created a new multi-stakeholder policy coherence forum (OECD, 2019[83]). Many other countries already have consultation mechanisms in place, for instance Finland, France, Italy and Luxembourg (OECD, 2017[88]) (OECD, 2018[87]) (OECD, 2019[44]) (OECD, 2017[84]).

[29] Peer reviews highlighted work on global value chains in the reviews of Germany and the Netherlands (OECD, 2015[86]) (OECD, 2017[13]). In 2018, Belgium launched a similar initiative in the chocolate sector (Service public fédéral Affaires étrangères (Royaume de Belgique), 2018[65]).

[30] For instance, in a recent paper, CONCORD stresses the need for an EU SDG strategy 'to make sure that the principle of sustainable development encompasses all policy sectors and that from a global perspective the EU's contribution is not limited to development cooperation' and makes suggestions in four policy areas (CONCORD, 2019[96]).

[31] Survey results for a sample of 49 bilateral and multilateral providers of development co-operation, covering all the development co-operation resources provided by OECD countries (OECD, Forthcoming[56]).

[32] The eleven OECD governments that have included the SDGs in their corporate results frameworks for development co-operation to a great extent are Canada, Finland, some entities in the German development co-operation system, Iceland, Israel, Luxembourg, the Netherlands, New Zealand, Spain and Switzerland, as well as the European Commission.

[33] The UN Inter-Agency and Expert Group on SDG Indicators considers that indicators are readily-usable when they count on good-quality methodologies and some level of data availability.

[34] Statistical analysis indicates that donors using the SDGs in their country strategy documents are, to a greater extent, also using integrated and cross-sector approaches in development co-operation planning and delivery (means test – t = 2.0755; df = 24.955; p-value = 0.048).

[35] We compared the observed behaviour of 109 development co-operation ministries and agencies operating in a variety of developing country contexts, including Bangladesh, Ethiopia, Kenya, Myanmar, Peru, Samoa and Uganda (OECD, 2019[3]; OECD, forthcoming[78]).

[36] Examples are the whole-of-mission strategies by Ireland such as in Vietnam, or the Fiji-Australia Vuvale Partnership.

[37] As discussed in an HLPF VNR lab on 17 July 2019: Bridging the policy-statistics gap: strengthening the use of data for evidence-based VNRs, https://sustainabledevelopment.un.org/index.php?page=view&type=20000&nr=6681&menu=2993

[38] For example, the collapse of a textile factory in Bangladesh in 2013 prompted Germany and the Netherlands to act more decisively on responsible business conduct in global textile value chains (OECD, 2015[86]) (OECD, 2017[13]).

4 Private sector resilience: The role of responsible business conduct in 'building back better' globally

Tihana Bule, OECD Directorate for Financial and Enterprise Affairs

The 2030 Agenda for Sustainable Development explicitly calls for robust private sector involvement. By implementing responsible business conduct (RBC) principles and standards, businesses can ensure that they are understanding and prioritising their most significant impacts on the people and the planet, domestically and internationally, and 'operationalising' the SDGs. This chapter provides an overview of RBC principles and standards and highlights efforts by governments, businesses, civil society and trade unions to ensure respect for human rights and protection of the environment in global supply chains. It also presents examples and recent efforts to measure RBC impacts throughout the global economy.

Understanding responsible business conduct

The 2030 Agenda for Sustainable Development, adopted in 2015 by all UN Member States, and the 17 Sustainable Development Goals (SDGs) represent a shared blueprint and a call to action for all countries and all stakeholders to end poverty, improve health and education, reduce inequality and spur economic growth, while tackling climate change and working to preserve oceans and forests. The 2030 Agenda explicitly recognises the important role of the private sector in this regard (see A/RES/70/1 calling 'upon all businesses to apply their creativity and innovation to solving sustainable development challenges'), as well as its critical role for delivering, financing and implementing the SDGs.

Implementation of responsible business conduct (RBC) principles and standards can help companies 'operationalise' the SDGs and to ensure that their most significant impacts on the people and the planet are prioritised. RBC means that all companies – regardless of their legal status, size, ownership or sector – should 1) make a positive contribution to the economic, environmental and social progress of the countries in which they operate and 2) avoid and address negative impacts of their activities, including in the supply chain and throughout business relationships.

These expectations are set out in international instruments and agreements, such as the OECD Guidelines for Multinational Enterprises, the UN Guiding Principles on Business and Human Rights the ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy and the fundamental ILO conventions (OECD/OHCHR/ILO, 2019[1]).[1] They are also prevalent throughout global value chains and are increasingly integrated into international trade and investment agreements and national development strategies, laws and regulations. Since RBC covers entire supply chain and business relationships, it is particularly relevant to consider in the context of understanding and addressing transboundary impacts on the SDGs in company operations.

Many businesses also find that responsible business is good business, beyond ensuring respect for human rights and compliance with relevant laws and regulations. A key element of RBC is risk-based due diligence, a process through which businesses can identify, prevent and mitigate their actual and potential negative impacts and account for how those impacts are addressed (see Box 4.1). Understanding risks material to business operations in a more comprehensive way – that is, beyond financial risks – can often lead to a competitive advantage.

RBC moves away from the historical understanding of corporate social responsibility (CSR), i.e. philanthropy as a basis for business interactions with society, and emphasises that environmental and social issues are not an add-on, but rather a core and material issue for business operations. In recent years, CSR has been increasingly used in a similar way to RBC and business and human rights (BHR) to describe this evolution.

From risk to resilience: RBC and COVID-19

The COVID-19 crisis has underlined the interdependence of the global markets and put into focus the extent to which business practices can have wide-reaching impacts beyond their operations.[2] 70% of international trade involve exchanges of raw materials, parts and components, services for businesses and capital goods that are used by firms to produce goods. A third of world production is undertaken by multinational enterprises, who account for half of world trade (OECD, 2020[2]).

The crisis has caused a major disruption and exposed significant vulnerabilities in supply chains, including related to disaster preparedness and supply chain continuity and resilience. In addition to the health impact, millions of companies and workers are at economic risk (OECD, 2020[3]), not to mention the impact that it has had on already vulnerable populations, such as migrant workers (IOM, 2020[4]). For example, ILO estimates that globally 91 million people were employed by the textile and garment sector in 2019, 55% of

which were women. In Asia-Pacific, that accounted for more than 5% of overall employment for women, making the sector the largest employer for women among all industrial sectors and the 4th largest overall (ILO, 2020[5]). It is estimated that COVID-19 has put 60 million workers around the world at economic risk, with up to $5.8 billion in wages lost due to cancelled orders and disruptions (Business and Human Rights Resource Centre, 2020[6]).

In this context, promoting the implementation of already agreed principles and standards, such as RBC instruments, can provide a framework for ensuring a balanced approach to COVID-19 recovery efforts that takes into account economic, environmental and social perspectives, while promoting a level playing field globally by avoiding conflicting requirements and extra compliance costs for businesses and removing inefficiencies for businesses operating across borders as many are already implementing RBC principles and standards.

It can also contribute to ensuring that progress already made on RBC is maintained. For example, ILO and UNICEF have estimated that the risk that children will end up in child labour has significantly increased and that the world could actually see an increase in child labour for the first time in 20 years (ILO/UNICEF, 2020[7]). UN DESA has already raised the alarm about the systemic risk of backtracking on social SDGs (as well as on temporary gains that have been made on certain SDGs, like improving air pollution and CO_2 emissions due to COVID-19) without immediate efforts to promote greater coherence and coordination, as well as a re-invigorated global partnership for development (UN DESA, 2020[8]).

WEntire supply chain efforts will be necessary to address COVID-19 impacts. Early evidence is already showing that responsible businesses are faring better and that more resilient production networks can be achieved through better risk management strategies at firm level, putting the emphasis on risk awareness, greater transparency in the value chain and promoting agility (OECD, 2020[9]).

Government support for an RBC approach will be essential for ensuring coherence between their own policies in response to the crisis and their expectations of how businesses should act. Governments should consider in the context of their recovery policies that many companies might not commit to an RBC approach of their own accord in their response to COVID-19, either because of a lack of incentive, capacity, resources or knowledge. This may be especially exacerbated in contexts where awareness of RBC is low.

From a business perspective, RBC can be a strategic orientation that can encourage a more systemic and dynamic crisis response, discourage a ‘go-at-it-alone’ position (Barry, 2020[10]) and bring short- and long-term benefits to the company as it designs its crisis response. For example, working out contingency plans with workers and suppliers may make more commercial sense than paying the price of disbanding large segments of a workforce that took years to build and train. Furthermore, information from supply chain due diligence (e.g. on the origin of raw materials and other traceability data) when overlaid with risks related to COVID-19 (such as infection rates, government restrictions and associated disruptions in production or distribution channels) can be used to understand short- and medium-term vulnerabilities in the supply chain, and support continuity planning to manage disruptions. Notably, it can also contribute to disaster preparedness and resilience overall, which is especially useful considering the risks of disruptions by climate change and transboundary impacts overall.

There are clear benefits to acting responsibly. RBC is not just about compliance or ‘doing no harm’. Understanding and addressing the impact that business operations can have on workers, communities and the environment can be transformative in itself. RBC instruments provide a clear and practical framework for businesses to act, including in contexts where systemic issues may be out of a company’s direct control.

Box 4.1. OECD instruments on responsible business conduct

The **OECD Guidelines for Multinational Enterprises** are the main OECD instrument on RBC. They cover all major areas where businesses can have an impact on the society and the planet, namely the disclosure of information, human rights, environment, employment and industrial relations, bribery, consumer interests, competition and taxation. To support their effective implementation, countries adhering to the OECD Guidelines are required to set up National Contact Points (NCPs). As part of their mandate, NCPs provide a mediation and conciliation platform to help to resolve cases (known as 'specific instances') of the alleged non-observance of the Guidelines.

The OECD recommends that businesses can know and show they are addressing their most significant environmental and social impacts through risk-based due diligence – a process through which businesses identify, prevent and mitigate their actual and potential negative impacts across all business operations and account for how those impacts are addressed over time. The **OECD Due Diligence Guidance for Responsible Business Conduct** adopted in 2018 explains how to do so in practice. The Guidance is relevant for all types of companies operating in all countries and all sectors of the economy. It has been adopted by all Governments adhering to the MNE Guidelines and was developed in close consultation with businesses, governments, civil society and trade unions. In addition, the OECD has developed **sector-specific due diligence guidance** for a range of sectors (minerals, agriculture, garment & footwear, extractives, financial sectors) to help companies address impacts in their operations.

Measuring RBC in the global economy: opportunities and challenges

Against this background, there has been a strong and increasing demand for more data and evidence on RBC in the global economy, including that related to the extent and degree of impacts in supply chains. However, the complexity and interconnectedness in the global markets presents a challenge for conventional statistics and accounting methods. For example, tracing the origins of a final product or even its components requires capturing statistics not only in the market where the product is 'consumed', but also all along its supply chain, a task that is beyond the scope of traditional survey and national accounting methods. Even having a complete picture of relatively basic information about activities of multinational enterprises and their affiliates or about the participation of smaller companies in the global market is not always straightforward.[3] Understanding environmental and social impacts in the context of this complexity is a separate and yet equally significant challenge.

In order to meet the demand for better data, governments, businesses, civil society, academia and advocacy groups have supported a wide set of organisations and researchers that have focused on measuring impact in the supply chain or business operations more generally over the last decade. For example, initiatives like the Global Reporting Initiative (GRI), International Integrated Reporting Council (IIRC), B-Lab, World Business Council for Sustainable Development (WBCSD), the Corporate Human Rights Benchmark, Shift Measurement Framework, Natural Capital Coalition, Sustainability Accounting Standards Board (SASB), UN Global Compact, and Principles for Responsible Investment (PRI) have all engaged a wide range of stakeholders in measurement and continuously improved and tested different methodologies (see (Shinwell, 2018[11]) and Section 2.1 for further details).

Empirical evidence has also been growing on the benefits of RBC for companies.[4] One particularly promising trend as featured in the 2019 *OECD Business and Finance Outlook* has been the demand on institutional investors to take environmental, social and governance factors into account in their decision-making. This is a powerful lever for changing behaviour in the market due to the influence of the financial

sector on companies, also including when it comes to changing behaviour across the whole supply chain. According to the PRI's Data Portal, more than 120 investors are already screening their investment portfolios against the UN Guiding Principles on Business and Human Rights and/or the OECD Guidelines for Multinational Enterprises. Additionally, investors are increasingly taking practical action, such as, for example, multiple statements filed in support of the Australian Modern Slavery Act in 2018[5] by investors representing over USD 4 trillion assets under management. Another example is the recent call on governments by a group of 105 international investors, representing over USD 5 trillion in assets under management, to put into place regulatory measures requiring companies to conduct and report on human rights due diligence.[6]

Furthermore, demand for RBC is also growing among clients. For example, in the United States, 80% of asset managers cited increasing client demand as their motivation for pursuing sustainability strategies (Calvert Investments, 2015[12]). Demand for responsible investment is especially strong among millennials. A 2017 EY survey suggests that millennial investors are twice as likely as others to invest in companies with ESG practices (EY, 2017[13]).

GA growing body of empirical evidence also suggests that investments which take RBC factors into account can add value and lead to higher risk-adjusted returns net of expenses. RBC factors appear to have, at best, a positive relationship with corporate financial performance and, at worst, a neutral relationship (OECD, 2017[14]). A recent study by PRI found that ESG-based portfolio strategies outperformed the MSCI World Index in active cumulative returns over a 10-year period by 16.8% and 11.2% depending on the strategy itself (PRI, 2018[15]).

The availability of such data is a powerful lever for promoting and enabling RBC across the globe. The section below describes three main areas of ongoing efforts to measure RBC impacts at the macro and sector levels and provides further information on how this is relevant for transboundary impacts on the SDGs. These areas include 1) tracing RBC impacts in the whole supply chain; 2) understanding the uptake, impact and effectiveness of RBC due diligence; and 3) efforts to monitor the implementation of RBC instruments and understanding the effectiveness of RBC policies.

Tracing impact from the perspective of the entire supply chain

Tracing environmental and social issues in the supply chain and having reliable global datasets that can be used to provide a bird's-eye view of the supply chain is a challenge, but certain RBC-related impacts in the supply chain can and have been measured. For example, the analysis of CO_2 emissions in the global economy has already been integrated into the OECD Trade in Value-Added (TiVA) database (e.g. CO_2 embodied in foreign demand).

Efforts to expand the use of Inter-Country Input Output (ICIO) tables beyond economic indicators are ongoing. Input-Output (IO) tables are commonly used by national statistical offices to describe the relationship between producers and consumers within an economy at an industry level. They account for final and intermediate goods and services, allowing statisticians to identify and isolate the direct and indirect impact of, for instance, a specific industry in the whole economy. Several initiatives at international level, including the OECD ICIO tables,[7] have aimed to expand these tables to also analyse interdependencies between countries.[8] These expanded datasets have provided researchers with tools to analyse several aspects of international trade and its impacts.

In 2019, the OECD – jointly with the International Labour Organization (ILO), the International Organization for Migration (IOM) and the United Nations Children's Fund (UNICEF) – used the ICIO and datasets from ILO, IOM and UNICEF to relate child labour, forced labour and human trafficking to the supply chain. The results are summarised in a report on *Ending child labour, forced labour and human trafficking in global supply chains*, elaborated under the aegis of Alliance 8.7 which was set up in 2016 to contribute to the implementation of SDG 8.

The report represents the first attempt by international organisations to measure these human rights abuses and violations in global supply chains. Using mixed datasets, the OECD, ILO, IOM and UNICEF combined and tested a methodology so far applied only for economic indicators and in a limited way for environmental indicators. This is the first time this method has been applied by international organisations in such a wide range of countries (see technical paper for full details (Alsamawi et al., 2019[16])).

The results offer an initial quantitative picture of the supply chain and reinforce that child labour, forced labour and human trafficking affect the whole of the global supply chain. They also provide a critical foundation for further data collection efforts aimed at generating a more granular picture of the extent, nature and location of these violations in global supply chains. Work is ongoing at the OECD to extend this methodology to other indicators where global datasets are available as part of the efforts by the Directorate for Financial and Enterprise Affairs (DAF) and the Directorate for Science, Technology and Innovation (STI) on RBC and the application of ICIO beyond the TiVA database. Work is also ongoing on several other approaches and methodologies. For example, the initiative by the OECD Statistics Department to measure impacts of businesses on people's well-being and sustainability using the OECD's Well-Being Framework is also relevant for RBC.

Strengthening the evidence base on the impact and effectiveness of due diligence

Another entry point for measurement efforts are sector-specific initiatives. As governments increasingly promote companies to carry out RBC due diligence to address their impacts on people, the planet and society, there is a corresponding need to establish a coherent and comparable global picture on the extent to which due diligence is being implemented by companies and the impact of those efforts within specific sectors, jurisdictions and across countries. While numerous benchmarks exist to measure and compare company practices, there lacks an authoritative, comprehensive, government-backed set of indicators for measuring and monitoring due diligence and their impacts. This information is necessary for developing meaningful capacity building and evaluating policy interventions over time (OECD, 2020[17]).

For example, the OECD recently examined risks prevalent in cobalt and copper sourcing from the Democratic Republic of the Congo (DRC). DRC consistently comprises over 60% of the global production of cobalt and is the 5th largest producer of copper in the world, thus playing an indispensable role in the upstream supply chain of these metals. It is estimated that between 18% and 30% of this production is artisanal and not large-scale production.[9]

Cobalt and copper both have several major industrial applications, including in aerospace, electronics, construction and industrial machinery industries. For example, cobalt is increasingly used in battery applications, including in portable devices (mobile phones and laptops), stationary applications (energy storage) and electric mobility (electric or hybrid vehicles and charging stations). Copper is also not only used in batteries, motors and wiring, but also in charging infrastructure. For example, an electric car contains four times more copper than a comparable internal combustion engine car (80 kg and 20 kg, respectively).

The research showed that significant gaps and challenges remain in due diligence and risk mitigation of adverse impacts by companies sourcing from the DRC and that the assumption that industrial and artisanal mining and refining are entirely distinct should be challenged. The report called upon copper and cobalt users to extend due diligence beyond child labour to include corruption and human rights risks associated with security forces (OECD, 2019[18]).

As illustrated by the above example, due diligence efforts and strategies can have a direct and transboundary impacts on several SDGs, from informal economy to transition to the green economy. Therefore, the uptake of due diligence is a critical question.

The OECD is working to contribute to filling these data gaps, starting with pilot projects in the minerals and garment sectors. A project to measure the global uptake of the OECD Due Diligence Guidance for

Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas was launched in 2019. In parallel, a monitoring and evaluation framework to measure the outcomes of the implementation of the guidance in mineral-producing countries is ongoing. Furthermore, a feasibility study on monitoring the uptake and impact of due diligence in the garment and footwear sector was also launched in 2019 (for complete information see the forthcoming OECD Annual Report on the OECD Guidelines for Multinational Enterprises 2019 (OECD, 2020[17])).

Although these efforts are in early stages, a set of common challenges and trade-offs have emerged and showcase how important it will be to carefully shape methodology decisions and balance objectives related to:

- Designing sampling approaches to be globally representative whilst facilitating a deeper understanding of priority sectors;
- Indicators that can capture trends to date while being sufficiently forward-looking to continue to capture novel trends and types of implementation;
- Building in flexibility and a broad thematic focus to capture existing secondary research data, while adding features or additional studies to examine specific interventions and implementation perspectives in more depth;
- Examining patterns and trends through multiple lenses based on geography, legislative framework, industry and supply chain segment and ownership structures.

Core targeted efforts are also being made in other sectors. For example, as part of the *RBC in the Financial Sector* project, the OECD is working with stakeholders to frame policies and laws dealing with ESG reporting and company performance in order to promote alignment around sustainable finance, also including alignment related to sustainability reporting frameworks and regulations. For example, GRI, the world's leading sustainability reporting framework, used by over 5,000 companies and the majority of S&P 500 companies, recently modified its universal reporting standards to integrate and align with the recommendations of the 2018 OECD Due Diligence Guidance for Responsible Business Conduct (GRI, 2020[19]). These reports will be crucial for more transparency and data. There have also been efforts at national level to promote better reporting. For example, the EU is currently updating the Directive on Non-Financial Reporting originally introduced in 2014. The discussion related to the revision of the Directive is underway, with strengthening due diligence reporting identified as a key requirement. Furthermore, in April of 2019, the European Parliament approved Regulation 2019/2088 on Sustainability-Related Disclosures in the Financial Services Sector ('Sustainable Finance Disclosures Regulation'). The Regulation introduces transparency rules for financial institutions involved in investment management on the integration of sustainability risks and impacts in their processes and financial products, including reporting on adherence to internationally recognised standards for due diligence, taking into account the guidance developed by the OECD.[10]

Supporting alignment in the market and gathering primary data

Governments and industry also rely on supply chain certification and other schemes on RBC for a wide variety purposes, including auditing common suppliers; to provide assurance on the environmental or social conditions associated with certain products; to support effective industrial relations in global supply chains; or to assess compliance of businesses with government policies on RBC. These schemes, which may be led by governments, industry or multi-stakeholder groups, play a critical role in supporting businesses to carry out due diligence for RBC, although they are currently fragmented, duplicative and lack coherence.

Various efforts are ongoing to support global coherence and mutual recognition of RBC-related initiatives and schemes in order to facilitate better outcomes. For example, the OECD has produced two Alignment Assessment tools[11] and a methodology[12] to promote coherence. In the minerals sector, pilot assessments

of five major industry programmes focusing on gold, tin, tantalum and tungsten[13] have been published. In the garment and foot wear sector, an assessment of the Sustainable Apparel Coalition's Higg Brand & Retail Module[14] as well as government-led multi-stakeholder initiatives in Germany and the Netherlands have also been undertaken.

This alignment process is having a major impact on market practice. For example, the metals schemes mentioned above cover more than 90% of global metal production. Further alignment is also being promoted through policy and law. For example, in 2019, the Commission Delegated Regulation on the recognition of industry schemes ((EU) 2019/429), part of the EU Regulation on Responsible Mineral Supply Chains (Regulation (EU) 2017/821), entered into force in April 2019 and enshrined into EU law the OECD alignment assessment methodology.

Finally, efforts are also being made to understand the challenges that businesses face with RBC due diligence in specific geographies. For example, as part of the EU-ILO-OECD *Responsible Supply Chains in Asia* programme, a pilot project was conducted with companies in Southeast Asia along the agricultural supply chain to promote collective learning and peer sharing.[15] The OECD and UNDP have also conducted a survey with Southeast Asian companies on practices and challenges with anti-corruption compliance and RBC, which shows that the practical implementation of due diligence remains a challenge.16 Less than half of respondents (46%) carried out assessments of environmental and social risks as part of a due diligence process on their direct suppliers and partners. This number falls to 19% beyond the first tier of suppliers and business partners. These examples and insight provide important data points for the uptake of due diligence in the region.

Monitoring implementation of instruments and understanding effectiveness of RBC policies

While RBC standards generally target business behaviour, governments have an important role to play in promoting these standards and supporting their effective implementation. This role includes creating an enabling policy and regulatory environment to drive, support and promote responsible business practices. It also implies that governments observe RBC standards in their role as economic actors (e.g. as buyers of goods, works and services and as owners of enterprises). Since RBC touches upon a range of policy areas, this has resulted in growing calls on governments to mainstream RBC across relevant policies to ensure coherence with the standards they have agreed to at international level, and issued at domestic level.

Countries that adhere to the OECD Council Recommendations related to the MNE Guidelines and due diligence guidance commit to promote the implementation of these tools by companies operating in or from their jurisdictions. This encompasses a wide range of activities and includes efforts by Adherents to organise educational events and outreach for businesses, internal efforts to promote policy coherence around RBC, and international engagement. The OECD supports Adherents with these efforts in a multitude of ways, with three areas particularly relevant for RBC and measurement, notably 1) maintaining a database and providing in-depth analysis of cases that are brought to the National Contact Points for the RBC grievance mechanism; 2) monitoring the adoption of the due diligence framework; 3) building evidence on the effectiveness of RBC policies.

Supporting National Contact Points

National Contact Points for Responsible Business Conduct (NCPs for RBC) are established by governments. Their mandate is twofold: to promote the OECD Guidelines for Multinational Enterprises, and related due diligence guidance, and to handle cases (referred to as 'specific instances') as a non-judicial grievance mechanism. To date, 49 governments have an NCP for RBC. NCPs provide a mediation and conciliation platform for helping to resolve cases (referred to as 'specific instances') relating to non-observance of the OECD Guidelines for Multinational Enterprises by companies.

Any individual or organisation with an interest in the matter can submit a case to an NCP regarding a company operating in or from the country of the NCP. NCPs have jurisdictional flexibility, which means they can consider issues that arise outside of the country they are based in and can also make decisions on which NCP should lead on a case. Specific instances are not legal cases and NCPs are not judicial bodies. As such, NCPs cannot impose sanctions, directly provide compensation nor compel parties to participate in a conciliation or mediation process. Dispute resolution through NCPs is intended to be consensual and focused on identifying constructive solutions and mutual agreement between parties.

NCPs have handled over 550 cases and considered issues arising in more than 100 countries and territories to date, including in Asia (29%), Europe (21%), Latin America and the Caribbean (21%) and Africa (18%). The OECD maintains a database of these cases. Between 2011 and 1 March 2021:

- Three most prevalent themes that specific instances have dealt with are human rights (58%), the general policies of the Guidelines (53%) and employment and industrial relations (39%).
- Primary submitters of specific instances are NGOs (40%), trade unions (27%) and individuals (25%).
- 42% of all concluded cases have resulted in an agreement.
- 30% of all concluded cases have resulted in a company policy change.
- Eight NCPs with the largest number of cases received are the United Kingdom, the United States, the Netherlands, Brazil, France, Germany. Chile and Switzerland. The top three NCPs received 25% of all cases.

Collective information about NCPs is also published in the Annual Report on the OECD Guidelines and the data is based on an annual questionnaire sent to all Adherent governments. Furthermore, NCP peer reviews also offer important qualitative data on the internal workings of an NCP and any barriers the NCP may face in realising its objectives, as well as achievements and good practices in discharging its functions.

Monitoring

The OECD Council Recommendations relating to due diligence guidance call on Adherent countries to 'regularly report on any dissemination and implementation activities' and also provide that NCPs should contribute to their dissemination and active use by enterprises.[17] In addition, the Investment Committee (together with partner committees, where appropriate) is instructed to report to the OECD Council on the implementation of these recommendations. Adherents have primarily addressed this mandate by participating in sector implementation programmes, meetings (fora and roundtables) and through participation in the Multi-Stakeholder Steering Groups or Advisory Groups for each of the sector initiatives (minerals, garment & footwear, agriculture and finance).

To broaden the collection of information on Adherents' activities, the OECD circulated an initial questionnaire to Adherents on the Recommendation on the OECD Due Diligence Guidance for Responsible Minerals Guidance in January 2018 and again in January 2019. The information collected has also been useful in shaping outreach and promotional activities, understanding new and developing regulatory measures and in gathering evidence for reporting on implementation to the OECD Council. In March 2020 the WPRBC approved a consolidated questionnaire to be circulated in September 2020 to collect information on Adherent activities for the five Recommendations relating to the due diligence guidance.

Deepening evidence on RBC policies

The OECD is also working on expanding and deepening qualitative and targeted evidence on the effectiveness of RBC polices through RBC policy reviews. Since 2014, 20 RBC policy reviews (standalone or integrated into other OECD reviews) have been undertaken or are in process (OECD, 2020[17]). These

reviews collectively represent a new body of work on how a focus on RBC can help governments maximise the benefits of investment in their economies and are also complemented by NCP Peer Reviews noted above. They also allow for building qualitative evidence in one emerging area which policy makers are dealing with in real time – understanding and measuring the interaction between economic, environmental and social impacts and understanding the cumulative picture of the impacts on the people, planet and society (see Box 4.2).

2019 saw a continuing trend to mainstream RBC expectations in various policy areas that have the potential to make a significant impact in the global markets, such as public procurement, trade and investment agreements, exports credits and state-owned enterprises.

The main take-away from this experience is the need to promote policy coherence at national and international levels for a global level playing field. Proliferation of uncoordinated policy measures at domestic level can create challenges for businesses operating globally and potentially undermine the effects of government action on RBC. Moreover, many governments may lack the resources and capacity to effectively integrate RBC across various policies and legislation that deal with business conduct. A further challenge is for governments to coordinate efforts in the promotion and implementation of different international standards on RBC, which are often the responsibility of a range of Ministries (Economy, Labour, Foreign Affairs, Justice, Environment, etc.). The UN Working Group on Business and Human Rights has cautioned that, while some governments have taken steps to enhance coherent policy with the aim of preventing business-related human rights abuses, in practice the lack of policy coherence is widespread and deeply concerning.[18]

Box 4.2. Complexity also extends to measuring interaction between economic, environmental and social impacts and understanding the cumulative picture

Policy makers deal with a complex calculus in promoting policy coherence on RBC. Take infrastructure as an example: the development of infrastructure is both an explicit SDG as well as a critical factor for achieving other SDGs. The needs for basic and other types of infrastructure are significant. The UN estimates that 2.3 billion people still do not have access to simple sanitation and almost 800 million lack access to water. In many parts of the world, digital infrastructure does not exist at all. 1.2 billion people do not have reliable phone service and just under 1 billion people lack access to electricity. Even where infrastructure does exist, economic losses from ageing assets and challenges related to financing and adapting them to be climate-compatible are significant challenges for governments. OECD estimates that, on average, USD 6.3 trillion is required annually until 2030 to meet infrastructure development needs globally. An additional USD 0.6 trillion/year will make these investments climate-compatible.

Financing infrastructure, however, is only one aspect of ensuring that socio-economic and sustainable development needs are met. Without a broad and balanced consideration of environmental, social and governance, along with economic criteria, infrastructure projects and the communities where they are being developed are under significant risk. For example, getting and keeping the social license to operate is often an underestimated and undervalued risk. (Inter-American Development Bank, 2017[20]) analysed 200 projects across six sectors in Latin America and the Caribbean that were strongly opposed by local communities and found that a lack of a multi-dimensional approach in project planning, design and delivery was seriously detrimental for companies, investors and national governments – 36 of the 200 projects were cancelled; 162 faced delays; and 116 faced cost overruns. The costs for communities are often even higher and more serious. Land-consuming industries (such as mining, agribusiness, oil, gas and coal and dam construction) remained deadliest for human rights defenders in 2018 according to the UN Special Rapporteur on the Situation of Human Rights Defenders. In addition, environmental impacts of concrete – a major input into infrastructure – are well-documented. Amongst materials, only coal, oil and gas are a greater source of greenhouse gases; and the mining of

sand, without which concrete cannot be made, is increasingly controlled by organised crime groups. Equally, there are governance challenges. (OECD, 2016[21]) Research shows that almost 60% of foreign bribery cases occurred in four sectors related to infrastructure – extractives (19%), construction (15%), transport and storage (15%). Transparency International estimates that corruption is a bigger problem in construction than mining, real estate, energy or the arms market.

The UN Office of the High Commissioner for Human Rights (2018[22]) has cautioned that without explicitly and systematically acknowledging and addressing the sustainability and human rights gap in infrastructure policy frameworks and practices, at best, the enormous potential of infrastructure as a facilitator for SDGs will not be realised, and, at worst, infrastructure development will actually undermine the SDGs.

Building back better will therefore need to include investments in data collection related to private sector environmental and social impacts, also including cooperation with the private sector to obtain that data. As experience shows, addressing entire supply chain issues with methods not fit for purpose is challenging not just from the point of view of good policy design, but also for businesses themselves. For example, data gaps, owing to the lack of regular child labour and forced labour national surveys in several countries, and the difficulty of generating detailed data on the prevalence of these phenomena in specific suppliers operating in the upstream segments of global supply chains, significantly limit the ability of stakeholders to prioritise areas or industries where action is most urgent (although it should be noted that these gaps should not be used as a reason not to undertake due diligence).

Further data collection efforts aimed at generating a more granular picture of the extent, nature and location of these (and other) phenomena in global supply chains are needed. Additional investments for countries to collect more timely and better disaggregated national data are of particular relevance. Continuing efforts to develop measurement tools and ensure sustainability of data collection on these issues are particularly welcomed to inform future research and action. The role of private sector data in official models should be explored. Additionally, starting to chip away at the complexity and trade-offs related to measuring how economic, environmental and social impacts interact and moving towards understanding the cumulative picture is another area of critical future work to help policy makers. Both macro and micro perspectives are valuable in this regard.

Particular attention will also need to be paid to how new and emerging policy areas impact measurement efforts. For example, the digital economy is not only affecting existing business models and the workplace itself, but also challenging the core understanding of what a ‘business’ actually is. Furthermore, while new digital tools can accelerate and enable businesses to act responsibly, the digital transformation can also lead to businesses causing or contributing to human rights and other social and environmental harm in new ways.[19] The potential for all these technologies to be a comprehensive source of RBC data is significant and requires continued exploration. Big data in particular deserves a mention as an under-tapped source of large and global datasets.

References

Alsamawi, A. et al. (2019), *Measuring child labour, forced labour and human trafficking in global supply chains: A global Input-Output approach.*, https://mneguidelines.oecd.org/Technical-paper-Measuring-child-labour-forced-labour-and-human-trafficking-in-global-supply-chains.pdf. [16]

Barry, M. (2020), "Shaping a sustainable post-Covid-19 world: five lessons for business", *Ethical Corporation*, http://www.ethicalcorp.com/shaping-sustainable-post-covid-19-world-five-lessons-business?utm_campaign=ETH%2003APR20%20Newsletter%20Database&utm_medium=email&utm_source=Eloqua&elqTrackId=bc93f1101bc74ea380a342a7df89e199&elq=bb2b08a80eec4e58a8067731b9238d61. [10]

Business and Human Rights Resource Centre (2020), *COVID-19 Apparel Action Tracker*, https://covid19.business-humanrights.org/en/tracker/. [6]

Calvert Investments (2015), *Perspectives on ESG Integration in Equity Investing: An opportunity to enhance long-term, risk-adjusted investment performance*, http://www.sustainablefinance.ch/upload/cms/user/201507_Calvert_PerspectivesOnESGIntegrationInEquit yInvesting.pdf. [12]

EY (2017), *Sustainable Investing: the millennial investor*, http://www.ey.com/Publication/vwLUAssets/eysustainable-investing-the-millennial-investor-gl/$FILE/ey-sustainable-investing-the-millennialinvestor.pdf. [13]

GRI (2020), *Review of GRI's Universal Standards (GRI 101, 102 and 103)*, https://www.globalreporting.org/standards/work-program-and-standards-review/review-of-gris-universal-standards/. [19]

ILO (2020), *COVID-19 and global supply chains: How the jobs crisis propagates across borders. Policy Brief*, https://www.ilo.org/global/research/policy-briefs/WCMS_749368/lang--en/index.htm. [5]

ILO/UNICEF (2020), *COVID-19 and Child Labour: A time of crisis, a time to act*, https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---ipec/documents/publication/wcms_747421.pdf. [7]

Inter-American Development Bank (2017), *Lessons from Four Decades of Infrastructure Project-Related Conflicts in Latin America and the Caribbean*, https://publications.iadb.org/handle/11319/8502#sthash.M7vhXdeL.dpuf. [20]

IOM (2020), *Covid-19 places migrant workers in highly vulnerable situations (26 March 2020)*. [4]

OECD (2020), *Annual Report on the OECD Guidelines for Multinational Enterprises 2019*, OECD Publishing. [17]

OECD (2020), *COVID-19 and Global Value Chains: Policy Options to Build More Resilient Production Networks*, https://read.oecd-ilibrary.org/view/?ref=134_134302-ocsbti4mh1&title=COVID-19-and-Global-Value-Chains-Chains-Policy-Options-to-Build-More-Resilient-Production-Networks (accessed on 3 June 2020). [9]

OECD (2020), *COVID-19 and Responsible Business Conduct (April 2020)*, https://read.oecd-ilibrary.org/view/?ref=129_129619-6upr496iui&title=COVID-19-and-Responsible-Business-Conduct. [3]

OECD (2020), *Trade Policy Implications of Global Value Chains, OECD Trade Policy Brief*, https://issuu.com/oecd.publishing/docs/trade_policy_implications_of_global. [2]

OECD (2019), *Interconnected supply chains: a comprehensive look at due diligence challenges and opportunities sourcing cobalt and copper from the Democratic Republic of the Congo*, http://mneguidelines.oecd.org/Interconnected-supply-chains-a-comprehensive-look-at-due-diligence-challenges-and-opportunities-sourcing-cobalt-and-copper-from-the-DRC.pdf. [18]

OECD (2019), *OECD Business and Finance Outlook 2019: Strengthening Trust in Business*, OECD Publishing, Paris, https://dx.doi.org/10.1787/af784794-en. [23]

OECD (2018), *Aid (ODA) disbursements to countries and regions*, http://dotstat.oecd.org/?lang=en (accessed on 10 March 2020). [24]

OECD (2017), *Investment Governance and the Integration of Environmental, Social and Governance Factors*, http://www.oecd.org/finance/Investment-Governance-Integration-ESG-Factors.pdf. [14]

OECD (2016), *OECD Foreign Bribery Report*, http://www.oecd.org/corruption/oecd-foreign-bribery-report-9789264226616-en.htm. [21]

OECD/OHCHR/ILO (2019), *Responsible Business: Key Messages From International Instruments*. [1]

PRI (2018), *Financial Performance of ESG Integration in US Investing*, http://www.unpri.org/download?ac=4218. [15]

Shinwell, M. (2018), *Measuring the impact of businesses on people's well-being and sustainability: Taking stock of existing frameworks and initiatives*, OECD Publishing. [11]

UN DESA (2020), *Achieving the SDGs through the COVID-19 response and recovery*, https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-78-achieving-the-sdgs-through-the-covid-19-response-and-recovery/. [8]

UN Office of the United Nations High Commissioner for Human Rights and Heinrich Böll Stiftung (2018), *The Other Infrastructure Gap: Sustainability: Human Rights and Environmental Dimensions*, https://www.ohchr.org/Documents/Publications/TheOtherInfrastructureGap_FullLength.pdf. [22]

Notes

[1] Additionally, a number of important initiatives such as the UN Global Compact, the Global Reporting Initiative and others have also been promoting the global implementation of RBC, building consensus among stakeholders to promote change in the global market.

[2] For example, 93% of natural rubber production – which is used in medical, automotive, manufacturing and consumer goods industries across the world – comes from Asia. Source: https://www.businesswire.com/news/home/20200427005431/en/South-East-Asia-RubberMarkets-2019-2020-Featuring .

[3] These challenges have been well documented. See, for example, 2018 OECD paper Multinational enterprises in the global economy: Heavily debated but hardly measured or the 2015 OECD paper on Measuring International Investment by Multinational Enterprises: Implementation of the OECD's Benchmark Definition of Foreign Direct Investment, 4th edition.

[4] For a summary of recent empirical evidence on the RBC and financial performance, see (OECD, 2018[24]). For more information about recent empirical evidence on investors see section 2.4 in (OECD, 2019[23]).

[5] The Act mandates that certain large businesses and other entities (with an annual turnover of AUSD 100 million or more) prepare annual Modern Slavery Statements which identify modern slavery risks in their supply chains and any actions taken to address those risks. The reporting guidance aligns with and makes reference to recommendations of the OECD Due Diligence Guidance for RBC.

[6] Investor Alliance for Human Rights (2020), *Investors with US$5 trillion call on governments to institute mandatory human rights due diligence measures for companies*, https://investorsforhumanrights.org/news/investor-case-for-mhrdd.

[7] More information on the OECD-ICIO, including methodology notes, is available at http://oe.cd/icio .

[8] Other examples of currently available ICIO databases include: EORA, EXIOBASE, IDE-JETRO and WIOD. Each of these tables has a different time series, industry details and country coverage.

[9] The discrepancy stems from the degree of informality in artisanal production, which makes it difficult to measure the exact number of workers and the mobility of workers.

[10] The Regulation notes that when reporting on due diligence, practitioners 'should consider the due diligence guidance for responsible business conduct developed by the Organisation for Economic Cooperation and Development.' Official Journal of the European Union (2019), *REGULATION (EU) 2019/2088 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 November 2019 on sustainability-related disclosures in the financial services sector*, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R2088&rid=1.

[11] Both tools are available online: minerals and garment and footwear.

[12] The methodology is available online in English and French.

[13] See 2018 Alignment Assessment of Industry Programmes with the OECD Minerals Guidance, https://mneguidelines.oecd.org/Alignment-assessment-of-industry-programmes-with-the-OECD-minerals-guidance.pdf.

[14] OECD Pilot alignment assessment report garment and footwear: https://mneguidelines.oecd.org/alignment-assessment-garment-footwear.htm.

[15] For more information on pilot projects in the agriculture sector, see OECD-FAO *Global Pilot on Responsible Agricultural Supply Chains* in 2019 (see baseline and final reports).

[16] For more information, see results at http://www.oecd.org/daf/anti-bribery/anti-corruption-business-integrity-southeast-asia.htm .

[17] For example, the 2018 Recommendation of the Council on the Due Diligence Guidance for Responsible Business Conduct recommends 'that Adherents and where relevant their NCPs, with the support of the OECD Secretariat, ensure the widest possible dissemination of the Guidance and its active use by enterprises, as well as promote the use of the Guidance as a resource for stakeholders such as industry associations, trade unions, civil society organisations, multi-stakeholder initiatives, and sector-initiatives, and regularly report to the Investment Committee on any monitoring, dissemination and implementation activities.

[18] UN Working Group on the issue of human rights and transnational corporations and other business enterprises, Report to the UN General Assembly, A/74/198, 19 July 2019, paras. 1-2, https://undocs.org/en/A/74/198.

[19] For more information on RBC and the digital economy, see https://mneguidelines.oecd.org/rbc-and-digitalisation.htm.

5 Measuring transboundary impacts in the 2030 Agenda: Conceptual approach and operationalisation

Michal Shinwell and Junya Ino,
OECD Statistics and Data Directorate

In order to reach the SDG targets globally, it is imperative to consider how the actions of one country can affect others, and in doing so contribute to or detract from the effort to reach the targets. This chapter presents a conceptual approach for measuring transboundary impacts using five flows: finance, people, trade, knowledge and environmental flows. This approach provides a framework to assess transboundary impacts of countries in the context of the SDGs. The conceptual approach in this chapter is operationalised by a limited set of indicators, demonstrating how it can be used for assessing transboundary impacts at national, regional or global level.

Measuring and monitoring progress on the SDGs has advanced since the adoption of the Agenda in 2015, with the development of the *UN IAEG-SDGs Global SDG Indicator Framework*[1], as well as many national measurement frameworks. The OECD has also assisted member countries in their implementation of the SDGs and in navigating its data landscape through the report (OECD, 2019[1]), which included a preliminary assessment of the transboundary aspects of the SDGs. However, within both national and international measurement frameworks for SDGs, measurement is primarily focused on domestic performance and indicators. However, questions on the impacts that countries have outside of their borders must be addressed to achieve the SDGs globally.

This paper explores the conceptual framing and measurement of transboundary impacts across borders in the context of the 2030 Agenda[2]. It starts with defining transboundary impacts and exploring different approaches and indicators used for measuring these. Next, we propose an approach for measuring transboundary impacts using five types of flows. Finally, we describe these five flows using data for each of them to explore global transboundary dynamics. We conclude by outlining some possible next steps and issues to be addressed in the future.

Defining and measuring transboundary impacts in the context of the SDGs

Transboundary impacts can be defined as the impacts of one country beyond their borders on (i) other countries and (ii) global common goods. These impacts can be both bilateral (from one country to another) and multilateral (from one country to many others); they can affect both private goods as well as public goods and global commons. They can result from deliberate actions having an explicit transboundary objective, such as Official Development Assistance (ODA), but also from domestically focused policies and circumstances unrelated to direct policies. For example, a country with high forest coverage will be positively affecting several global public goods and commons, such as biodiversity and the mitigation of climate change.

Both global commons and global public goods are terms which have been described in economic literature (International Task Force on Global Public Goods, 2006[2]). Global commons are those parts of the planet that fall outside national jurisdictions and to which all nations have access, such as oceans and the climate system (UN DESA & UNEP, 2013[3]; UN Statistics Division, 1997[4]), whereas global common goods, which are also non-jurisdictional, are also subtractive and depletable, such as fisheries, forests and lands. Public goods, which are generally non-rivalrous (i.e. they are not diminished by other people's consumption) and non-excludable (no one can be excluded from benefitting from them), can also cross borders, such as cultural goods and knowledge.

In the context of the SDGs, transboundary impacts are important in at least two different ways. On the one hand, countries can contribute to global achievement of the 2030 Agenda outside their borders, whether directly through funds and resources such as Official Development Assistance, or indirectly by minimising their negative impacts on global goods such as climate. On the other hand, countries can negatively impact on the ability of other countries to achieve the 2030 Agenda, such as by placing additional strain on the environment resources of other countries through increased consumption of their natural resources.

While many of the SDG targets focus on domestic measures such as reducing poverty (Goal 1), improving access to clean water (Goal 6) and raising educational attainment (Goal 4), the 2030 Agenda also includes international commitments, with at least 24 of the 169 targets referring to the transfer of resources to, or capacity building in, developing countries, and several of the goals relating to global goods such as climate (Goal 13), oceans (Goal 14) and sustainable production (Goal 12).

Within the 2030 Agenda, global commons are mostly concentrated under goals relating to sustainable production and consumption, climate change, oceans and biodiversity (Goals 12 to 15). While these goals focus on domestic policies and outcomes such as the consumption or protection of natural resources, they

also pertain to transboundary impacts on these global commons and public goods. For example, while targets under Goal 15 relate to the protection and conservation of ecosystems and endangered species, deforestation, degradation and desertification within national borders, taking action on these will have an impact on the global public goods related to biodiversity, ecosystems and climate change.

In addition to these environmental global goods, the 2030 Agenda addresses global goods through international agreements and other forms of cooperation on peace and security (addressed in Goal 16). Similarly, countries' contributions to the total sum of human knowledge, such as through investment in research and development, education and skills, form part of the global commons that people can enjoy worldwide.

International cooperation and action play a direct and central role in achieving the SDGs globally. Goal 17 addresses partnerships for sustainable development, with emphasis on official development assistance and capacity-building. In addition to Goal 17, 62 of the 169 targets that underpin the SDGs are identified as 'means of implementation' targets, with 19 of these in Goal 17, and another 43 spread through Goals 1 to 16. These targets often emphasise the relationships between countries and their shared responsibility for achieving sustainable development, especially in less developed countries. Thus, particularly when viewed from an OECD country perspective, actions taken to achieve many of these targets are transboundary in nature.

Measurement of transboundary impacts

The question of how to measure transboundary impacts comprehensively, rather than on a particular issue, has yet to be addressed in practice. However, several studies have set some foundations, both in general as well as within the context of the SDGs. These initiatives and country experiences vary conceptually and in their scope – both in terms of the countries and in the issues covered – as well as in the methodology used for measuring transboundary effects. Most of these initiatives consider how transboundary effects contribute to sustainable development in a broad sense, or within an SDG context but only from the perspective of a single country.

Measuring transboundary impacts can help countries enhance policy coherence, which presents a major challenge for SDG implementation (OECD, 2019[5]). Developing meaningful collaboration and coordinated action across both policy sectors and different levels of government with the aim of achieving the 2030 Agenda also requires understanding the impacts of policy actions and development patterns outside country borders. Policy coherence also means balancing short-term priorities with long-term sustainability objectives, and taking into account the impact of domestic policies on global well-being outcomes. Thus, developing a comprehensive framework for measuring these transboundary impacts is essential for policy coherence for sustainable development, and is indeed mandated by SDG Target 17.14.

Ideally, a comprehensive global model should be used to identify the impacts of countries' actions and policies 'elsewhere'. Such a model would need to identify, attribute and isolate drivers, barriers and impacts across borders. Additionally, it would cover the full range of economic, social and environmental outcomes as prescribed in the 2030 Agenda. At a practical level, the scope of existing efforts to measure impacts beyond national borders is much more limited. National statistical systems primarily focus on what happens *within* national borders, and their measurement of transboundary phenomena such as trade or migration is mainly directed towards measuring the size of the in/outflows, rather than their impacts.

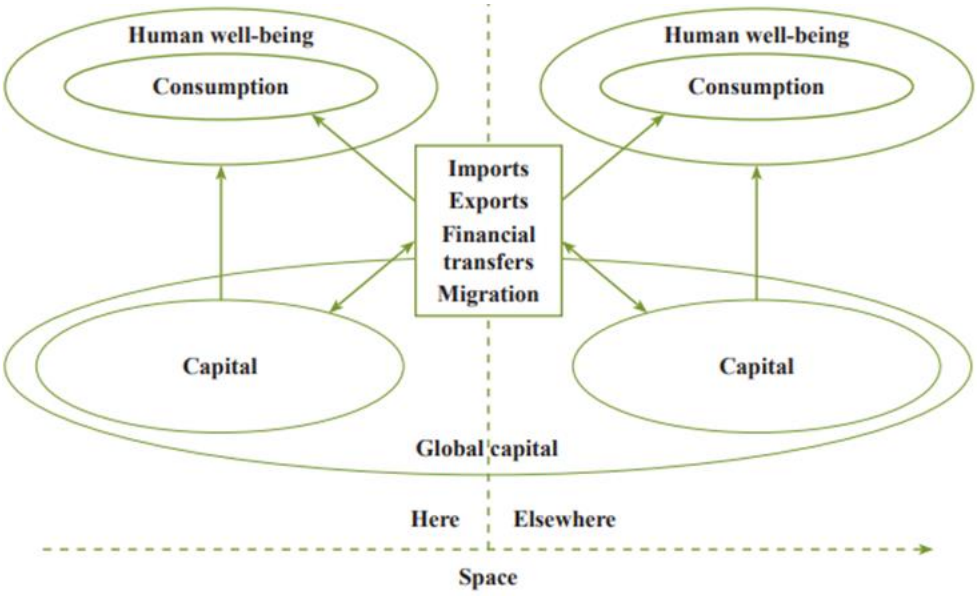
Nonetheless, there are several useful tools and data frameworks for measuring transboundary effects and global phenomena. Inter-country input-output (ICIO) tables are useful sources for assessing direct and indirect impacts of trade flows, as they describe the sale and purchase relationships between producers and consumers, showing flows of final and intermediate goods and services[3] defined according to industry outputs (industry by industry tables) or according to product outputs (product by product tables). The ICIO

tables underpin the Trade in Value Added (TiVA, (OECD[6])) data, which record the value added embedded in the production of goods and services produced in a country and consumed elsewhere. ICIO tables are also used to assess the demand-based CO_2 emissions of each country, meaning the CO_2 embodied in its final demand, wherever the CO_2 was emitted along the production chain (Wiebe and Yamano, 2016[7]). Demand-based CO_2 is one of several 'footprint' indicators, popularised in the field of environmental performance, which assess the environmental impact of human activity. Recent novel applications of footprint indicators have also been made to assess the social impacts of trade activities, such as income inequalities and employment (Alsamawi et al., 2017[8]). A similar approach using ICIO tables to assess social impacts across global value chains is adopted in a recent report assessing the prevalence of child labour, forced labour and human trafficking in global value chains (ILO et al., 2019[9]). Other indicators on the trade environment nexus include: trade flows in environmental goods and services; flows on raw materials; support for fossil fuel and renewable energy; and nutrient balance of exported grains (Garsous, 2019[10]). Input-output tables have also been used in several applications of network analysis to show the complexities of global value chains (Giammetti, Russo and Gallegati, 2020[11]).

Different approaches to measuring transboundary impacts

A few interesting works and approaches to measuring the impacts that countries have outside of their borders have been developed in recent years. The **UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development** (TFSD), which was convened by the Conference of European Statisticians, developed a conceptual framework for measuring sustainable development (UNECE, OECD, ESTAT, 2013[12]) based upon three dimensions of sustainable development: 'here and now', i.e. the well-being of the present generation in one particular place; 'later', i.e. the well-being of future generations; and 'elsewhere', i.e. the well-being of people in other places. The TFSD approach suggested measuring transboundary impacts by identifying the mechanisms by which these impacts occur. It identified four important channels through which countries affect the rest of the world: financial transfers, imports/exports of goods and services, migration of people and transfer of knowledge. Figure 5.1illustrates the interaction between the two dimensions of 'here' and 'elsewhere', with the different types of flows (at the centre of the diagram) affecting both human well-being and the capital resources of other countries.

Figure 5.1. TFSD diagram of sustainable development 'here' and 'elsewhere'



Source: UNECE, OECD, ESTAT, Conference of European Statisticians Recommendations on Measuring Sustainable Development, 2013 (UNECE, OECD, ESTAT, 2013[12]).

The TFSD conceptual framework for measuring sustainable development included several suggestions of possible indicators, although these indicators were not included in the report. The TFSD framework has not been operationalised comprehensively, but several countries have used it in the development of their own frameworks for measuring sustainable development (OECD, 2017[13]). In the Netherlands, the *Monitor on Well-being and SDGs* covers the three dimensions recommended by the TFSD: here and now, elsewhere and later, and includes measures of sustainability performance in each of these areas. In Finland, the *Development Policy Committee* supports policy-making in sectors that impact developing countries. In Switzerland, the *Guidelines on Sustainability Policy* used in the Swiss Sustainable Development Strategy 2016–2019 explicitly state that economic, social and environmental impacts should be considered in both domestic and foreign policy proposals. In Belgium in the *Complementary Indicators to GDP* (Belgium Federal Planning Bureau, 2018[14]) and most recently New Zealand, in the *Indicators Aotearoa New Zealand* (Statistics New Zealand, 2019[15]) also include indicators relating to the 'elsewhere' dimension.

In addition to NSOs, several other initiatives have contributed to measuring transboundary impacts. The **SDG Index and Dashboards Report** (Sachs et al., 2019[16]), which assesses countries' performance on SDGs, includes a segment on global responsibilities and international spillovers, which is composed of 10 indicators linked to transboundary effects, six of which are trade/consumption-related. Some attempts have also been made to rank or measure countries' impacts on and performance in other countries or their contribution to common global goods. The Center for Global Development publishes the **Commitment to Development Index** (Center For Global Development, 2018[17]) with the goal of capturing the actions of most developed countries, aimed at promoting and aiding developing countries. The index covers seven dimensions: aid, finance, technology, environment, trade security and migration. It ranks 27 countries, using over 100 indicators. The **Good Country Index** aims 'to measure what each country on earth contributes to the common good of humanity, and what it takes away' (Anholt, 2020[18]). The index includes 35 indicators across a range of seven dimensions: Science & Technology, Culture, International Peace & Security, World Order, Planet & Climate, Prosperity & Equality and Health & Wellbeing. Conversely, the **Global Peace Index**, published by the Institute for Economics and Peace, ranks countries according to their level of 'peacefulness', considering both internal and external impacts on peace, across three domains: ongoing domestic and international conflict, societal safety, and security and militarisation. These are measured by 23 indicators, normalised on a scale of 1 to 5.

Table 5.1presents the indicators used in these various frameworks, with the indicators that repeat across frameworks identified in italics. Common indicators include: Official Development Assistance (financial flow), greenhouse gas emissions (environmental flow), Foreign Direct Investment (financial flow), imports from developing countries (trade flow), refugees (movement of people) and imports of energy and mineral resources (trade & environmental flows).

Table 5.1. Transboundary indicators included in different frameworks

Belgium Complementary Indicators to GDP	Netherlands Monitor of Well-being and SDGs	Indicators Aotearoa New Zealand	TFSD	SDG Index 2019	Commitment to Development Index	Good Country Index
Official Development Assistance	Biomass imports from LDCS	Consumption of net greenhouse gas emissions	Official Development Assistance	Imported groundwater depletion	Aid: Aid Quantity - Official Development Assistance, Aid Quality	Science & Technology: International students, Journal exports, International publications, Nobel prizes, Patents
Domestic material consumption	Metal imports from LDCs	Official Development Assistance	Imports from developing countries	Fatal work-related accidents embodied in imports	Finance: Investment, Financial Secrecy	Culture: Creative goods exports, Creative services exports, UNESCO dues in arrears as % of contribution, Freedom of movement, i.e. visa restrictions, Press freedom
Primary energy consumption	Non-metallic mineral *imports from LDC*	Remittances to other countries	Migration of human capital	Imported SO2 emissions	Technology: Government support to R&D, Intellectual property rights	International Peace and Security: Peacekeeping troops, Dues in arrears to UN peace keeping budgets, International violent conflict, Arms exports, Internet security
Greenhouse gas emissions	Fossil imports from LDC	International investment position	Land footprint (foreign part)	Net imported emissions of reactive nitrogen	Environment: Global climate, Sustainable fisheries, Biodiversity & global ecosystems	World Order: Charity giving, *Refugees hosted*, *Refugees generated*, Birth rate, UN Treaties signed
	Biomass imports	Foreign direct investment	Water footprint (foreign part)	Imported CO2 emissions, technology-adjusted	Trade: Lower income weighted tariffs, Agricultural subsidies, Services trade restrictions (STRI), Logistics performance	Planet and Climate: *Ecological footprint*, Environmental agreements compliance, Hazardous pesticides exports, Renewable energy share, Ozone
	Fossil imports	Net migration by skill type	Carbon footprint (foreign part)	Imported biodiversity threats	Security: Contributions to peacekeeping, Arms exports, Participation in security regimes	Prosperity and Equality: Open trading, UN volunteers abroad, Remittance Cost, *FDI outflows*, *Development assistance*
	Metal imports	Net greenhouse gas emissions	Imports of energy resources	Transfers of major conventional weapons (exports)	Migration: International conventions, Integration policies, *Share of asylum seekers*, *Share of refugees*, Foreign students	Health and Wellbeing: Food aid, Pharmaceutical exports, Voluntary excess donations to the WHO, Humanitarian aid donations, International Health Regulations Compliance
	No-metallic mineral imports	Export of waste (net and gross)	Imports of mineral resources	International concessional public finance,		

Belgium Complementary Indicators to GDP	Netherlands Monitor of Well-being and SDGs	Indicators Aotearoa New Zealand	TFSD	SDG Index 2019	Commitment to Development Index	Good Country Index
			(excluding coal and peat)	including *official development assistance*		
	Private transfers		Contribution to international institutions	Tax Haven Score		
	Official Development Assistance (% GNI)		Exports of physical capital	Financial Secrecy Score		
	Total imports from LDC		Exports of knowledge capital			
			Foreign Direct Investment (FDI)			

Source: (Statistics New Zealand, 2019[15]; Statistics Netherlands, 2017[19]; Belgium Federal Planning Bureau, 2018[14]; Sachs et al., 2019[16]; UNECE, OECD, ESTAT, 2013[12]; Center For Global Development, 2018[17]; Anholt, 2020[18]).

Describing flows as transboundary mechanisms

Building on the TFSD's approach, this paper proposes framing the measurement of transboundary impacts using flows, which act as the conduits to the impacts borne outside country borders. The flows are expanded beyond the TFSD to include financial flows, trade flows, knowledge transfers, movement of people and environmental flows, including pollution, waste and natural resources. These flows are all channels by which countries are connected to each other, and can impact on other countries' well-being outcomes or capital resources. The flows are not mutually exclusive, so that a flow of goods can be accompanied by financial and environmental flows, and a movement of people can also imply movement of knowledge and finance, etc. A description of the flows and of the ways in which these affect other countries or global public goods follows.

Financial flows

The movement of financial resources and investments beyond borders are key drivers of global economic growth. Moving financial resources beyond national borders provides investment opportunities to domestic investors, whilst also complementing domestic savings in recipient countries. Developed countries can also assist developing countries through ODA, as well as through flows from different sources, such as philanthropy.

The 2015 Addis Ababa Action Agenda (United Nations, 2015[20]) provides the framework for financing sustainable development, identifying different financial flows from philanthropic foundations, public agencies (ODA and OOF), households (remittances) and the private sector (e.g. FDI). In 2016, these cross-border financial flows to developing countries totalled USD 1.7 trillion, more than a third of the amount collected locally in developing countries through domestic taxation (USD 4.3 trillion) (OECD, 2018[21]). ODA from the 30 members of the OECD's Development Assistance Committee (DAC) totalled USD 153.0 billion in 2018 (less than one tenth of the total value of these financial flows), down 2.7% from 2017 (OECD, 2019[22]). However, financial flows, even when well-intended can have negative outcomes, such as in the case of recipient countries with poor governance structures which receive financial assistance, which can then be misused and exploited. Financial flows can also drive changes in the

exchange rate which will be harmful to importing or exporting industries, depending on the direction of change.

Transboundary financial flows can eventually be detrimental to the sustainable economic development of poorer developing countries, for example when differences in tax regimes and the inadequate recording of trade flows enable tax evasion and generate flows to tax havens. The OECD's Inclusive Framework on Base Erosion and Profit Shifting brings together more than 135 countries cooperating to tackle tax avoidance, improve the coherence of international tax rules and ensure a more transparent tax environment (OECD, 2019[23]). Similarly, illicit financial flows, which can stem from corruption, crime and terrorism, are transboundary flows that use channels ranging from cash smuggling and remittance transfers to trade finance and shell companies, and which extract important resources from developing countries. These harmful financial flows require international cooperation, such as the BEPS programme, in order to limit their negative impacts on countries.

Movement of people

People move beyond national borders for many reasons, whether in the hopes of bettering their lives, family reunification, or due to disasters, conflicts and threats in their home country. When moving, people take with them their accumulated economic, social and human capital, in the form of their financial resources, knowledge, ideas and culture (Bernstein et al., 2018[24]; Abramitzky and Boustan, 2017[25]; Borjas, 1994[26]). In 2018, permanent migration flows to OECD countries amounted to approximately 5.3 million[4], according to preliminary data, 2% more than in 2017 (OECD, 2019[27]). Whilst migration, when well-managed, can bring economic and cultural benefits in destination countries to migrants and non-migrants alike (OECD, 2014[28]), it can also present challenges in terms of integration in host countries. Migration can also have a significant impact on the development of origin countries, both positively and negatively, through remittances, cultural exports and other risks and opportunities linked to a diaspora (Nurse, 2005[29]).

People also move across borders for temporary visits, for business or leisure. Even during short term visits, people rely on and consume local resources, and are exposed to new and different experiences, raising awareness of environmental and cultural values. Indeed, in some countries tourism is a central driver for the economy. The sector directly contributes 4.4% of GDP, 6.9% of employment and 21.5% of service exports in OECD countries, and OECD countries account for more than half of global arrivals (OECD, 2020[30]). The tourism sector accounts for an even larger share of domestic production in several developing counties. However, tourism can also drive extraction and exploitation of local resources and services, and over-use can cause deterioration and indeed destruction of the very things which draw tourism in the first place. Enhancing countries' commitments to promoting sustainable and inclusive tourism, as acknowledged in the 2017 OECD Policy Statement on Tourism Policies for Sustainable and Inclusive Growth, is important alongside the long-term rise in international tourism.

Human trafficking is a harmful form of transboundary movement of people across borders. More than 20.9 million people around the world are estimated to be victims of forced labour, generating an estimated USD 150 billion per year of illegal profits in the private economy worldwide (ILO, 2020[31]). Two thirds of these are trafficked across borders. Human trafficking is often linked to organised crime and corruption, and tackling it requires cross-border coordination and cooperation.

Trade flows

The trade of goods and services across borders drives GDP growth and economic opportunities worldwide, but also has an impact throughout the global value chain. Many benefits are associated with trade: more open economies often grow faster than relatively closed economies, and salaries and working conditions are generally better in companies that trade across borders than in those that do not (OECD[32]). In turn, economies that grow through trade generate higher domestic demand, which drives production of goods

and services worldwide. This domestic production relies on local resources that can include produced and natural capital, as well as labour, human and social capital. Thus, the consumption of imported goods and services in one country can affect other countries' via employment, employment conditions (be they better or worse than local alternatives), the depletion of natural resources, investment in produced capital and other economic and social impacts.

Whilst countries are increasingly engaged in Global Value Chains (GVCs), their impact on wage inequality is inconclusive, and in some analyses appears to be relatively marginal in reduced wage inequality for low-skilled segments of the labour force (Lopez Gonzalez, Kowalski and Achard, 2015[33]). The impact of openness of the economy on the population depends on the domestic institutions and the economy's capacity to take advantage of opportunities, and to fairly distribute the benefits. For example, high reliance on exports of natural resources coupled with weak institutions (the 'resource curse') can result in poorer outcomes relative to countries at the same level of development but with few natural resources (Havro and Santiso, 2008[34]).

Environmental transboundary flows

It is often said that nature knows no borders; animals and plants do not respect border controls, and likewise water, air pollution and the climate. Environmental flows across borders include the depletion of natural resources, flows of pollution and waste and trade in environmental goods and services. It is also useful to differentiate between flows affecting global goods (such as CO_2 emissions accumulating globally whose impacts affect all countries worldwide) versus local goods (such as local air pollution, due to small particles) (Brunekreef, 2010[35]; Amann, Klimont and Wagner, 2013[36]). For instance, electricity production based on fossil fuels, even if produced and consumed locally, emits greenhouse gasses that exacerbate climate change, a global challenge. Local pollution can also cross borders, such as sulphur emissions or PM2.5 transported across borders in Asia and elsewhere (JAXA Earth Observation Research Center (EORC), 2014[37]).

Another channel for the environmental impacts of countries outside their national borders is through trade in goods produced elsewhere, and may drive natural resource depletion or pollution. Measures of material footprint show that wealthier countries tend to reduce their domestic materials extraction through international trade, while increasing the overall volume of their material consumption (Wiedmann et al., 2015[38]). Indeed, the use of global materials is projected to more than double from 79 Gt in 2011 to 167 Gt in 2060, even whilst material intensity (material used per unit of economic production) is on the decline (OECD, 2019[39]).

Biodiversity (the 'variability among living organisms from all sources, …, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems', as defined by the 1992 UN Convention on Biological Diversity) is a global public good, as some ecosystem services benefit people and communities beyond country borders (e.g. through carbon sequestration, clean water and genetic resources (CBD, 1992[40]). Transboundary impacts on biodiversity can be location-dependent, such as shared waters affected by overuse and pollution, or transboundary in the sense that they affect a global public good such as the existence of diverse species.

Trade in environmental goods and services, as well as in waste and scrap, are also channels for transboundary environmental impacts. OECD countries tend to export more waste than they import, with increasing domestic restrictions on landfilling driving exports. While transboundary movements of waste and scrap can be detrimental to the environment of importing countries (depending primarily on how these are then treated), this trade can also be beneficial for these countries, both financially as well as for expanding environmental infrastructure and technological capabilities.

Knowledge transfers

The movement of knowledge and ideas across borders predates globalisation and nation states and is indeed a fundamental part of human history. Modernisation has made this movement faster and easier through communication technologies and open resources, but has also seen the institutional protection of created knowledge in the form of intellectual property rights. Knowledge shares the features of a public good as it is undiminished by consumption, and low transaction costs often mean that dissemination is easy (Arrow, 1962[41]). Now more than ever, low transaction costs and fast exchanges make knowledge flows essential to economic and social prosperity. Indeed, transboundary knowledge transfers have been argued to drive cross-country convergence of GDP per capita (Aghion and Jaravel, 2015[42]; Howitt, 2000[43]). Flows of scientific knowledge have also been recorded and researched, showing that affiliations, collaborations and networks have positive impacts on academic output and productivity (Halevi, Moed and Bar-Ilan, 2016[44]; Azoulay, Zivin and Wang, 2010[45])

In recent years, with technological developments, the transfer of data across borders has become a central part of the economy. Transboundary e-commerce, which relies on the smooth transfer of data across borders, is expanding, with 45% of EU firms having undertaken cross-border e-commerce sales in 2016, up from 42% in 2010 (OECD, 2019[46]). Cross-border data transfers enable consumers and producers around the world to connect and thus facilitates the trade of goods and services across borders. Data flow is therefore a means for widening consumer choice and the affordability of goods and services, helping SMEs reach global markets and a key element of international production through GVCs (Casalini and López González, 2019[47]).

Wrapping-up

These five transboundary flows are the main channels through which domestic policies and development patterns of individual countries affect both countries ‘elsewhere’ and global public goods. Whilst there are other mechanisms through which transboundary impacts occur, such as policies (tariffs and trade barriers, as an example), or international institutions and agreements that reinforce, regulate and monitor various international transactions and relationships, these are indirect mechanisms whose effects materialise through the five flows discussed above. Conversely, the discussion above has clarified that the direction of these impacts (either positive or negative) depends on much more than the size of these flows. The next section will present an illustration of how data on these five transboundary flows could be used to analyse transboundary inter-relationships that are crucial for the success of the 2030 Agenda.

Measuring transboundary flows

Building on the conceptual framework for measuring transboundary impacts described in the previous section, this section illustrates the measurement of each of the five transboundary flows. This analysis offers a first operationalisation of the approach to measuring transboundary impacts in the context of SDGs. National statistical systems already collect many data on these transboundary flows. Table 5.2presents a small sample of such indicators. For this analysis, one indicator is selected to describe each of the five flows. The indicators were primarily selected according to data availability allowing coverage of most countries in each region, including bilateral data, i.e. origin and destination of the flow, as well as relevance to the five flows and, where possible, to the SDGs.

Table 5.2. Example indicators by transboundary flows

Financial flows	Movement of people	Trade flows	Environmental flows	Knowledge transfer
Official development assistance (ODA)	Foreign born population, stock	Value-added embodied in trade flows	CO_2 emissions	Patent applications
Foreign direct investment (FDI)	Refugee population, stock	Total value of export and import	Material footprint	Industrial design applications
International remittances	International tourists, flow	Imports from developing countries	Trade of environmentally related goods	Charges for the use of intellectual property
Other Private transfers	International students, flow	Human rights risks embodied in trade	Red List Index	Trademark applications
Philanthropic transfers			Forest area	Government support to R&D
			Trade in waste and scrap	

For the purpose of this illustrative analysis, a set of indicators are selected for both inbound and outbound flows for each of the five categories. The indicators were selected according to general relevance, data availability and country coverage. These indicators are:

- **Financial flow - Net ODA disbursement/receipt,** which is one aspect of the global transfer of financial resources from developed to developing countries. ODA is the main source of development aid and features prominently in the 2030 Agenda, with 13 of the 169 targets related to it. Additionally, detailed country-level data are available for OECD-DAC member countries and the EU. Data are sourced from OECD databases (2018[48]).
- **Movement of people - Migrant stock by country of origin and destination.** Migration is the most significant form of movement of people across borders. Stock is used here rather than flow as data coverage was more substantial than that for flows. Additionally, migration is a long-term movement of people, and in that sense different to the financial and trade flows, so the data on migrant stocks provides a useful picture of the long-term flows of migration. Additionally, available data cover most of the countries and regions in detail. Migration is the subject of SDG Target 10.7. Data are sourced from the World Bank (2017[49]).
- **Trade flows - Total domestic value-added embodied in foreign final demand and total foreign value-added embodied in domestic final demand**, based on the Trade in Value Added data for 2015 and for which detailed country-level data are available. Trade-related SDG targets are concentrated under Goal 17, in Targets 17.10, 17.11, and 17.12. Data are sourced from OECD databases (2015[50])
- **Environmental flows - CO_2 emissions based on domestic production and on domestic final demand,** as these show two facets of the country's contribution to climate change, one of the greatest environmental challenges of our time. Climate change is a global common good, so it is different to other transboundary impacts which occur only through the movement beyond borders, as countries affect the global good by their own emissions, as well as through the consumption of products produced elsewhere, i.e. demand-based emissions. For the purpose of this analysis, rather than using incoming and outgoing flows, we use domestic emissions and (net) imported emissions, i.e. demand-based. SDG 13 is entirely dedicated to climate change, and includes five targets. Data are available for most countries and regions and are sourced from the OECD database (OECD, 2015[51]).
- **Knowledge transfers - Patent application by residents and by non-residents,** used as a proxy for knowledge creation. While patents are in fact a legal tool providing intellectual property rights, excluding others from making or using an invention, it is a useful proxy for research and

development, and as such, for knowledge creation (Kalutkiewicz and Ehman, 2014[52]). Knowledge is considered as a public good, so that the domestic production of knowledge (by residents) contributes to global knowledge creation. Likewise, the number of patent applications in a country deposited by non-residents implies the import of knowledge, also contributing to knowledge as a global public good. Data are sourced from the World Bank database (World Bank[53]).

The analysis is presented at global level, with data aggregated into 11 world regions: Australia and New Zealand; Central Asia; China; East Asia; Europe; Japan and Korea; Latin America and the Caribbean; Middle East and North Africa (MENA); South Asia; Sub-Saharan Africa; and the United States and Canada. This grouping (based on the work of Morrisson and Murtin (2013[54]), is based on both geographical location and the level of economic development. Table 5.3 presents the number of countries, total population and total GDP for each of the 11 regions. The analysis of transboundary flows at this regional level allows for a high-level global assessment of transboundary flows.

Table 5.3. Summary of 11 world regions

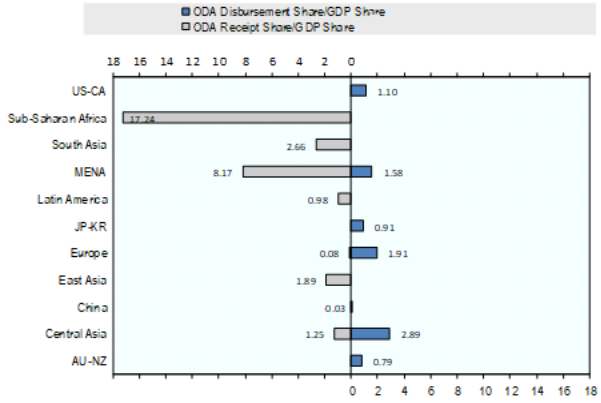
	Number of countries and economies	Total population in 2018 (Millions)	Total GDP in 2018 (Millions USD)
Europe	45	545	20 041 106
Australia – New Zealand	2	30	1 638 828
Japan – Korea	2	178	6 590 747
China	3	1 401	14 025 918
East Asia	13	684	2 988 955
South Asia	8	1 814	3 452 512
Central Asia	13	374	2 994 033
Middle East and North Africa	21	449	3 033 267
Sub-Saharan Africa	48	1 075	1 696 998
United States - Canada	2	364	22 257 685
Latin America	19	589	4 961 461

Source: Grouped and calculated by authors based on World Bank Database (World Bank[53])

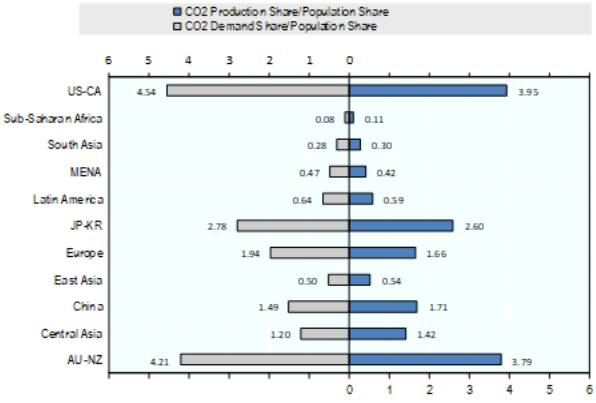
Based on the available data for the five flows described above, below we assess the relative magnitude of transboundary flows from each of the 11 regions beyond their borders and relative to their size. The five panels in Figure 5.2 describe the ratios of each region's share in the global flows, both incoming and outgoing, relative to its share of the global economy or population, according to relevance. Ratios higher than one imply that the region is dominant in this transboundary flow relative to its size.

Figure 5.2. Ratios of transboundary flows to size, by region

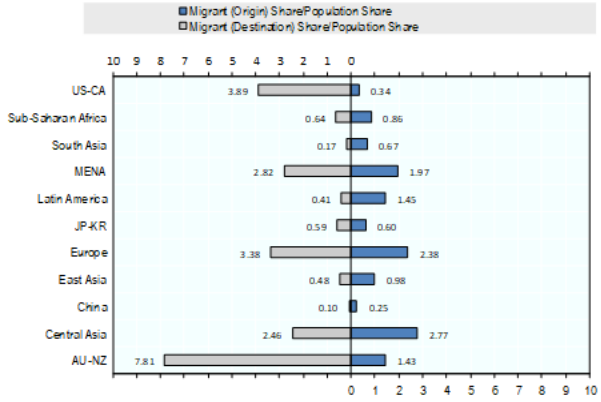
A. The ratio of each region's share of ODA disbursement/receipt and GDP share



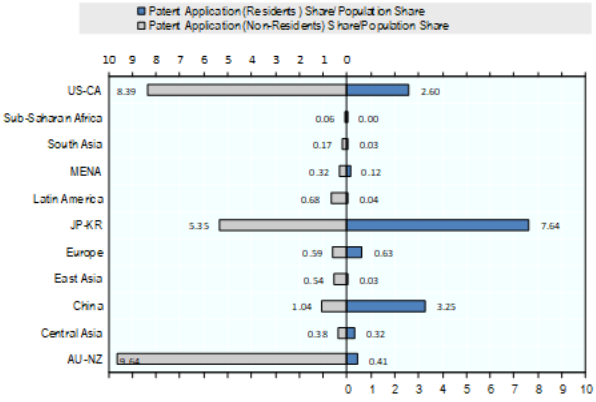
D. The ratio of each region's share of CO2 production/demand and population share



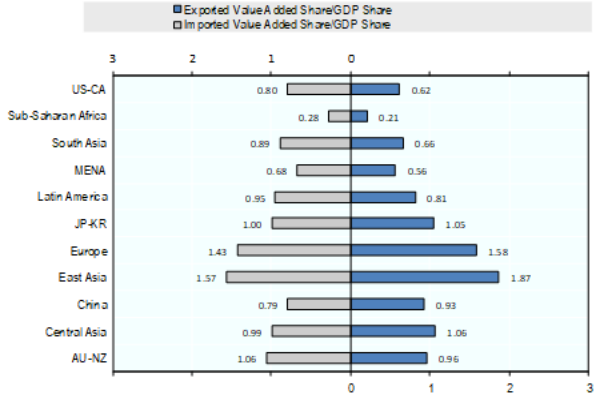
B. The ratio of each region's share of migration (origin/destination) and population share



E. The ratio of each region's share of patent application (residents/non-residents) and population share



C. The ratio of each region's share of exported/imported value-added and GDP share



Note: Each indicator is aggregated at regional level for both incoming and outgoing flow. For each transboundary indicator, a ratio is computed as the share of each region in the total, divided by the share of the same region in the world population or GDP (depending on the nature of the flow considered). Panel A shows incoming ODA and outflows, Panel B shows stocks of migration by origin and destination, Panel C shows goods imported and exported value-added, Panel D shows production and demand-based CO2 emissions, and Panel E shows patent applications by residents and non-residents. Panels A, B and C include intra-regional flow and do not include the flow to/from unspecified areas.
Source: Author calculations based on the following data sources: Net ODA disbursement (OECD, 2018[48]); exported and imported value-added (OECD, 2015[50]); Bilateral migrant stocks (World Bank, 2017[49]); Production-based CO2 emissions and CO2 emissions embodied in final demand, (OECD, 2015[51]); Patent applications by residents and non-residents in 2017 (World Bank, 2015[53]).

Transboundary **financial** flows (Panel A, Figure 5.2,) are expressed as the ratio of the regional share of global ODA relative to the regional share of global GDP. For ODA outflows (disbursements), regions with a ratio greater than one, i.e. the dominant regions in this area, are Central Asia, Europe, MENA and United States - Canada, meaning that their share in global ODA disbursements exceeds their economic size. For recipients, the regions recording a ratio above one are Sub-Saharan Africa, MENA, South Asia, East Asia and Central Asia. Central Asia and MENA are both large distributors and recipients of ODA, whereas Sub-Saharan Africa is by far the largest recipient relative to its size, with a ratio above 16.

The transboundary movement of **people** (Panel B) is represented by the share of incoming and outgoing stocks of migrants relative to the population size of each region. Dominant emigration regions, with a ratio greater than one in the outflow of migrants are Central Asia, Europe, MENA, Latin America and Australia - New Zealand, meaning that their share of migration outflow is greater than their share in global population. Conversely, the regions with a relatively higher inflow of migrants compared to their population share are Australia - New Zealand, United States - Canada, Europe, MENA and Central Asia. Large outflows of migrants are not necessarily orthogonal to inflows, with some regions (MENA, Europe, Australia - New Zealand and Central Asia) featuring high levels of both incoming and outgoing migration relative to their population share. Of these, only Central Asia has more inflow than outflow of migrants.

Transboundary **trade** flows (Panel C) are measured by ratio of the shares of both exported and imported value-added relative to the GDP share of the same region. Trade flow ratios are relatively symmetrical compared to the other ratios, meaning that regions featuring relatively high imports compared to GDP also have relatively high exports. This is the case of East Asia and Europe, which have higher shares of both export and import of value-added relative to GDP. On the other side, South Asia, MENA and Sub-Saharan Africa have relatively low share of value-added embodied in their imports and exports compared to their share of global GDP. However, the absolute size of trade flows should also be considered when assessing the transboundary impacts of regions.

Transboundary **environmental** flows are represented here by CO_2 emissions (Panel D), both production and demand-based, relative to their share in global population. As in the case of trade flows, environmental flows are also fairly symmetrical, with inflows (CO2 emissions imported from abroad) and outflows (CO2 emissions stemming from domestic production) following similar patterns. Regions with a high share of emissions relative to the share of global population are United States - Canada, Australia - New Zealand, Japan - Korea, China, Europe and Central Asia. This means that considering the size of the population, these regions are both producing and consuming (embodied in goods and services) a disproportionate share of global CO_2 emissions. Notably, China and Central Asia produce more CO2 than they consume, indicating that part of these two regions' impact on the global environmental good is driven by foreign demand, as well as the domestic policies and circumstances.

Lastly, transboundary **knowledge** transfers are represented here by the patent application of residents and non-residents, relative to the share of different regions in global population (Panel E). Residents' patent applications in Japan - Korea, China and United States - Canada are greater than their share of population, suggesting that these regions are contributing considerably to the accumulation of knowledge as a global common good. Likewise, non-resident patent applications in Australia - New Zealand, United States - Canada and Japan - Korea are also relatively high. These findings could be interpreted as greater contributions to knowledge, although policies and institutions concerning intellectual property protection should also be considered as explaining factors here.

Beyond the individual flows, it is also informative to identify those regions that have greater transboundary impacts relative to their size across *all* five flows. Regions with relatively higher transboundary flow ratios are Europe, Central Asia, United States - Canada and MENA, meaning that the transboundary ratio is above one across several of the indicators. Specifically, Europe and Central Asia have relatively high ratios in 7 of the 10 indicators, while the United States - Canada and MENA regions record a high ratio in 6 of the 10 indicators. Conversely, Sub-Saharan Africa, South Asia and Latin America all record relatively low

transboundary flow ratios, with 9 out of 10 indicators below 1. This suggests that Europe, Central Asia, United States - Canada and MENA have relatively higher transboundary impacts as measured by flows, compared to their relative size. Similarly, Sub-Saharan Africa, South Asia and Latin America all record relatively lower transboundary impacts.

This illustration of data analysis of the transboundary flows offers an operationalisation of the conceptual framing of transboundary impacts. It can be used to further develop analyses focusing on the five flows identified and present a more granular picture at country level. Better understanding of the dynamics of transboundary impacts worldwide is essential for the successful implementation of the SDGs, and better measurement and data analysis can contribute to this objective.

References

Abramitzky, R. and L. Boustan (2017), *Immigration in American economic history*, American Economic Association, http://dx.doi.org/10.1257/jel.20151189. [25]

Aghion, P. and X. Jaravel (2015), "Knowledge spillovers, innovation and growth", *Economic Journal*, Vol. 125/583, pp. 533-573, http://dx.doi.org/10.1111/ecoj.12199. [42]

Alsamawi, A. et al. (2017), *The social footprints of global trade*, Springer Singapore, http://dx.doi.org/10.1007/978-981-10-4137-2 (accessed on 13 May 2020). [8]

Amann, M., Z. Klimont and F. Wagner (2013), "Regional and Global Emissions of Air Pollutants: Recent Trends and Future Scenarios", *Annual Review of Environment and Resources*, Vol. 38/1, pp. 31-55, http://dx.doi.org/10.1146/annurev-environ-052912-173303. [36]

Anholt, S. (2020), *The Good Country Index*, https://www.goodcountry.org/index/results/ (accessed on 12 June 2020). [18]

Azoulay, P., J. Zivin and J. Wang (2010), "Superstar Extinction", *Quarterly Journal of Economics*, Vol. 125/2, pp. 549-589, http://dx.doi.org/10.1162/qjec.2010.125.2.549. [45]

Belgium Federal Planning Bureau (2018), *Complementary indicators to GDP, 2018*, https://www.plan.be/publications/publication-1745-en-complementary+indicators+to+gdp+2018 (accessed on 20 January 2020). [14]

Bernstein, S. et al. (2018), *The Contribution of High-Skilled Immigrants to Innovation in the United States*, Stanford University Graduate School of Business Working Paper, https://www.gsb.stanford.edu/faculty-research/working-papers/contribution-high-skilled-immigrants-innovation-united-states (accessed on 24 June 2020). [24]

Borjas, G. (1994), "Long-Run Convergence of Ethnic Skill Differentials: The Children and Grandchildren of the Great Migration", *Industrial and Labor Relations Review*, Vol. 47/4, p. 553, http://dx.doi.org/10.2307/2524658. [26]

Brunekreef, B. (2010), *Air pollution and human health: From local to global issues*, Elsevier, http://dx.doi.org/10.1016/j.sbspro.2010.05.010. [35]

Casalini, F. and J. López González (2019), "Trade and Cross-Border Data Flows", *OECD Trade Policy Papers*, No. 220, OECD Publishing, Paris, https://dx.doi.org/10.1787/b2023a47-en. [47]

CBD (1992), *UN Convention on Biological Diversity*, https://www.cbd.int/convention/text/ (accessed on 16 April 2020). [40]

Center For Global Development (2018), *Commitment to Development Index*, https://www.cgdev.org/commitment-development-index-2018 (accessed on 12 June 2020). [17]

Garsous, G. (2019), "Trends in policy indicators on trade and environment", *OECD Trade and Environment Working Papers*, No. 2019/01, OECD Publishing, Paris, https://dx.doi.org/10.1787/b8d2bcac-en. [10]

Giammetti, R., A. Russo and M. Gallegati (2020), "Key sectors in Input-Output Production Networks: an application to Brexit", *The World Economy*, p. twec.12920, http://dx.doi.org/10.1111/twec.12920. [11]

Halevi, G., H. Moed and J. Bar-Ilan (2016), "Researchers' Mobility, Productivity and Impact: Case of Top Producing Authors in Seven Disciplines", *Publishing Research Quarterly*, Vol. 32/1, pp. 22-37, http://dx.doi.org/10.1007/s12109-015-9437-0. [44]

Havro, G. and J. Santiso (2008), *To benefit from plenty: lessons from Chile and Norway*, http://www.oecd.org/dev (accessed on 28 February 2020). [34]

Howitt, P. (2000), "Endogenous growth and cross-country income differences", *American Economic Review*, Vol. 90/4, pp. 829-846, http://dx.doi.org/10.1257/aer.90.4.829. [43]

ILO (2020), *Statistics on forced labour, modern slavery and human trafficking*, https://www.ilo.org/global/topics/forced-labour/policy-areas/statistics/lang--en/index.htm (accessed on 15 June 2020). [31]

ILO et al. (2019), *Ending child labour, forced labour and human trafficking in global supply chains*, International Labour Organisation, Organisation for Economic Co-operation and Development, International Organisation for Migration and United Nation's Children Fund, http://mneguidelines.oecd.org/Ending-child-labour-forced-labour-and-human-trafficking-in-global-supply-chains.pdf (accessed on 13 May 2020). [9]

International Task Force on Global Public Goods (2006), *Meeting Global Challenges: International Cooperation in the National Interest*, Stockholm, Sweden, https://www.keionline.org/misc-docs/socialgoods/International-Task-Force-on-Global-Public-Goods_2006.pdf (accessed on 30 March 2020). [2]

JAXA Earth Observation Research Center (EORC) (2014), *Air pollutants across borders observed from space 2014*, https://www.eorc.jaxa.jp/en/earthview/2014/tp140319.html (accessed on 2 March 2020). [37]

Kalutkiewicz, M. and R. Ehman (2014), "Patents as proxies: NIH hubs of innovation", *Nature Biotechnology*, Vol. 32/6, pp. 536-537, http://dx.doi.org/10.1038/nbt.2917. [52]

Lopez Gonzalez, J., P. Kowalski and P. Achard (2015), "Trade, global value chains and wage-income inequality", *OECD Trade Policy Papers*, No. 182, OECD Publishing, Paris, https://dx.doi.org/10.1787/5js009mzrqd4-en. [33]

Morrisson, C. and F. Murtin (2013), "The Kuznets curve of human capital inequality: 1870-2010", *Journal of Economic Inequality*, Vol. 11/3, pp. 283-301, http://dx.doi.org/10.1007/s10888-012-9227-2. [54]

Nurse, K. (2005), “Diaspora, Migration and Development in the Caribbean”. [29]

OECD (2020), *OECD Tourism Trends and Policies 2020*, OECD Publishing, Paris, https://dx.doi.org/10.1787/6b47b985-en. [30]

OECD (2019), *Development aid drops in 2018, especially to neediest countries - OECD*, https://www.oecd.org/newsroom/development-aid-drops-in-2018-especially-to-neediest-countries.htm (accessed on 28 February 2020). [22]

OECD (2019), *Global Material Resources Outlook to 2060: Economic Drivers and Environmental Consequences*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264307452-en. [39]

OECD (2019), *Going Digital: Shaping Policies, Improving Lives*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264312012-en. [46]

OECD (2019), *International Migration Outlook 2019*, OECD Publishing, Paris, https://dx.doi.org/10.1787/c3e35eec-en. [27]

OECD (2019), *Measuring Distance to the SDG Targets 2019: An Assessment of Where OECD Countries Stand*, OECD Publishing, Paris, https://dx.doi.org/10.1787/a8caf3fa-en. [1]

OECD (2019), *OECD/G20 Inclusive Framework on BEPS: Progress Report July 2018-May 2019*, https://www.oecd.org/tax/beps/inclusive-framework-on-beps-progress-report-july-2018-may-2019.htm (accessed on 12 June 2020). [23]

OECD (2019), *Policy Coherence for Sustainable Development 2019: Empowering People and Ensuring Inclusiveness and Equality*, OECD Publishing, Paris, https://dx.doi.org/10.1787/a90f851f-en. [5]

OECD (2018), *Aid (ODA) disbursements to countries and regions*, http://dotstat.oecd.org/?lang=en (accessed on 10 March 2020). [48]

OECD (2018), *Global Outlook on Financing for Sustainable Development 2019: Time to Face the Challenge*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264307995-en. [21]

OECD (2017), *Policy Coherence for Sustainable Development 2017: Eradicating Poverty and Promoting Prosperity*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264272576-en. [13]

OECD (2015), *Carbon dioxide emissions embodied in international trade*, http://dotstat.oecd.org/Index.aspx?DataSetCode=AEO11_INDEPTH_CHAPTER6_TAB4_EN (accessed on 10 March 2020). [51]

OECD (2015), *Trade in Value Added (TiVA): Principal indicators*, http://dotstat.oecd.org/?lang=en (accessed on 26 June 2020). [50]

OECD (2014), “Is migration good for the economy?”, *Migration Policy Debates*, OECD, https://www.oecd.org/migration/OECD%20Migration%20Policy%20Debates%20Numero%202.pdf (accessed on 2 March 2020). [28]

OECD (n.d.), *Guide to OECD’s Trade in Value Added (TiVA)*, https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm. [6]

OECD (n.d.), *Why open markets matter?*, https://www.oecd.org/trade/understanding-the-global-trading-system/why-open-markets-matter/ (accessed on 9 January 2020). [32]

Sachs, J. et al. (2019), *Sustainable Development Report 2019*, Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN), http://sdgindex.org/assets/files/2018/01%20SDGS%20GLOBAL%20EDITION%20WEB%20V9%20180718.pdf. [16]

Statistics Netherlands (2017), *Dutch Sustainability Monitor*, CBS, https://www.cbs.nl/en-gb/publication/2017/20/dutch-sustainability-monitor-indicator-updates (accessed on 21 January 2020). [19]

Statistics New Zealand (2019), *Ngā Tūtohu Aotearoa – Indicators Aotearoa New Zealand*, https://wellbeingindicators.stats.govt.nz/?_ga=2.181184487.1704549833.1579543687-2073847058.1579543687 (accessed on 20 January 2020). [15]

UN DESA & UNEP (2013), *Global governance and governance of the global commons in the global partnership for development beyond 2015*, UN System Task Team on the Post-2015 UN Development Agenda, OHCHR, OHRLLS, UNDESA, UNEP, UNFPA, https://www.un.org/en/development/desa/policy/untaskteam_undf/thinkpieces/24_thinkpiece_global_governance.pdf (accessed on 30 March 2020). [3]

UN Statistics Division (1997), *Glossary of Environment Statistics*, United Nations Statistics Division, New York, https://unstats.un.org/unsd/publication/SeriesF/SeriesF_67E.pdf (accessed on 30 March 2020). [4]

UNECE, OECD, ESTAT (2013), *Conference of European Statisticians Recommendations on Measuring Sustainable Development*, Prepared by the Joint UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development, https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2013/SD_framework_and_indicators_final.pdf. [12]

United Nations (2020), *Global indicator framework adopted by the General Assembly, annual refinements, and 2020 Comprehensive Review changes*, United Nations, https://unstats.un.org/sdgs/indicators/indicators-list/. [55]

United Nations (2015), *Addis Ababa Action Agenda of the Third International Conference on Financing for Development*, https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=2051&menu=35 (accessed on 12 June 2020). [20]

Universities-National Bureau Committee for Economic Research, C. (ed.) (1962), *Economic Welfare and the Allocation of Resources for Invention*, Princeton University Press, http://www.nber.org/chapters/c2144 (accessed on 24 February 2020). [41]

Wiebe, K. and N. Yamano (2016), "Estimating CO2 Emissions Embodied in Final Demand and Trade Using the OECD ICIO 2015: Methodology and Results", *OECD Science, Technology and Industry Working Papers*, No. 2016/5, OECD Publishing, Paris, https://dx.doi.org/10.1787/5jlrcm216xkl-en. [7]

Wiedmann, T. et al. (2015), "The material footprint of nations", *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 112/20, pp. 6271-6276, http://dx.doi.org/10.1073/pnas.1220362110. [38]

World Bank (2017), *Migration and Remittances Data*, http://pubdocs.worldbank.org/en/705611533661084197/bilateralremittancematrix2017-Apr2018.xlsx (accessed on 10 March 2020). [49]

World Bank (2015), *World Development Indicator*, http://databank.worldbank.org/data/download/WDI_csv.zip (accessed on 10 March 2020). [53]

Notes

[1] The United Nations Statistical Commission (UNSC) created the Inter-Agency Expert Group on SDG indicators (IAEG-SDGs) to develop and implement a global indicator framework for the goals and targets of the 2030 Agenda. The framework is comprised of 247 indicators which cover the 169 targets and 17 goals (United Nations, 2020[55]). Among these indicators, 231 are 'unique', while the remainders are used for monitoring more than one target.

[2] *2030 Agenda* and *SDGs* are used interchangeably in this document.

[3] The OECD ICIO tables use the industry output method, rather than product outputs.

[4] According to preliminary data.

6 Quantitative accounting for transboundary impacts: A new approach

Ali Alsamawi[1], OECD Directorate for Science, Technology and Innovation

The complexity and interconnectedness of global markets present a challenge for conventional statistics and accounting methods, in particular for the transboundary aspects of the 2030 Agenda. This chapter suggests using the OECD Inter-Country Input-Output framework as a tool to measure these transboundary aspects in a comprehensive way. The framework consists of annual matrices that describe the monetary flows of intermediate and final goods and services worldwide. These matrices can support the development of indicators for transboundary impacts related to, for example, the amount of child labour linked to exported goods and services.

Over the last two decades, the structure of the world economy has changed significantly, with the emergence of more complex trade relations and global supply chains. Technological changes, reductions in costs, greater access to resources and digitalisation have enabled new collaborative business models. However, the growing international fragmentation of production networks and the complexity of national economic systems require new measures to better understand the economic relations between countries and regions. Today, about 70 per cent of global goods and services ripple across long and complex international supply chain networks (OECD, 2018[1]). That means that conventional trade statistics cannot fully capture the interconnectedness of the global economy. Also, current country complexity models typically use 'gross' export statistics as a proxy for measuring the diversity of product output across countries (Zaccaria et al., 2018[2]). However, this largely ignores a country's position within Global Value Chains (GVCs). It is a challenge to determine a country's role and involvement in global supply chains unless one has an overview of the linkages between industries worldwide (e.g. quantifying the share of imported intermediate products in the value of exported goods and services). When assessed in isolation, traditional trade statistics may lead to misleading policy decisions targeting the wrong domestic information. Modelling the flows of value added within, and across, countries and regions can provide the quantitative accounting needed for policymakers to understand trade-offs. Moreover, firms operating in global value chains have the potential to generate growth, jobs, skills and technological transfer. However, negative environmental and social impacts have been linked to these economic activities supported by GVCs.

In the context of SDGs, the private sector plays an important role in delivering and financing the Sustainable Development Goals (SDGs) is explicitly recognised by the 2030 Agenda. Additionally, the social and environmental impact of firm participation in GVCs is an area of increasing policy interest. This paper provides a proof of concept on how to combine multiple datasets in order to build indicators that can assess the transboundary aspects related to sustainable development goals and targets. These indicators are not well presented in the current Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) developed by the United Nations Statistical Commission (IAEG-SDGs, 2019[3]). Child labour and forced labour will be mentioned later in the paper as an example of the challenge in this context. Comprehensive data sources are few and the capacity to capture reliable statistics is limited in many national contexts. The challenge becomes exponential when it comes to understanding how and whether child labour and forced labour may be linked to export-oriented activities and international demand for products and services. Thus, understanding the transboundary impacts embodied in the 2030 Agenda – Target 8.7 – requires a comprehensive model that gives a complete picture.

This paper is organised with, firstly, a brief introduction on the topic. Secondly, an overview is explored of the current challenges that may face the proposed methodology. The following section describes the methodology that has already been applied for similar analyses, whereas the subsequent section pertains to the identification of transboundary aspects, and the final section is the conclusion.

Understanding the challenges in global supply chain estimates

Understanding the full picture of economic activity in today's interconnected and global markets is complex. Goods and services we buy are composed of inputs from many countries around the world and are processed, assembled, packaged, transported and consumed across borders and markets. This presents a challenge for conventional statistics and accounting methods. For example, tracing back the origins of a final product or even its components requires capturing statistics not only in the market where the product is 'consumed', but also along its supply chain.

The 'value' of economic activity within a country's borders can mean many things. For example, traditional trade statistics look at gross trade flows in dollars, counting them multiple times as products cross borders in the global economy. This is not an issue in itself as the OECD TiVA database points out: it helps us

understand the structure of the global economy. However, it does not tell us much about the value-added or wages and profits left in the economy for countries that participate in global supply chains. The risk of having only one perspective is to assume that bigger flows mean greater value-added for countries or better profits and wages. The OECD Trade in Value-Added (TiVA) Database (i.e. issue related to SDGs 9 & 12) provides an alternative perspective by capturing the value-added (economic indicators, see http://ec.cd/tiva) for a country from goods and services 'consumed' worldwide [For example, TiVA provides insights beyond gross trade flows such as domestic vs foreign value-added content of exports; position and participation of a country in global value chains; 'global orientation' of industrial activity, i.e. share of industry value-added that meets foreign demands; country and industry origins of value-added in final demand, etc.]. For other indicators, the picture becomes exponentially more complex when social and environmental dimensions of sustainability that related to economic activity are considered. The challenges include 1) datasets that can trace economic activity from one end of the supply chain to the other are few; 2) environmental or social datasets that are truly global are even fewer; and 3) a consistent way to trace and attribute social and environmental impacts in global supply chains that has not yet been developed.

Nevertheless, certain social and environmental aspects can and have been measured and in particular in the context of the SDGs 2030 Agenda. For example, the United Nations Conference on Trade and Development (UNCTAD) implements action lines that can enrich and enhance the 2030 Sustainable Development Agenda by building capacities, tackling vulnerabilities and developing indicators. These actions and indicators contribute to more than fifty SDG targets. One of these indicators, for instance, relates to measuring the number of companies publishing sustainability reports (i.e. issue related to SDG 12). The United Nations Industrial Development Organization (UNIDO) is also contributing to the 2030 Sustainable Development Agenda by promoting rapid industrial growth and building capacities for transition into greening industries resource efficiency methodologies (i.e. issue related to SDG 9). Furthermore, the European Commission, through its statistical institution (Eurostat), provides a monitoring framework in progress towards the SDGs in the EU by developing 100 indicators for all SDGs.

In addition, building on the work done with Trade in Value Added, the OECD has developed a methodology to analyse CO_2 emissions across the entire supply chain (i.e. issue related to SDG 13). The analysis moves beyond traditional emissions statistics – which are based on measuring emissions that occur within sovereign borders – to provide a perspective on how much CO_2 is embodied in final demand or 'consumed'; regardless of where that CO_2 has been 'produced' (see http://oe.cd/io-co2). This perspective focuses on understanding global consumption patterns that 'drive' the demand for CO_2. More recently, an example of this model is the estimate of child labour and forced labour in global supply chains (Alliance8.7, 2019[4]). The Alliance 8.7 report is the first attempt by four international organisations, namely OECD, ILO, IOM and UNICEF have been combined to provide a fresh perspective on the extent to which highly exploitative forms of labour, such as child and forced labour, serve global consumption (for more information about this method, see (Alsamawi and al, 2019[5])).

Similar methodology has recently been applied to understanding the role of skills in the comparative advantage and industry performance of countries in global value chains. By using information on cognitive skills from the Survey of Adult Skills (PIAAC) and TiVA data, the OECD was able to show that workers' skills bundles and their distribution have larger effects on trade specialisation than countries' endowment of capital per employee, or the relative endowment of workers possessing different levels of education (Grundke, 2017[6]). Finally, there have been a number of attempts in academic literature to use the same methodology to analyse social indicators (Alsamawi, 2017[7]), child labour (Jorge Gómez-Paredes, 2016[8]), inequality (Alsamawi A, 2014[9]), water (Xiao, 2017[10]) and biodiversity (Lenzen, 2012[11]).

Methodology

The foundation for all this research is Input-Output (IO) tables. IO tables are commonly used by national statistical offices to describe the relationship between producers and consumers within an economy at sector level [Wassily Leontief developed the first IO table for the US economy in the 1930s. He won the Nobel Prize for Economics in 1973 for his life's work on IO tables. Since then, IO technique has had many applications]. They account for final and intermediate goods and services, allowing statisticians to identify and isolate the direct and indirect impact of, for instance, a specific industry on the entire economy.

OECD developed Inter-Country Input-Output (ICIO) tables that can be considered to be 'a global IO table'. ICIO tables are annual matrices that describe the monetary flows of intermediate and final goods and services worldwide. The diagonal blocks of an ICIO table represent the domestic flows of intermediate and final goods and services values while the off-diagonal blocks refer to the exports and imports between countries and industries. The ICIO framework can be used, for example, to quantify the origins (both domestic and foreign) of inputs into each industry and hence it has been widely used in Global Value Chains (GVCs) and Trade in Value Added (TiVA) analyses. The construction of a global Input-Output table is a data-intensive process, requiring numerous inputs from a variety of national and international sources. The latest edition of the tables (2018) covers 64 economies (including all OECD, EU-28 and G20 countries, most East and Southeast Asian economies and a selection of South American countries) and is available for 36 unique industrial sectors, which also include aggregates for total manufactures and total services. The 2018 edition covers the period 2005 to 2015, with preliminary projections to 2016 for some indicators.

The basic tenets of the methodology rely on using the ICIO structure to link industries and countries where, for instance, child labour and forced labour occur with final consumption of goods and services. Child labour or forced labour numbers are allocated per unit of production and then traced across the world. The main benefit lies in the fact that the ICIO model can capture the direct (within the same industry) and indirect (from upstream industries) impacts within an economy and along the supply chains. *Direct* impact captures the contribution of an industry in a specific country related to the production of goods and services for exports whereas *indirect* impact represents the contribution of other upstream industries that are incorporated in the production of goods and services for exports.

he hypothetical example of the CO_2 dataset can be shown in an illustrative way (i.e. issue related to SDG 13). A wooden table bought by a final consumer in France from Poland (i.e. trade from Poland to France of furniture and other wooden products accounted for around USD 742 million in 2017[2]) may have been transported by a German logistics company, where it was assembled from wooden planks produced in Lithuania (trade shows around USD 15 million) and screws produced in China (USD 116 million), see, for example, (Wiebe, 2016[12]). The timber for the wooden planks originated from Finland and the tools used to cut it into wooden planks originated in China. These tools were manufactured from metal produced in the UK (USD 1.1 billion) using iron ore from Australia (24 million) and machinery (USD 9.6 billion) from Germany. The data presented the purchases within these countries in monetary terms. In the meantime, with these monetary transactions, CO_2 is also emitted from the production of these goods at each step along this complex production line/chain. Traditional accounting methods would count the emissions based on which component was produced. The OECD-ICIO method instead allocates the emissions to the country where the wooden table was finally used (in this example – France). This 'consumption-based' methodology counts the exact same emissions, just from a different point of view.

Identifying the transboundary impacts through a global model

Understanding the transboundary impacts embodied in the 2030 Agenda requires a comprehensive model that provides a complete picture. Through the movement of goods and services worldwide, this model would consider all possible actions occurring in a country with its potential impact on others. The global

interconnectedness captured by ICIO tables means that the downstream use of an industry's output by other domestic and foreign industries can be identified. Conversely, for a particular industry, we can determine the inputs required from home and abroad to generate one unit of total output. Thus, the total requirements (direct and indirect) needed to produce a product can be determined using the ICIO tables.

With estimates of the units of inputs required per unit of total output (consumed domestically or exported) and with estimates of additional datasets that can be linked to this model, i.e. the amount of child labour per unit of total output, we are able to determine, broadly, the number of children supporting domestic and foreign demand for final goods and services. This indicator can be used to help address Target 8.7 in the SDGs not only through the domestic operations but also through the supply chains. Similar indicators can be generated for other targets/goals in the SDGs to capture the transboundary impacts through long and complex roots. Hence, an action in one country may have negative or positive impacts on other countries' performances and abilities to meet their SDGs. Tracing these impacts is challenging and traditional trade statistics are not very well suited to covering a country and cross-border impacts.

This paper provides a proof of concept on how to combine multiple datasets in order to build indicators that can assess the transboundary aspects related to sustainable development goals and targets. These indicators are not well presented in the current Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs) developed by the United Nations Statistical Commission. A wide range of indicators can be developed using the IO technique for the economic, social and environmental dimension. However, it is important to mention some weaknesses and limitations of the proposed approach:

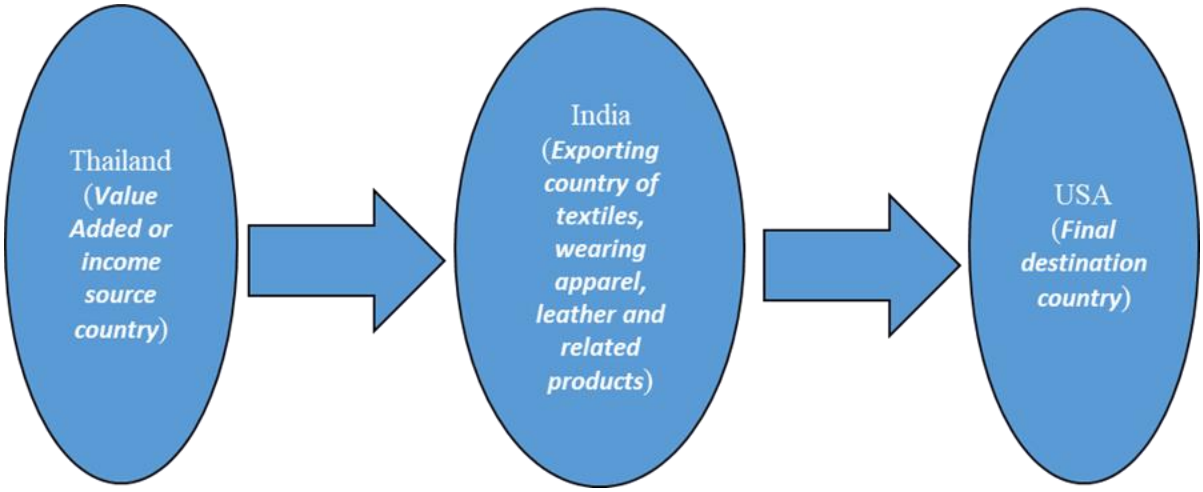
- The IO model can only be applied to the SDGs issues where the main focus is around the production and consumption of goods and services. Issues related to, for instance, Target 16.9 '*By 2030, provide legal identity for all, including birth registration*' cannot be assessed using such an approach. However, there are significant amounts of targets that can be dealt with using the IO technique.
- Combining two different sources with different classifications (i.e. prevalence of child labour and input-output tables) and mapping them with sustainable development goals and targets may face some challenges.
- In the absence of available data needed to develop these indicators, an underestimation in the investigated target (i.e. child labour) if it dominated in export-oriented sectors and overestimation if dominated in domestic markets. Nevertheless, the proposed indicators where data is completely missing can be used as a risk indicator.

Table 6.1. Example of three possible developed indicators using global IO tables for SDGs

Target	IAEG-SDGs indicator	Suggested indicators using IO
Target 8.9 'By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products'	8.9.1'Tourism direct GDP as a proportion of total GDP and in growth rate'	Domestic value added generated from non-resident expenditures
Target 8.7 'Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms'	8.7.1 'Proportion and number of children aged 5–17 years engaged in child labour, by sex and age'	Child labour linked to global supply chains
Target 9.2 'Promote inclusive and sustainable industrialisation and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries'	9.2.1 'Manufacturing value added as a proportion of GDP and per capita'	Direct and indirect value added content in gross exports

Figure 6.1 presents an example of a possible indicator developed by a global Input Output table that can be used for Target 9.2. According to this, around 27% of the total value added generated in this supply chain that related to other countries' demands and with no direct trade relationship (Source: based on ICIO 2018 edition and author's calculations). In other words, these transboundary impacts have the potential to provide data to support policies, reduce people in extreme poverty or create decent jobs and, hence, will have an impact to help address SDGs 1 and 8. The flow chart presented in Figure 10.1 is from an exporting point of view and represents the income from Thailand that is embodied in the exports of the exporting country (in this example, India) of wearing apparel, leather and related products that end up in the final destination (in this example, the United States). Estimates of such a complex production network cannot be identified unless a comprehensive model is developed that includes all of these transactions.

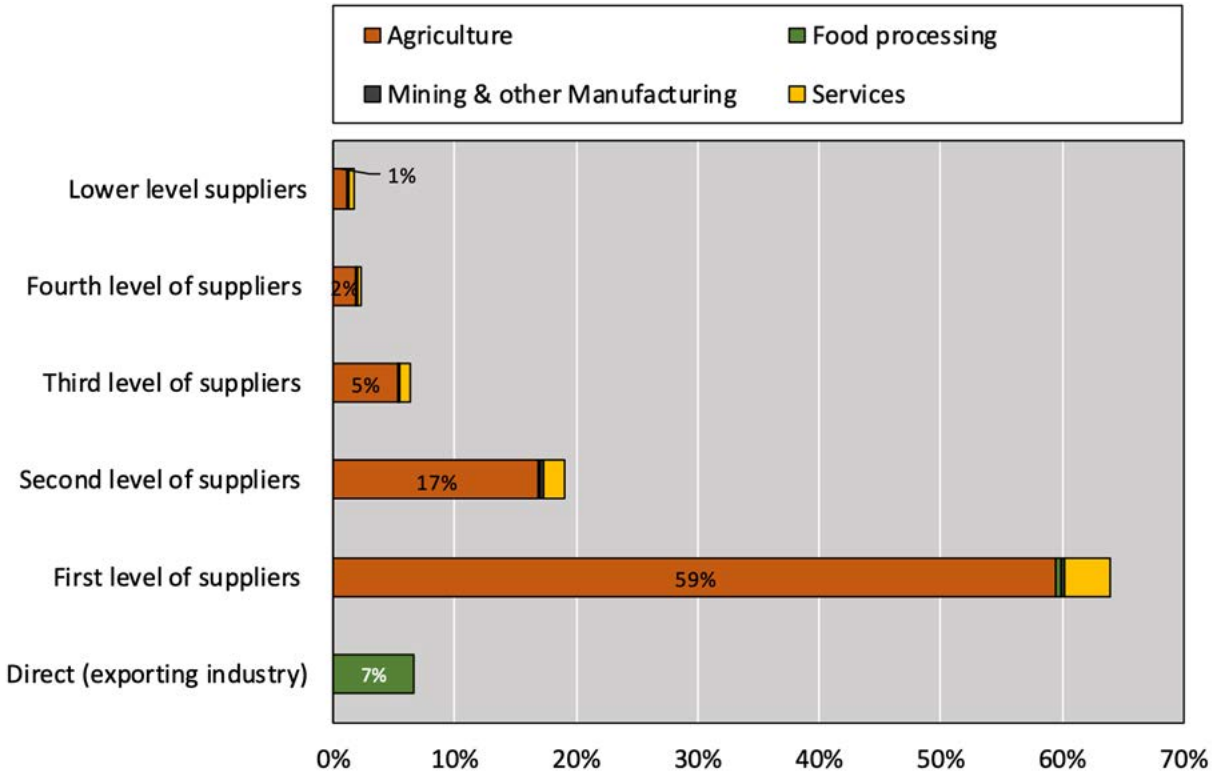
Figure 6.1. An example of gross exports by origin of income and final destination (2015)



Source: Author's elaboration

Similarly, Figure 6.2 shows the child labour linked in imports of the food products for Europe. These results provide a granular insight into this issue and provide the direct and indirect cases linked to trade. It shows that most of the child labour embodied in exported food products (93%) is associated in upstream industries (mostly from agriculture) whilst only 7% of the embodied child labour directly participates in the final stage of food processing production. Furthermore, a non-negligible share is occupied by services, which is approximately 7% of total cases. Thus, any policy aiming to eradicate children from work in the food product industry will need to take into account an entire supply chain approach that includes not only the direct cases, but also the indirect cases in the upstream industries. The child labour linked in exports is non-negligible and equivalent to about 22% of total children in child labour in Latin America and the Caribbean, see the Alliance 8.7 report. In this regard, measuring the transboundary impacts of the sustainable development Target 8.7 would require non-conventional statistics.

Figure 6.2. Estimated share of child labour embodied in imported food products for Europe (2015)



Source: OECD calculations following the same methodology as ILO, IOM, OECD and UNICEF, 'Child Labour and Human Trafficking in global supply chains'.

With a current global crisis because of Covid-19, governments all over the world have made rapid and dramatic policy decisions in many areas to combat the virus. This would in turn have a negative or positive indirect impact on the SDGs. What we have seen is that the global lockdown for a few months has had a substantive impact towards the reduction of CO_2 emissions worldwide (i.e. an indirect positive effect, for instance, towards SDGs 12 and 13). It is therefore a situation that we are living with, not a hypothetical scenario that greener actions can make a difference. This might play an important role in galvanising actions toward more sustainable consumption and production and more sustainable choices around how we consume and produce goods and services.

On the other hand, the disruption in trade and global supply chains resulting from this virus has had negative effect in terms of job losses and this could lead to an increase in the poverty rate in some countries (i.e. an indirect negative effect towards SDGs 1 and 8). Many workers in developing countries, heavily involved in export-oriented sectors, have been laid off, and run the risk of falling into poverty, because of the disruption in global supply chains. In this regard, the importance of estimating robust results for cross-border or transboundary aspects would be crucial during the pandemic, the recovery period and thereafter. Therefore, the proposed methodology in this paper can play an important role in tracking the embodiments of social, economic and environmental indicators of SDG-related issues through complex supply-chain networks: from the origins of primary resources, via global manufacturing and service activities, to the locations where final goods and services are consumed.

Conclusion

Although this paper is just a proof of concept and does not reveal any concrete indicators, it is one of the first studies that attempts to merge Input-Output tables and other related data (i.e. CO_2 data) from one side with SDGs on the other to estimate the transboundary impacts worldwide. The analysis in this paper would suggest considering the OECD Inter-Country Input-Output (OECD-ICIO) infrastructure as a tool to measure these transboundary impacts in a comprehensive manner. The use of an IO model as a tool to tackle SDG-related issues could be an area of increasing policy interest. The model can play a crucial role in identifying the embodiments, i.e. child labour linked to trade in the context of the SDG 2030 Agenda. The approach presented in this paper sheds new light on how to create a new list of indicators that complement the IAEG-SDGs indicators to provide a complete picture of how to address the SDG 2030 Agenda. A call for greater granularity for SDG-related datasets by country and industry would be needed for future work. Additional investigation that takes into consideration all possible indicators with transboundary aspects will provide a closer insight into the use of IO techniques in addressing the SDGs.

References

Alliance8.7 (2019), *Ending child labour, forced labour and human trafficking in global supply*. [4]

Alsamawi A, M. (2014), "The Inequality Footprints of Nations: A Novel Approach to Quantitative Accounting of Income Inequality", *PLoS ONE*, http://dx.doi.org/doi:10.1371/journal.pone.0110881. [9]

Alsamawi and E. al (2019), *Measuring child labour, forced labour and human trafficking in global supply chains: A global Input-Output approach.*, International Labour Organization, Organisation for Economic Co-operation and Development, International Organization for Migration and United Nations Children's Fund. [5]

Alsamawi, E. (2017), *The social footprints of global trade*, Springer, http://doi.org/10.1007/978-981-10-4137-2. [7]

Grundke, R. (2017), *Having the right mix: The role of skill bundles for comparative advantage and industry performance in GVCs*, OECD Publishing, https://doi.org/10.1787/89. [6]

IAEG-SDGs (2019), *Tier Classification for Global SDG Indicators,*, https://unstats.un.org/sdgs/files/Tier%20Classification%20of%20SDG%20Indicators_13%20February%202019_web.pdf. [3]

Jorge Gómez-Paredes, A. (2016), "Consuming childhoods: An assessment of child labor's role in Indian production and global consumption", *Journal of Industrial Ecology*, pp. 611–622, https://doi.org/10.1111/jiec.12464. [8]

Lenzen, M. (2012), "International trade drives biodiversity threats in developing nations", *Nature*. [11]

OECD (2018), *Trade Policy Implications of Global Value Chains*, Trade Policy Brief. [1]

Wiebe, K. (2016), *"Estimating CO2 Emissions Embodied in Final Demand and Trade Using the OECD ICIO 2015: Methodology and Results"*, OECD Science, Technology and Industry Working Papers, OECD Publishing. [12]

Xiao, Y. (2017), "How Social Footprints of Nations Can Assist in Achieving the Sustainable Development Goals", *Ecological Economics*, pp. 55-65. [10]

Zaccaria, A. et al. (2018), *Integrating Services in the Economic Fitness Approach*, Technical Report, The World Bank. [2]

Notes

[1] The author would like to express his very great appreciation to Colin Webb for enabling him to finish this work.

[2] See Bilateral Trade in Goods by Industry and End-use, OECD.

7 The omnipresence of transboundary effects: A global, systemic, model based approach for analysing the SDGs

Robert M'barek, European Commission, Joint Research Centre, Directorate D – Sustainable Resources;
George Philippidis, Aragonese Agency for Research and Development (ARAID), Agrifood Research and Technology Centre (CITA), Agrifood Institute of Aragón (IA2), Government of Aragón, Zaragoza;
Tevecia Ronzon, European Commission, Joint Research Centre, Directorate D – Sustainable Resources

In response to the increasing needs of policy-making related to global economic, social and environmental sustainability, this chapter presents a quantitative approach with a special focus on transboundary impacts. The multi-region, multi-commodity economic simulation model, MAGNET, provides a unique insight into the synergies and trade-offs in scenarios where several policy instruments and other drivers are operating simultaneously. The chapter illustrates the results of a business-as-usual reference scenario with two climate and energy sustainable pathways towards 2050, focusing on global transboundary impacts employing an SDG indicator framework.

Recent global sustainability assessments (e.g. (IPBES, 2019[1]), (IPPC, 2019[2]), (IRP, 2019[3])) give ample evidence of the critical state of the planet and its related interregional transboundary impacts. As a global response to the global challenges, the United Nation's 2030 Agenda and the sustainable development goals (SDGs) were agreed in 2015. Within the SDG framework, countries are required to meet the SDG targets within and beyond their borders, which 'at one extreme, measuring these effects in a comprehensive way could require a full model describing how every country has an impact on every other country and on global public goods' (OECD, 2019[4]). The same report identified over half of the targets in the 2030 (SDG) Agenda containing a transboundary effect, i.e. having direct or indirect effects beyond their own boundaries (see also (United Nations, 2017[5]; European Union, 2011[6])).

Taking a European perspective, the 'Green Deal', published in December 2019, is an integral part of the European Commission's strategy to implement the SDGs. This new growth strategy of the European Union acknowledges that 'drivers of climate change and biodiversity loss are global and are not limited by national borders' (EC, 2019[7]). The Farm to Fork strategy highlights the EU's objective to reduce its contribution to global deforestation and forest degradation (EC, 2020[8]). In 'Delivering on the UN's Sustainable Development Goals – A comprehensive approach', the European Commission directly refers to the commitments related to the policy coherence for sustainable development (PCSD) and implementation of the SDGs, requesting to 'take into account the impact of all policies on sustainable development at all levels – nationally, within the EU, in other countries and at global level' (EC, 2020[9])

To achieve a holistic and coherent approach to policy implementation, the representation of the SDG indicators within an ex ante global simulation model provides a unique insight into the synergies and trade-offs in scenarios where several policy instruments and other drivers are operating simultaneously, thus also capturing transboundary or indirect effects. A broad array of questions related to economic, social and environmental sustainability can be addressed in a global context, with a special focus on transboundary impacts from the perspective of the Global South, which is further described in the case study.

While all of the trade-offs (and synergies) deserve appropriate sectoral details for individual policies, a systemic approach can provide an initial broad analysis, pinpointing the main impacts, winners and losers, covering a wide range of SDGs. Evidence-based policy-making increasingly requires scientific support with modelling tools, even more so in the context of complex and interlinked challenges, such as the SDGs. The analysis of transboundary effects in an SDG indicator framework requires a global analytical framework to identify how one country or region measures impacts on another. Furthermore, with the objective of analysing transboundary effects within a policy-coherent and SDG framework requires the inclusion of the key drivers to disentangle causalities.

The Modular Applied GeNeral Equilibrium Tool (MAGNET) is such a tool, developed to provide high-level policy advice to clients including the European Commission, the OECD and FAO. This class of economy-wide simulation model is also presented in the OECD Policy Coherence for Sustainable Development (PCSD) framework, referring to economy-wide models for sustainable development policies at UN DESA, including the OECD ENV-Linkages and World Bank Maquette for MDG Simulations (MAMS) general equilibrium models (OECD, 2016[10]). Lately, the MAGNET model has been selected by UN DESA (UN, 2020[11]) as an outstanding SDG Good Practice.

In this paper we outline how the MAGNET model can contribute to the analysis of transboundary impacts in the context of SDGs and policy coherence. The case study presented in Section 3 primarily elaborates on the transboundary effects in the comprehensive report on 'Alternative Global Transition Pathways to 2050' (M'barek, Philippidis and Ronzon, 2019[12]).

An approach to analyse transboundary impacts, SDGs and trade-offs globally

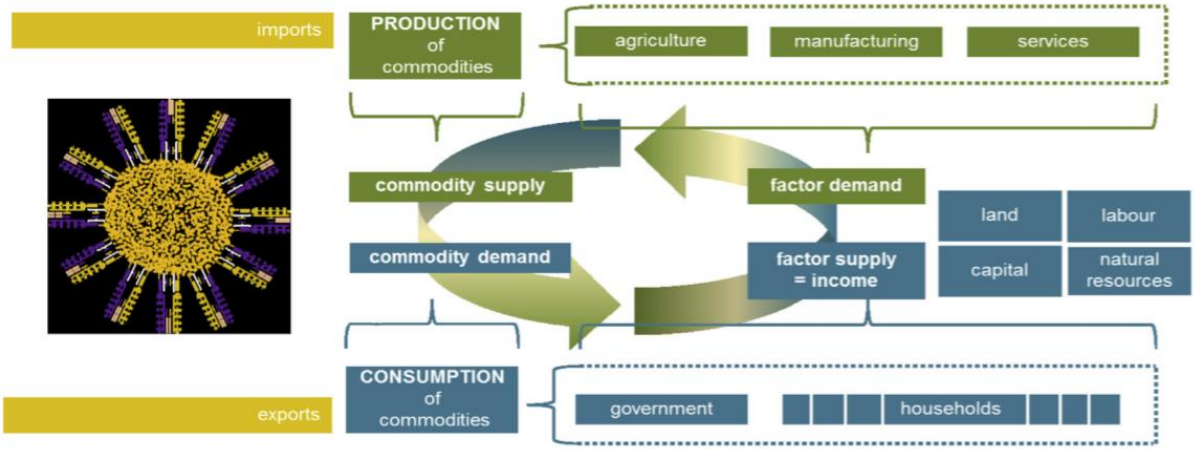
A global system-wide model

The MAGNET model is a class of neoclassical multi-region, multi-commodity computable general equilibrium (CGE) economic simulation model (Woltjer and Kuiper, 2014) and has an established pedigree in a number of high-profile forward-looking studies for international and intergovernmental organisations: European Commission (Boulanger et al., 2016[13]) (M'barek, Barreiro-Hurle and Boulanger, 2017[14]) (M'barek, Philippidis and Ronzon, 2019[12]); UNCTAD-FAO (Kuiper et al., 2018[15]); (OECD, 2019[4]); (FAO, 2019[16]). Calibrated to the Global Trade Analysis Project (GTAP) database, the MAGNET model has a global coverage of 141 singled-out countries and regions, as well as 65 sectors. With the addition of in-house sector splits for food, feed, fertiliser, bioenergy, bioindustry and fossil energy activities, MAGNET has access to over 110 activities.

Figure 7.1 describes the core mechanisms of MAGNET that are typical to this class of simulation model. It is assumed that all agents are rational decision-makers. For example, producers seek to minimise costs on their purchases of primary factors and inputs. Through the purchase of finished products, consumers (both private and public) seek to optimise their welfare subject to expenditure constraints. Assuming that supply equals demand in all commodity and factor markets, equilibrium prices emerge, whilst further accounting equations ensure that regional income, expenditure and output of each macroeconomy are balanced. To close the circular flow of incomes, outputs and expenditures within each macroeconomy, the balance of payments nets to zero, such that the current account (exports minus imports) must be balanced by the capital account (savings minus investments).

The bilateral trade flows between all included countries and sectors in MAGNET are of particular importance for the analysis of transboundary impacts, as they allow for the identification of how specific drivers, including policies, impact on third countries.

Figure 7.1. A graphical representation of the CGE model framework



Source: (Philippidis et al., 2020[17]).

The uniqueness and key strength of the MAGNET model, compared with other CGE models in this class, is that it is built on the principle of modularity. The core of the model is the standard GTAP model, around which a series of binary switches are coded to activate additional specialised modules and associated satellite databases (Figure 7.2) employing a user-friendly windows interface. With this flexibility, this impact

assessment tool has been applied in a number of research areas, with a particular focus on the topic of natural resource economics.

Figure 7.2. MAGNET - Modularity for cross-cutting assessments; policy-coherence

Source: (Kuiper, Meijl and Tabeau, 2019[18])

To support policy-making with the analysis of policy options, the modelling system has to represent the global economy and its biosphere with its interlinkages in a sufficient spatial and temporal scale. A baseline or reference scenario outlines the continuation of current trends and policies until the end of the time horizon of the study (e.g. until the year 2030 or 2050). Given the uncertainty in foresight exercises, numerous plausible alternate pathways of global developments are possible. One example set of alternative pathways is the Shared Socioeconomic Pathways (SSPs), developed as a joint community effort (Riahi, 2017[19]). Building on the SSPs, the 'Sustainable Development Pathways' (van Vuuren, Kriegler and Riahi, 2018[20]) focus more on how to reach the SDGs. The authors further explain: 'Given the linkages between the various transformations, an integrated approach is needed. Model-based scenarios can be a useful tool to explore the efforts associated with these transformations as well as to assess possible synergies and trade-offs between them' ((van Vuuren, Kriegler and Riahi, 2018[20]), p. 69). Another important source for transition pathways is the Global Energy and Climate Outlook (GECO) to 2050 (Keramidas et al., 2018[21]); (Weitzel et al., 2019[22]), which focuses on energy and climate issues. In addition to assumptions regarding growth and population, these narratives also examine global transformations of the energy markets as well as emissions reductions compatible with restricting world temperature increases.

The MAGNET model has been enriched with the SDG Insights Module (MAGNET SIM) currently embedding more than 60 official and supporting indicators, covering 12 of the 17 SDGs for all countries and regions. The following studies applying the MAGNET model are briefly mentioned in the context of policy coherence and transboundary effects.

The complexity of indirect effects of policies is shown in (Boulanger et al., 2018[23]) with an analysis of the ***CAP impact on the four main regional blocks in Sub-Saharan Africa*** (SSA). A thoroughly prepared reference scenario is contrasted with a counterfactual scenario, where the CAP is removed and ambitious trade agreements with non-African EU trade partners are implemented. Results provide interesting insights into the identification and quantification of predominantly indirect effects of the CAP in SSA. The removal of the CAP provides a two-sided picture: higher prices are detrimental to food-importing countries/regions because consumers face slightly higher food prices. On the other hand, agricultural producers in SSA can increase their production and additional jobs can be created. When combining a CAP removal and trade liberalisation scenario (not including SSA), some small trade diversion effects are observed with an improvement of the trade balance of SSA with the EU.

A case study with positive (environmental) transboundary impacts is the MAGNET analysis of SDG 12.3, ***halving per capita food waste*** in the EU only (Philippidis et al., 2019[24]). Compared to the baseline, non-EU land use savings are about 50 million hectares in the rest of the world because of reduced imports, with water abstraction in agriculture and emissions declining as well. On the other hand, these positive impacts result in concomitant costs in the form of lower employment and growth in exporting countries.

In a JRC report (Follador et al., 2019[25]), the ***impacts of the EU bioeconomy on third countries*** with the potential environmental impacts in Brazil of EU biofuel demand to 2030 are showcased. By combining MAGNET with the land use model of Brazil OTIMIZAGRO, the study analyses the potential impacts on land use changes and associated GHG emissions in Brazil resulting from increased EU demand for ethanol, and draws evidence-based conclusions to verify the compliance of sugarcane feedstock production with the REDII environmental criteria.

In a recent paper, (Bartelings et al., 2020[26]) analyse the ***EU aquaculture sector*** following a disaggregated approach and including public subsidies with the MAGNET model. The baseline with a time horizon 2050 is compared with scenarios, e.g. related to the inclusion of additional subsidies. It shows a small negative impact on the production of fish, mainly in Asia and South and Central America, as Europe would import slightly less fish products. Against the background of potential impacts of aquaculture production on delicate ecosystems such as mangroves in (sub)tropical export countries, this could also be interpreted as a positive transboundary effect.

The approach in the context of policy coherence modelling

In this section, the approach proposed is described in the context of the OECD Policy Coherence for Sustainable Development (PCSD) framework, which refers to economy-wide models (widely known as computable general equilibrium models) that are used to assess the direct and indirect economic impacts of alternative policies as well as policy coherence with a medium- to long-term horizon (OECD, 2016[27]).

The United Nations Department of Economic and Social Affairs (UN DESA) has been supporting countries to build analytical skills for this type of model. An example is the MAMS, which stands for Maquette for MDG Simulations, general equilibrium model developed by the World Bank.

The OECD PCSD report also features the OECD ENV-Linkages model, a recursive dynamic neoclassical general equilibrium model (GE) similar to MAGNET, which links economic activity to environmental pressures, specifically to greenhouse gas emissions (e.g. the impact of carbon taxes), while also highlighting associated spillover effects (OECD, 2016[27]). Similar to the OECD framework, the MAGNET model has been extended with different SDG indicators to analyse the impact of policies on the SDGs and explore policies to achieve SDGs (see Figure 7.3). Importantly, and very much in line with the MAGNET approach, the OECD report states ‘Many aspects of the SDGs are interlinked with complex feedback loops making the impacts of policies difficult or impossible to intuit’ (OECD, 2016[27]).

Figure 7.3. Coverage of SDGs in MAGNET

Note: Explanations: IAM representation of SDGs. Colours represent average scores for individual target coverage based on a survey among IAM models. Green: SDG is well captured and most targets can be modelled (darkest green: average score above 3, green: average score between 2 and 3, light green: average score between 1.5 and 2). Orange: SDG can be partially quantified (not all targets or only proxy indicators), with average scores between 1 and 1.5. Red: SDG is not well captured, with average scores below 1. Source: adapted from Van Soest et al. (in review).
Source: (The World in 2050 Initiative, 2018[28]), adapted by authors.

The MAGNET tool also embraces the key features of the internationally acknowledged causal framework (EEA, OECD) for analysing the interactions between society and the environment – the DPSIR (Drivers, Pressures, State, Impacts, Responses) – in a comprehensive and systemic way. With the inclusion of the SDG indicators (see also IRP Global Resources Outlook 2019), the modelling tool presented, in addition to a holistic description of the system, also allows the assessment of a wide range of policy options, behavioural and technological changes. The social and economic drivers (through macroeconomic assumptions) put pressure on the environment, changing its state and impact (through SDG and other indicators) on the socio-economic system. Policy and other societal and technical responses (through scenarios) are put in place to drive the system towards more sustainability.

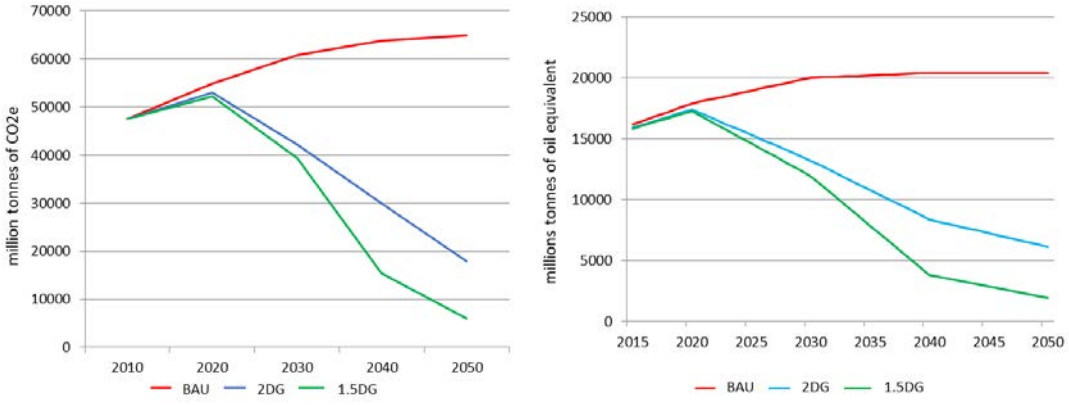
Case study investigating global transboundary effects of implementing the Paris Agreement

Hypothesis and scenario setting

The starting point of the case study is the unsustainability of the present economic system and the need to assess alternative pathways in a holistic manner. The SDG indicators provide the adequate framework to cover the three dimensions of sustainability and identify potential transboundary effects. In examining the trade-offs associated with different world drivers, it was seen as desirable to capture detailed road-maps on the evolution of energy markets (through the decarbonisation of energy sources, the 'decoupling' of energy usage from economic growth and the electrification of the energy market) and emissions reductions. With these crucial long-term drivers embedded within their transition pathways, this study opted to use the GECO pathways (Keramidas et al., 2018[21]); as a source of inspiration for the model experiments. Employing modelling assumptions, these drivers permit the targeting/calibration of changes in the labour force, the capital stock and productivity, as well as changing intermediate and final demand patterns for (i.e. fossil, renewable) energy usage across four broad usage classifications.

These drivers therefore characterise three scenarios: a business as usual reference scenario (BAU) with no further emissions reducing agreements and two sustainable pathways, consistent with temperature rises no greater than 2 °C (2DG) and 1.5 °C (1.5DG) above pre-industrial levels by 2100 due to technology-driven transformations in the energy sectors and a carbon tax. Figure 7.4 shows the assumed global changes in emissions and fossil energy markets, respectively. Whereas in the BAU an increase in both drivers is projected; both sustainable pathways show strong decreases over the time horizon towards 2050.

Figure 7.4. Assumed global changes in emissions and fossil energy markets



Source: Based on (Keramidas et al., 2018[21]) .

Employing the SDG indicator framework to understand global transboundary impacts

To illustrate the impacts of these transition pathways, Figure 7.4 presents a selection of SDG indicators for the world in 2015, 2030, 2050, for the BAU, 2DG and 1.5DG scenarios. Even assuming strong economic growth in developing and emerging countries towards 2050, the BAU scenario shows global income disparities persisting, while GHG emissions, land and other resource uses increase. A lack of market intervention (as in the BAU) is not an option, as the many negative impacts as the evolution of the SDGs over time show, especially with regard to inequalities and GHG emissions.

One cannot underestimate the benefits of decarbonisation pathways, which are clearly enumerated within Figure 7.5, as important reductions in GHGs are expected to generate significant non-market benefits (e.g. biodiversity, ecosystem services, health improvements, etc.). On the other hand, the carbon tax modelled in this scenario creates negative repercussions for production and employment in more emissions-intensive agricultural sectors in developing regions (SDG 8.5). World food prices in the scenarios rise only slightly, but regionally and for more vulnerable parts of the population, this could be problematic (SDG 2.1). Food security concerns also arise, through reduced growth in per capita calorie consumption for the poor (SDG 2.2). Finally, the alternative sustainable transition pathways towards a climate-neutral economy (2DG and 1.5DG) do not produce a noticeable change in real income inequalities (SDG 8.1).

Figure 7.5. Scenarios outcome in SDG indicator metrics for the world

		World						
SDGs	Description of indicator	REF 2015	BAU 2030 vs 2015	BAU 2050 vs 2015	2DG vs BAU 2030	1.5DG+ vs BAU 2030	2DG vs BAU 2050	1.5DG+ vs BAU 2050
2.1	Food prices index	100.1	20	1.6	0.7	0.8	1.1	3.5
2.2	Calories per capita per day	2729.8	6.7	10.1	-0.2	-0.7	0.0	-0.8
2	Food production (million metric tons)	11235.3	27.9	58.2	0.4	0.0	0.4	-0.4
2	Food production per ha	2.3	22.9	47.2	0.5	0.3	0.6	1.0
15.2	Brazil crop land	818107.0	3.1	-1.2	1.9	3.0	2.3	7.9
15.2	Land use	4853.2	4.1	7.4	-0.1	-0.3	-0.3	-1.4
6.4	Abstracted irrigated water use	2996.9	3.0	4.3	0.0	-0.1	-0.3	-1.2
17	Change of imports crude oil and gas in %						-43.4	-71.7
8.4	Advanced biofuels	2.0	1327.3	2398.2	200.2	240.2	319.8	1169.4
8.4	Conventional biofuels	80.0	58.9	264.0	-2.7	-2.3	-19.0	-10.2
7.2	Share renewable energy (change in %)	14.2	150.2	219.1	-8.6	0.0	66.4	90.4
13.2	Climate emissions reductions (Mt)	42807.0	10.3	26.0	-26.0	-33.7	-59.5	-79.1
13.2	Mt CO2e per million € of economic activity	532.1	-27.4	-48.8	-26.2	-33.6	-57.0	-81.3
8.1	Per capita growth (€/person/year)	7481.0	38.7	108.8	-0.2	-0.8	-1.1	-0.8
8.5	Employment agriculture (million persons)	1144.9	-0.3	-12.4	-0.1	-1.2	2.8	-1.7
9.2	Industry's share of employment (change in %)	20.4	2.1	2.1	1.5	0.1	0.8	3.5
17.1	Food import quantity index (change in %)	107.0	26.2	56.1	0.0	-1.5	2.4	0.0

Note: 'BAU 2015' ('Baseline 2015') are absolute values, index or shares for the initial values in the year 2015. 'BAU 2030 vs 2015' and 'BAU 2050 vs BAU 2015' depict the % change in the BAU scenario in 2030 and 2050 versus the initial year 2015. The third block of results shows the % change in the two scenarios 2DG and 1.5DG in the year 2030 compared with the BAU scenario in the year 2030. The fourth block of results shows the % change in the two scenarios 2DG and 1.5DG in the year 2050 compared with the BAU scenario in the year 2050.
Source: Author's calculations

The 2DG scenario underlines the need for a sustainable transition, but it cannot be left entirely to the market as regional income disparities and food security concerns are rising. In the following subsections examples of transboundary effects on specific regions are shown.

Impact on regional food security through higher prices (example Sub-Saharan Africa)

As previously mentioned, world food prices in the scenarios rise only slightly at global level (SDG 2.1) but at an uneven pace across macro-regions. Compared with the BAU, Figure 7.6 shows how food security concerns in Sub-Saharan Africa also arise, through reduced growth in per capita calorie consumption for the poor (SDG 2.2) and increasing food prices as a consequence of the carbon tax (Figure 7.7). Furthermore, food imports are increasing in particular in scenario 1.5DG. It should be stressed, as also visible from Figure 7.6, that strong population growth and the adoption of 'westernised' food consumption patterns is driving unsustainable use of natural resources and putting significant pressure on the biosphere in Sub-Saharan Africa.

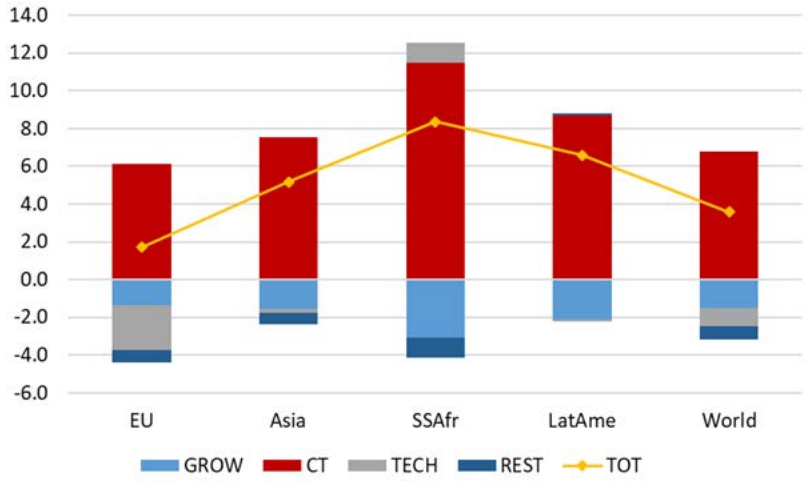
Figure 7.6. Scenarios outcome in SDG indicator metrics for Sub-Saharan Africa

		Subsaharan Africa (SSA)						
SDGs	Description of indicator	REF 2015	REF 2030 vs 2015	REF 2050 vs 2015	SUS vs REF 2030	SUS+ vs REF 2030	SUS vs REF 2050	SUS+ vs REF 2050
2.1	Food prices index	97.2	-5.8	-13.0	0.6	0.6	2.8	9.9
2.2	Calories per capita per day	2036.9	9.9	21.6	-0.2	-0.7	0.0	-2.9
2	Food production (million metric tons)	844.2	64.7	183.1	0.0	0.0	-0.7	-3.2
2	Food production per ha	0.8	45.5	126.7	0.4	0.9	-0.1	-0.3
152	Brazil crop land							
152	Land use	1077.2	13.2	24.9	-0.4	-0.9	-0.6	-2.9
6.4	Abstracted irrigated water use	100.4	13.2	24.9	-0.4	-0.9	-0.6	-2.9
17	Change of imports crude oil and gas in %							
8.4	Advanced biofuels	0.03	1725.7	5057.1	162.0	192.0	329.3	1334.6
8.4	Conventional biofuels	0.04	6670.9	12397.1	-4.6	-5.9	-33.6	-66.3
7.2	Share renewable energy (change in %)							
132	Climate emissions reductions (Mt)	2914.0	59.4	175.3			-67.0	-81.5
132	Mt CO2e per million € of economic activity	1219.5	-24.9	-50.1	-29.8	-40.1	-58.6	-79.7
8.1	Per capita growth (€/person/year)	1343.5	50.7	191.3	-0.4	-1.9	-2.2	-4.3
8.5	Employment agriculture (million persons)	154.5	22.6	17.5	-0.5	-1.0	1.3	-5.1
9.2	Industry's share of employment (change in %)	15.9	10.1	22.5	3.0	10.2	2.9	9.5
17.1	Food import quantity index (change in %)	113.0	48.7	134.5	1.8	1.8	5.3	15.1

Note: 'BAU 2015' ('Baseline 2015') are absolute values, index or shares for the initial values in the year 2015. 'BAU 2030 vs 2015' and 'BAU 2050 vs BAU 2015' depict the % change in the BAU scenario in 2030 and 2050 versus the initial year 2015. The third block of results shows the % change in the two scenarios 2DG and 1.5DG in the year 2030 compared with the BAU scenario in the year 2030. The fourth block of results shows the % change in the two scenarios 2DG and 1.5DG in the year 2050 compared with the BAU scenario in the year 2050.
Source: Author's own calculations.

Comparing the 1.5DG scenario with the BAU by 2050, the following graph shows the resulting impacts on food prices in selected countries/regions with their drivers. For the indicator of food prices, Figure 7.6 presents a series of part-worths (i.e. the weight attached to each individual driver in determining the outcome of said indicator), which highlights the synergies and trade-offs associated with each market driver. From the perspective of food security, Figure 7.7 provides clear evidence of the trade-off arising between environmental responsibility and food security. Greater responsibility for economic activities to internalise their costs (through carbon taxes) to meet emissions standards pushes up the costs of food production. There is a particularly strong impact in Sub-Saharan Africa, which, in the absence of any burden sharing arrangement on the part of developed countries, faces more acute carbon tax driven rises in food prices.

Figure 7.7. Food prices and drivers (1.5DG vs BAU), 2050, in % change

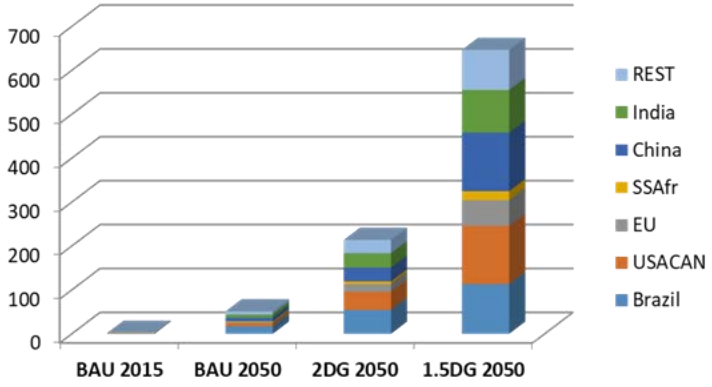


Note: GROWTH = macroeconomic growth; CT = carbon tax; TECH = technology changes in the energy markets arising from energy saving initiatives and energy efficiency; REST = other drivers; TOTAL = net impact of all drivers
Source: Author's own calculations.

Impact on regional land use through renewable bio-based energy demand increase

With a view to energy (SDG 7), the depletion of natural resource stocks is reflected in rising fossil fuel prices, which in turn closes the cost-disadvantage gap between fossil-based and bio-based alternatives. As a result, this increases the commercial viability and the resulting global capacity of conventional and (in particular) advanced biofuels. As Figure 7.8 shows, by 2050 the global advanced biofuels market is twelve-fold higher in 1.5DG than in BAU. This would mean that the share of biomass-based fuels (conventional and advanced) in total fuels/petrol could reach almost 20% in the EU in 2050 in the 1.5DG scenario.

Figure 7.8. Volume of advanced biofuel production in 2050 for BAU, 2DG, 1.5DG, Mtoe



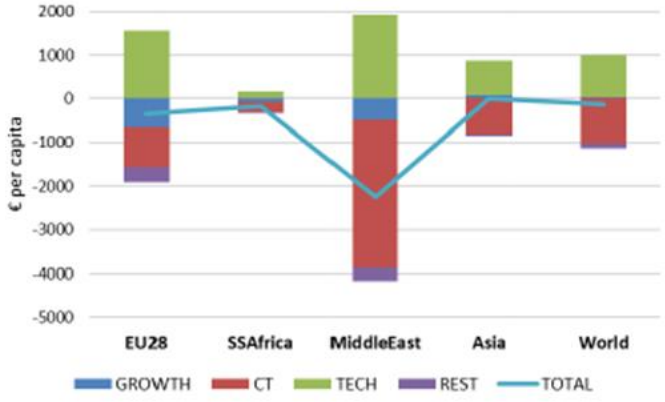
Source: Author's own calculations.

By 2050, the global liquid biofuels market will grow from 342 Mtoe in BAU to 450 Mtoe in 2DG and 908 Mtoe in 1.5DG. While the global volume of conventional biofuels remains relatively stable across the three transition pathways in 2050, more sustainable (i.e. less land-intensive) advanced biofuels, based on non-food lignocellulosic feedstocks (e.g. miscanthus, switchgrass) and residues, are heavily promoted in the 2DG and 1.5DG scenarios. The sustainable scenarios strengthen Brazil's role as a key producer and exporter of conventional and advanced biofuels. The crop land use in Brazil increases by up to 8% with potentially damaging effects on the environment. From a socio-economic and industrial perspective, this creates economic growth and jobs in Brazil.

Impact on regional wealth through fossil energy demand collapse (example the Middle East)

When looking at the oil exporting regions, such as the Middle East, the sustainability scenarios create important improvements on the environmental side, however experiencing a strong decline of per capita real income (more than $2000/year, Figure 7.9). Examining the part-worths, technology-driven (green bar) efficiency gains, driven by investment in energy innovation and savings, lead to increasing incomes. Higher carbon taxes (red bar) on emitting activities raise input and product prices, which depress real incomes. The resulting macroeconomic impacts (blue bar) are negative, as higher green taxes act as a brake on economic activity.

Figure 7.9. Real income per capita and drivers (1.5DG vs BAU), 2050



Note: GROWTH = macroeconomic growth; CT = carbon tax; TECH = technology changes in the energy markets arising from energy saving initiatives and energy efficiency; REST = other drivers; TOTAL = net impact of all drivers
Source: Author's own calculations.

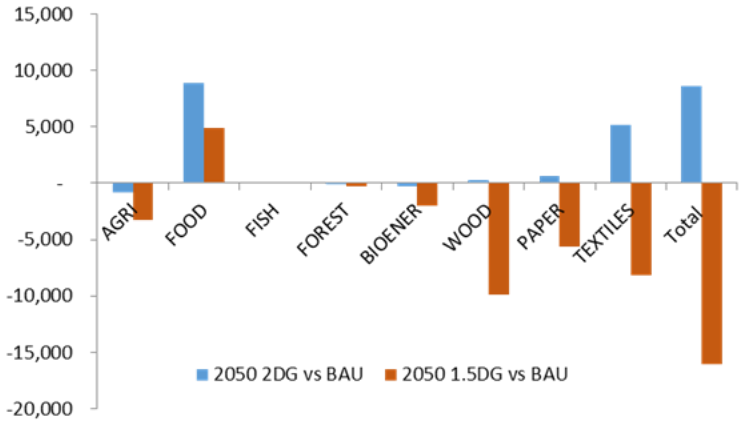
Transboundary effects of a similar policy measure (in this case the carbon tax) can have very different impacts in the same sector depending on the structure of the economy (see non-oil-exporting regions vs the Middle East in Figure 7.9).

Impact on self-sufficiency (example the EU)

The COVID-19 crisis cast doubts about the future of international agrifood trade and initially created fears of a repetition of countries imposing export bans as in the years 2011 and 2012. Nevertheless, there is ample evidence that international agrifood trade is crucial for the international food system. (Kinnunen, Guillaume and Taka, 2020[29]) show that local food crop production can only fulfil demand for less than one-third of the global population.

In this case study, the negative absolute European trade balance in 2DG improves relatively compared with the BAU in 2050. The food and textile sectors benefit most from this scenario. In the 1.5DG scenario, almost all sectors, apart from the food industry, experience a stronger increase in imports than in exports (or a reduction in the latter). The main reasons for these market shifts are increased competitiveness in other world regions, partly due to comparative advantage in non-EU bioenergy markets, and greater marginal land productivity improvements in non-EU regions arising from lower temperature increases. It should be noted that the results are subject to large uncertainties, not least because trade flows are mostly only a small share of total production and can therefore impact strongly on the trade balance.

Figure 7.10. Change of EU trade balance in million euros

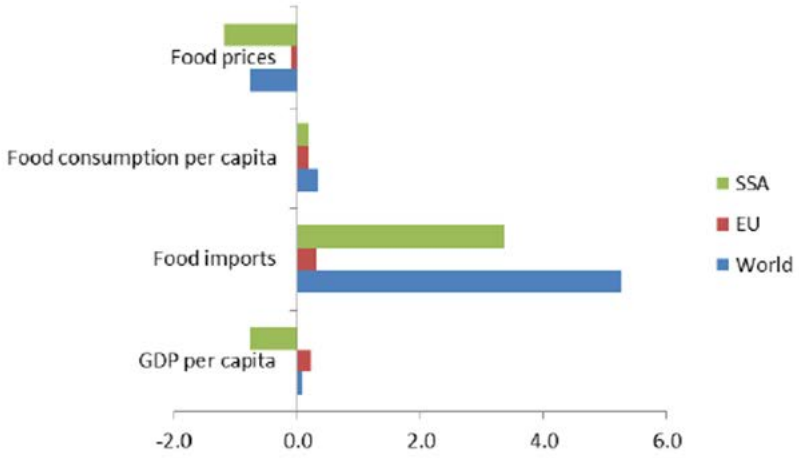


Source: Author's own calculations.

Impact of policy measures: example trade liberalisation

In this section we illustrate further possibilities in analysing potential policy measures with transboundary impacts, for instance a multilateral trade liberalisation of 50% on merchandise trade is assumed on top of the scenarios presented above. As an example, results are shown for the 1.5DG+liberalisation scenario, which again reveals trade-offs. Food prices decrease as expected, by as much as 1% for SSA, and food consumption improves slightly. Food imports (exports not shown) also rise, and there is improved access to third markets. It could be debated whether a higher food import quota has advantages for certain world regions. Overall per capita, GDP would rise; however, for SSAfrica a slight decrease of almost 1% is observed. Nevertheless, it should not be concluded that developing countries in general would not benefit from trade liberalisation.

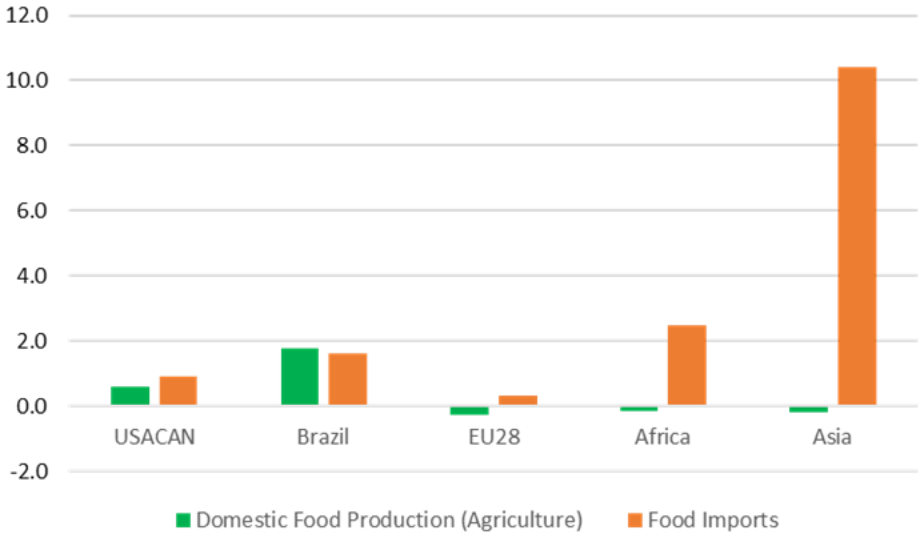
Figure 7.11. Change (%) in selected indicators, 2050 1.5DG+liberalisation vs 1.5DG, in SSAfrica, EU and globally



Source: Author's own calculations.

Bilateral trade flows could be analysed in detail to identify the origin of transboundary impacts. Another possibility is to compare the regional changes of domestic food production and food imports as shown in Figure 7.12. While key food importers such as Africa and Asia increase their food imports due to trade liberalisation (and slightly reduce the domestic food production), exporting regions such as Brazil and USACAN show an increase in their own agricultural production, thus supplying the global market. It should be noted that agrifood trade is only a small percentage of agricultural production.

Figure 7.12. Change (%) of Domestic Food Production (Agriculture) and Food Imports, 2050 1.5DG+liberalisation vs 1.5DG, selected countries



Source: Author's own calculations.

Conclusion: challenges and opportunities

The examples illustrate that long-term sustainability policies, but also more short-term COVID-19 recovery solutions, need to be green *and* inclusive, with transboundary impacts always in sight and a truly joint global effort.

It also shows that single targeted policies cannot achieve multiple policy objectives. The employed instrument of a carbon tax is a good example of the trade-offs that policy imposes on the world (green vs food security/economy). The case study presented also demonstrates the importance of a global and spatially disaggregated approach to allocate the impacts to countries and specific sectors. Indeed, the results suggest that poorer countries cannot be expected to manage the transition on their own, requiring burden- and knowledge-sharing efforts by wealthier partner countries. In relation to this, further research should look into options for how the revenue from the carbon taxes could be redistributed (double-dividend). This also needs to be backed up by the co-responsibility of consumers (responsible, sustainable consumption patterns) and by governments with longer-term sustainable visions as well as international cooperation (as we are now seeing with COVID).

To conclude, within a single coherent closed global system, this class of economy-wide global simulation model reconciles multiple market drivers with finite resource, technology and sustainability conditions. In this way, the implications of different pathways of human development, in terms of price effects and resource reallocations, are fully internalised within the model. Thus, this approach is designed to identify potential synergetic ('win-win') outcomes, which are needed more than ever to keep up with the challenge of implementing the UN 2030 Agenda.

Ongoing model developments to include footprints for land, water, energy and emissions are expected to improve the understanding of transboundary environmental impacts, for instance through food consumption (Philippidis et al., 2021[30]). Further developments to enumerate non-market social indicators (e.g. education, health) within a market simulation model are also needed. This may involve a combination of statistical analysis of historical panel datasets to understand the key drivers of social indicators with, where possible, the use of best-knowledge future projections of social indicators from secondary data sources integrated within the model through calibration under a set of predefined market conditions.

To close, it should be recognised that there is no 'one-size-fits-all' model for the analysis of the SDGs. For example, if one is wishing to examine the impacts of global transition pathways at a higher degree of spatial granularity (i.e. by activities and localities), then a recourse to bottom-up methods (i.e. LCA, biophysical and economic regional models), possibly even through a model linkage exercise, could be seen as a sensible strategy (although this also carries uncertainty through the harmonisation of the structural assumptions and different data sources inherent within each of the modelling approaches).

References

Bartelings, H. et al. (2020), *Aquaculture Modelling in a General Equilibrium Framework. An Application for the EU*, https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=6092. [26]

Boulanger, P. et al. (2016), "Russian Roulette at the Trade Table: A Specific Factors CGE Analysis of an Agri-food Import Ban", *Journal of Agricultural Economics*, Vol. Vol. 67(2), pp. pp. 272-291. [13]

Boulanger, P. et al. (2018), "Impacts of a NoCAP Scenario on Sub-Saharan Africa", presented at the 30th International Conference of Agricultural Economists, https://www.researchgate.net/publication/328354599_Impacts_of_a_NoCAP_Scenario_on_Sub-Saharan_Africa. [23]

EC (2020), *A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system, Brussels, 20.5.2020, COM(2020) 381 final.*. [8]

EC (2020), *Delivering on the UN's Sustainable Development Goals – A comprehensive approach, Brussels, 18.11.2020, SWD(2020) 400 final.*. [9]

EC (2019), *The European Green Deal, Brussels*. [7]

European Union (2011), *DIRECTIVE 2011/92/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment*, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:026:0001:0021:EN:PDF. [6]

FAO (2019), *The State of Food and Agriculture 2019 – Moving forward on food loss and waste reduction*. [16]

IPBES (2019), *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the intergovernmental science-policy platform on biodiversity and ecosystem services*, in Arneth, A. et al. (eds), IPBES secretariat, Bonn, https://doi.org/10.5281/zenodo.3553579. [1]

IPPC (2019), "An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems", in Shukla, P. et al. (eds.), *Climate Change and Land*, https://www.ipcc.ch/srccl/. [2]

Keramidas, K. et al. (2018), *Global Energy and Climate Outlook 2018: Sectoral mitigation options towards a low-emissions economy – Global context to the EU strategy for long-term greenhouse gas emissions reduction*, Publications Office of the European Union, Luxembourg. [21]

Kinnunen, P., J. Guillaume and M. Taka (2020), "Local food crop production can fulfil demand for less than one third of the population", *Nature Food*, Vol. Vol. 1, pp. pp.229-237, https://doi.org/10.1038/s43016-020-0060-7. [29]

Kriegler, E. (ed.) (2018), *Transformations to achieve the sustainable development goal - Report prepared by The World in 2050 Initiative*, Luxenburg: International Institute for Applied Systems Analysis (IIASA), pp. 69-105, https://iiasa.ac.at/web/home/research/twi/TWI2050_Report_web-small-071018.pdf. [20]

Kuiper, M. et al. (2018), *Exploring the impact of alternative population projections on prices, growth and poverty developments – Background paper to the unctad-fao commodities and development report 2017, commodity mark*. [15]

M'barek, R., J. Barreiro-Hurle and P. Boulanger (2017), *Scenar2030 - Pathways for the European And Agriculture and Food Sector Beyond 2020*, Publications Office of the European Commission. [14]

M'barek, R., G. Philippidis and T. Ronzon (2019), *Alternative Global Transition Pathways to 2050: Prospects for the Bioeconomy - An application of the MAGNET model with SDG insights*, Publications Office of the European Union, http://dx.doi.org/10.2760/594847. [12]

Oberle, B. (ed.) (2019), *Global Resources Outlook 2019 – Natural Resources for the Future We Want, a report of the International Resource Panel, United Nations Environment Progr*, United Nations Environment Progrogramme, https://www.resourcepanel.org/reports/global-resources-outlook. [3]

OECD (2019), *Measuring Distance to the SDG Targets 2019: An Assessment of Where OECD Countries Stand*, OECD Publishing, Paris, https://dx.doi.org/10.1787/a8caf3fa-en. [4]

OECD (2016), *Better Policies for Sustainable Development 2016*, OECD, http://dx.doi.org/10.1787/9789264256996-en. [10]

OECD (2016), *Better Policies for Sustainable Development 2016: A New Framework for Policy Coherence*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264256996-en. [27]

Philippidis, G. et al. (2021), "Eating your greens: a global sustainability assessment", *Resources, Conservation and Recycling*, Vol. 168, p. 105460, http://dx.doi.org/10.1016/j.resconrec.2021.105460. [30]

Philippidis, G. et al. (2019), "Waste not, want not: A bio-economic impact assessment of household food waste reductions in the EU", *Recources, Conservation and Recycling*, Vol. Vol 146, pp. pp. 514-522, https://www.sciencedirect.com/science/article/pii/S0921344919301788. [24]

Philippidis, G. et al. (2020), "Snakes and ladders: World development pathways' synergies and trade-offs through the lens of the Sustainable Development Goals',", *Journal of Cleaner Production*, Vol. 267, https://doi.org/10.1016/j.jclepro.2020.122147. [17]

Report, J. (ed.) (2019), *Assessing the impacts of the EU bioeconomy on third countries*, Publications Office of the European Union, http://dx.doi.org/10.2760/304776, JRC117364. [25]

Riahi, K. (2017), "The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview', Global Environmental Change", Vol. 42, pp. 153-168. [19]

The World in 2050 Initiative (ed.) (2018), *Transformations to Achieve the Sustainable Development Goals*, International Institute for Applied Systems Analysis (IIASA),, http://www.twi2050.org. [28]

UN (2020), *SDG Good Practices - A compilation of success stories and lessons learned in SDG implementation*, https://sdgs.un.org/sites/default/files/2020-11/SDG%20Good%20Practices%20Publication%202020.pdf. [11]

United Nations (2017), *Convention on Environmental Impact Assessment in a Transboundary Context*, http://www.unece.org/fileadmin/DAM/env/documents/2017/EIA/Publication/1733290_pdf_web.pdf. [5]

Wageningen Economic Research, W. (ed.) (2019), *MAGNET - a team-based modular CGE approach for coherent cross-cutting policy assessments, , Wageningen University & Research; EU conference on modelling for policy support, 26 Novem*, https://ec.europa.eu/newsroom/know4pol/document.cfm?doc_id=64023. [18]

Weitzel, M. et al. (2019), "Model-based assessments for long-term climate strategies", *Nature Climate Change*, Vol. Vol. 9,345e347, https://doi.org/10.1038/s41558-019-0453-5. [22]

8 Assessing transboundary issues through a systemic lens: Insights and proposals from EEA sustainability assessment reporting

Lorenzo Benini, Cathy Maguire, Tobias Lung and Lale Karayaka
European Environment Agency (EEA) - Integrated Assessments for Sustainability

The European Environment Agency (EEA) has been increasingly adopting systemic approaches to analyse the complex interrelations at the core of persistent environmental problems and sustainability challenges. Such systemic knowledge is fundamental to support the implementation of the European Green Deal and 2030 Agenda objectives. This chapter introduces a systematic and systemic approach that can support the identification and assessment of SDG spillover effects between the EU and the rest of the world. The approach is operationalised by focusing on three complementary analytical lenses that help identify transboundary impacts.

Europe, as well as other parts of the world, faces persistent environmental challenges that are rooted in decades of unsustainable development trajectories with respect to the fundamental systems of production and consumption underpinning modern societies (EEA, 2019[1]). The last 70 years mark a unique period in human history in terms of human-induced global change and economic activity (Steffen, W. et al., 2015[2]). While this has delivered substantial improvements in living standards for millions of people, it has caused unprecedented degradation of ecosystems and loss of biodiversity, human-induced changes to the global climate system and severe pollution and health issues (IPCC, 2018[3]; IPBES, 2019[4]).

Global sustainability frameworks such as planetary boundaries conclude that the unprecedented human alterations of several of the Earth's key biophysical systems have resulted in a high risk of abrupt large-scale and irreversible Earth system changes. In other words, humanity has left its 'safe operating space' (Rockström, J. et al., 2009[5]; Steffen, W. et al., 2015[2]). A recent study by the European Environment Agency (EEA) has explored ways of defining European shares of the global safe operating space and analysing Europe's performance against such shares. The analysis concludes that, irrespective of which normative approach is applied to define a 'European safe operating space', Europe's consumption-based footprints massively transgress the limits for several of the planetary boundaries. The study points in particular to the food system as a core driver of unsustainability, as well as to the substantial environmental pressures Europe exerts outside its own territory through European consumption patterns (EEA and FOEN, 2020[6]).

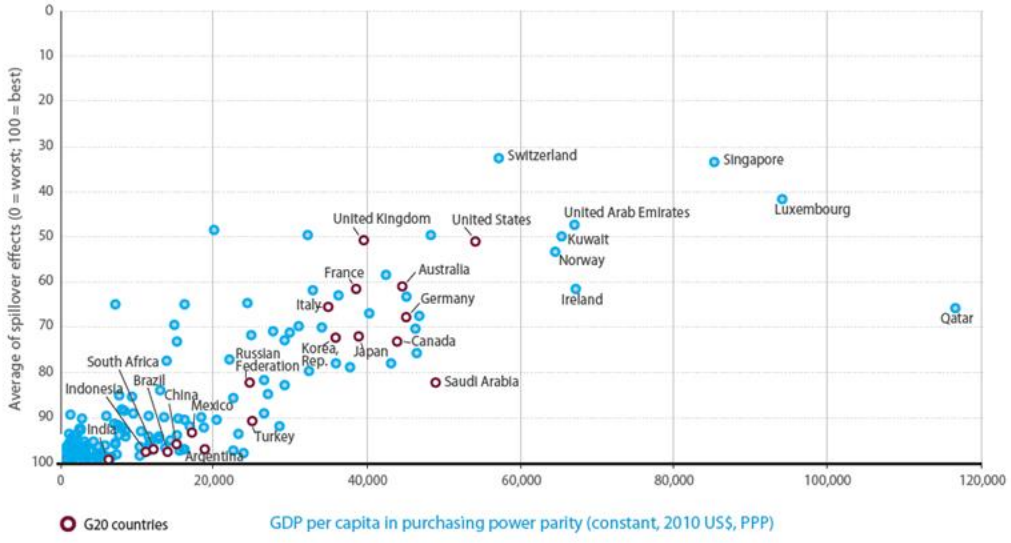
The systemic character of Europe's environmental challenges helps explain the limitations of established environmental governance approaches in delivering needed change. Europe is intertwined with the rest of the world in numerous ways (trade, financial flows, geopolitical processes, etc.). This means that Europe and its environment are influenced by multiple drivers of change at various scales and, in turn, Europe impacts environmental, social, economic developments on other parts of the world (EEA, 2020[7]). Thus, challenges can only be fully resolved by addressing environmental, social, economic and governance dimensions on the European and global scales.

The transboundary impact of SDG action at national or regional level is still one of the greatest challenges against progress towards the SDGs (SDG Watch Europe, 2019[8])(SDG Watch Europe, 2019). Spillover effects associated with SDG implementation are increasingly recognised (e.g. (Hoff et al., 2019[9]); (Sachs et al., 2019[10])), and some countries, such as Sweden and Germany, have begun to reflect spillovers in their strategies for SDG implementation (Schmidt-Traub et al., 2019[11]) However, in most cases monitoring of progress towards the SDGs and national strategies largely ignores spillover effects (Schmidt-Traub et al., 2019[11]), as an approach to systematic assessment of transboundary effects is lacking. The recently developed spillover index – an assessment tool used in the context of the 'Sustainable Development Report 2019' (Sachs et al., 2019[10]) – is an attempt to address this gap. It indicates that high-income countries, including European countries, indeed generate high environmental and socio-economic spillover effects (Figure 8.1).

The European Union (EU) and its Member States declared their full commitment to implementing the 2030 Agenda and to advancing its implementation globally through the full range of their external actions (EU, 2019[12]). Policy coherence is also at the core of the EU's Policy Coherence for Development, a key pillar of the EU efforts towards development cooperation (EU, 2019[12]). However, a great deal needs to be done to achieve full integration and consideration of trade-offs and synergies to its internal and external policies. So far, the EU´s ambition to remain a frontrunner on SDGs has retained an imbalanced approach focused on domestic action. For example, monitoring of EU progress towards the SDGs by Eurostat does not include transboundary effects and no SDG indicators on transboundary effects have been developed. Achieving the 2030 Agenda as well as the European Green Deal (EGD) in the EU will require cross-cutting action to reduce Europe's overall environmental footprint (domestically and abroad) and transformation of the societal systems that drive environmental pressures.

Against this backdrop, this paper introduces a systematic and systemic approach that can support the identification and assessment of SDG spillover effects between the EU and the rest of the world countries. The approach is operationalised by focusing on three complementary analytical lenses that help identify transboundary impacts, including synergies, complementarities and trade-offs: (1) drivers of change and global megatrends assessments; (2) environmental footprint approaches; and (3) systems assessments, with a particular focus on the food system. The remainder of the paper will present the methodological approach and illustrate the application of the three analytical lenses.

Figure 8.1. Average spillover score against Gross Domestic Product (GDP) per capita in purchasing power parity



Source: Adapted from 'Sustainable Development Report 2019' (Sachs et al., 2019[10]).

Assessment of the EU's transboundary interactions: a systematic approach

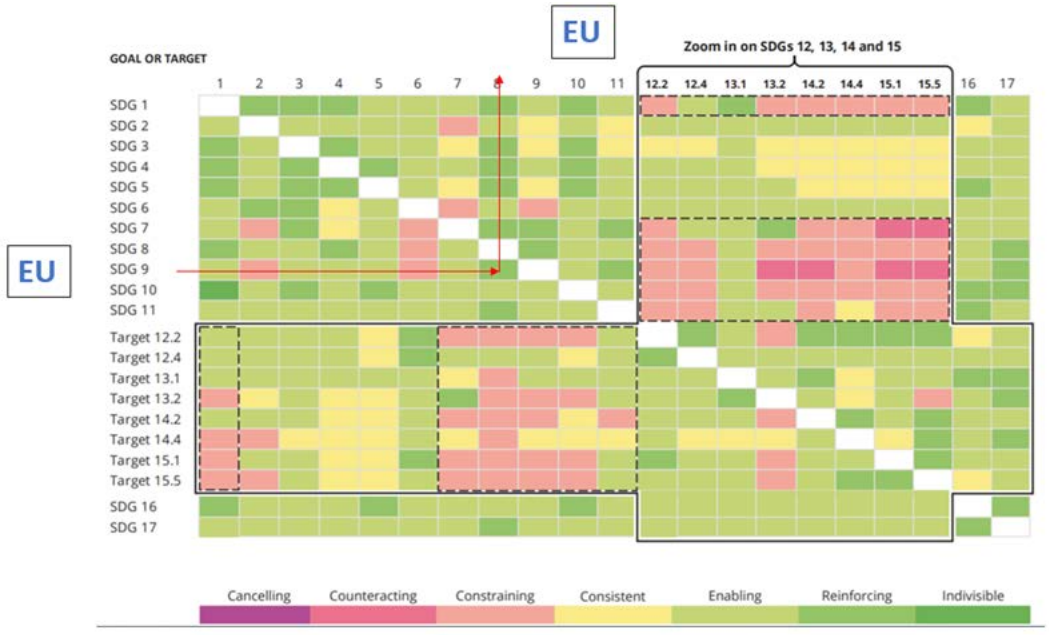
Overview of the SDGs synergies and trade-offs assessment approach

Prompted by the increased understanding of the systemic and transboundary nature of global and European sustainability challenges, the EEA is currently exploring an approach to the systematic investigation of the transboundary implications associated with the achievement of SDGs in Europe. The proposed methodology builds on the analytical approach developed by the Stockholm Environment Institute (SEI) (Weitz et al., 2017[13]; Weitz, Carlsen and Trimmer, 2019[14]; Weitz et al., 2019[15]) for assessing the interactions between SDGs (i.e. synergies and trade-offs), according to which the SDGs' interactions are categorised on the basis of their character (synergistic or counteracting) and strength, on the basis of expert judgement expressed on a 7-point scale ranging from -3 to +3 (see (Nilsson, Griggs and Visbeck, 2016[16])), and benefits from three analytical lenses (see next section). An application of the method was developed by SEI and the EEA (Weitz et al., 2019[15]) in support of the EEA's '*State and Outlook of the European Environment Report 2020*' (SOER 2020), with a focus on the systemic effects associated with the implementation of environmental SDGs (SDGs 12, 13, 14 and 15).

The method belongs to the class of 'argumentative/expert judgement' approaches, as indicated by (Miola et al., 2019[17]), as the assessment of the nature of the interactions existing among targets is largely based on a combination of literature review and group-based expert judgement. This implies that each of the

interactions existing between the SDGs is systematically assessed on the basis of the scoring system (-3 to +3, ranging from 'cancelling' to 'indivisible', respectively, see Figure 8.2). The results constitute a matrix of synergies and trade-offs existing between SDGs on a given geographic scale. The outcomes can be represented in a heat map that signals potential trade-offs (pink to violet) and synergies (light green to dark green) as well as consistency (yellow). The outcomes enable the identification of areas that deserve particular attention for policy coherence by highlighting which targets are most and least influential for making progress on the SDGs, where there are critical trade-offs and synergies, and where stakeholders have shared or conflicting interests. This is useful to guide priority-setting and cross-sector collaboration for implementing the SDGs (EEA, 2019[1]).More sophisticated analysis based on network analysis can also highlight second order interactions that may not be immediately captured by looking at direct interactions alone (Weitz et al., 2019[15]).

Figure 8.2. Synergies and trade-offs between SDGs in the European Union



Note: The granularity of the assessment was increased to cover selected targets within SDGs 12 to 15 given the focus of the assessment, i.e. European Environment, State and Outlooks (SOER 2020).
Source: SOER 2020 https://www.eea.europa.eu/soer/2020 (EEA, 2019[1]), based on (Weitz et al., 2019[15]).

Extended approach for exploring transboundary impacts

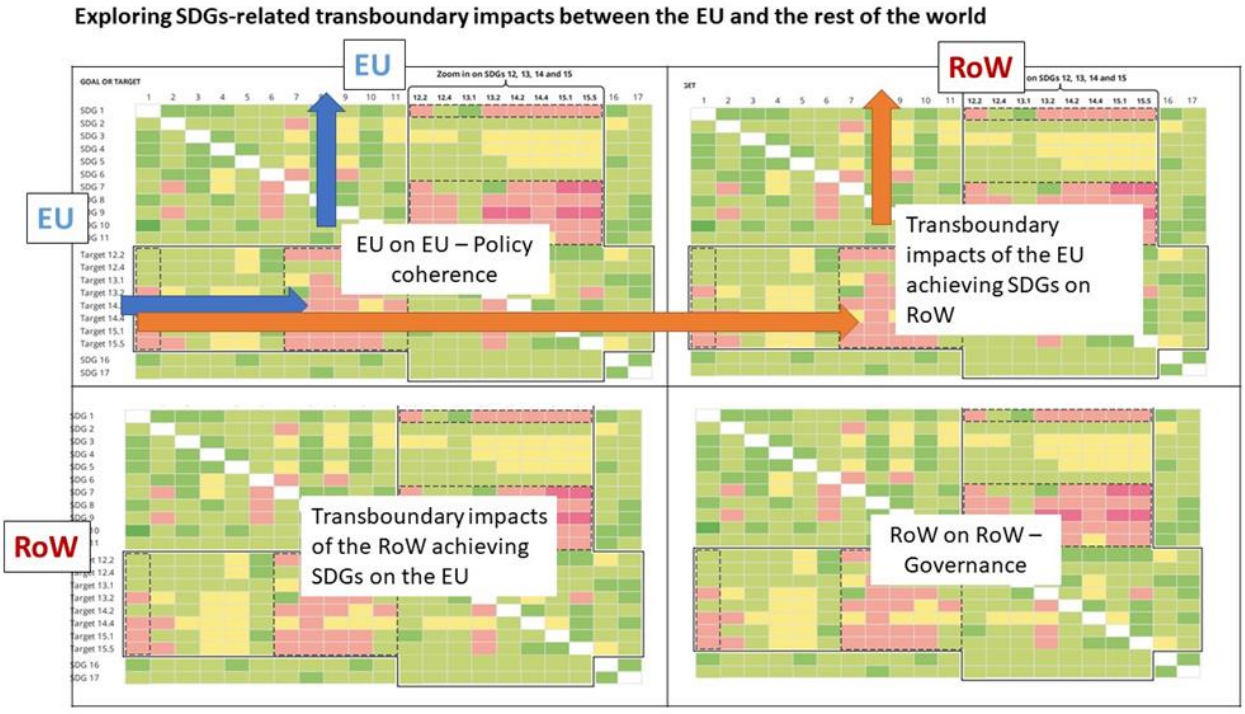
The approach presented in this paper builds on what was developed by (Weitz et al., 2019[15]).by further expanding its scope. By including a second geographic entity beyond the EU, i.e. the rest of the world countries (RoW), the methodology can account for cross-impacts across SDGs and across different geographical scales. In particular, the approach enables the assessment of the following interactions: the influence of the EU's achievement of SDGs on SDG achievements in the rest of the world; the influence of the achievement of SDGs in the rest of the world on the achievement of SDGs in the EU; and the mutual influence of SDG achievement within other world regions.

Figure 8.3 provides a graphical illustration of the approach. The top-left quadrant (Q1) represents the SDG interactions within the EU (as from (Weitz et al., 2019[15])), with the other quadrants explicitly assessing transboundary interactions, the focus of this paper. The top-right quadrant (Q2) identifies transboundary effects associated with the achievement of SDGs in the EU and their achievement in the RoW. The bottom-

left quadrant (Q3) identifies what could be the implications for the achievement of SDGs in the European Union, were the SDGs achieved in the RoW. The bottom-right quadrant (Q4) assesses the interactions occurring between SDGs in regions outside the EU.

The advantages and limitations of this approach are presented in the following sections and illustrated by means of three analytical lenses used by the EEA in integrated assessment and described below in relation to their relevance and usefulness in supporting the identification of synergies and trade-offs in quadrants 2, 3 and 4. Overall, this methodology provides an entry point for mapping critical trade-offs, synergistic effects as well as identifying where stakeholders may have shared or conflicting interests. On that basis, opportunities for improved policy coherence and international governance can be identified and explored, while trade-offs are anticipated and managed.

Figure 8.3. Visualisation of SDGs' transboundary impacts across multiple scales (i.e. EU and rest of the world) by means of synergies and trade-offs analysis



Note: The heat maps are for illustrative purposes only and do not represent actual results excluding Q1.
Source: EEA

Illustration of the lenses and systematisation of knowledge

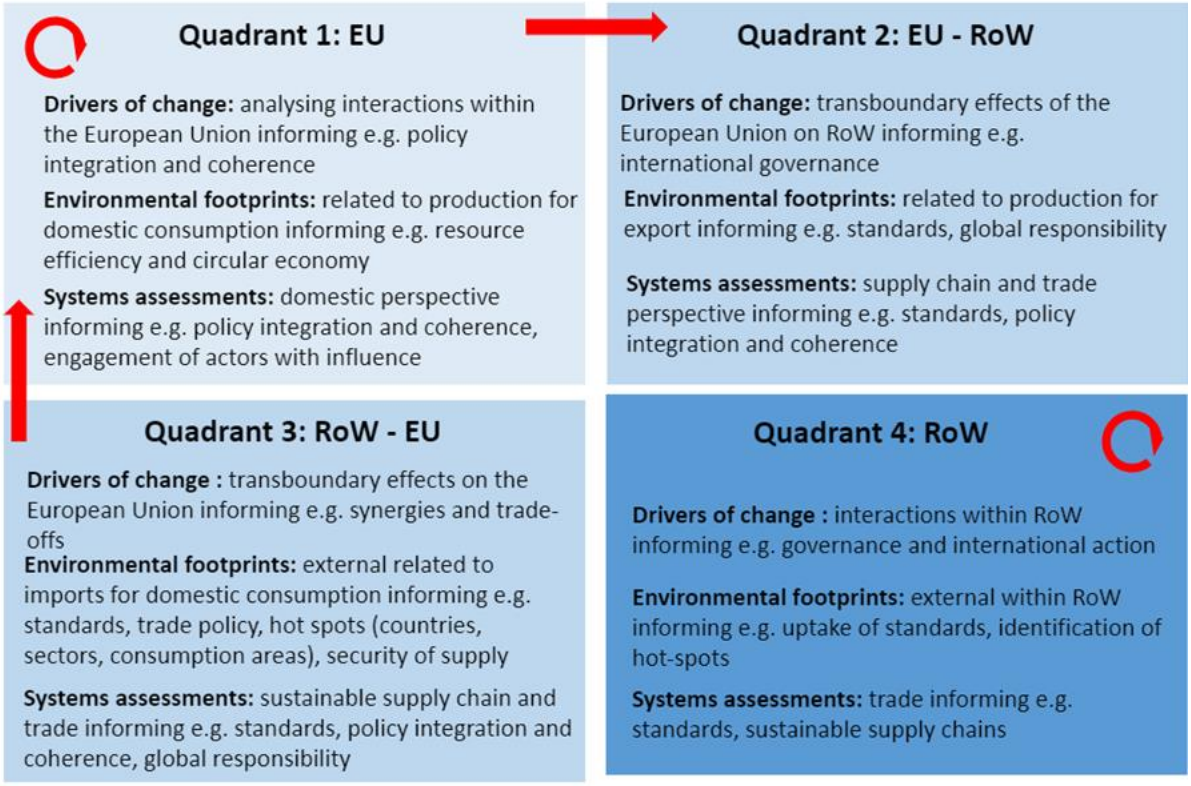
As indicated in the introduction, an improved understanding of the sustainability implications of transboundary impacts is necessary to support the design and implementation of effective responses. The methodology illustrated in this paper aims to contribute to improving understanding by building on the insights provided by three systemic lenses used by the EEA, namely:

- Drivers of change and global megatrends assessments (EEA, (2015[18]; EEA, 2020[19]));
- Environmental footprints ((EEA, 2019[1]) and background studies); and
- Systems assessments (illustrated by the food system) (EEA, (2017[20]; EEA, 2019[1])).

The specific contributions that each analytical lens makes to understanding transboundary impacts is shown in Figure 8.4 and further elaborated below. Each analytical lens can be used to inform specific policy instruments such as standards; cross-cutting policy domains such as the circular economy; as well as improving broader policy integration and coherence through the identification of synergies, complementarities and trade-offs.

While each lens has its own strengths and limitations, their use in combination provides a more comprehensive picture across sustainability dimensions, geographic scales and time frames. Drivers of change analysis enable the identification and characterisation of transboundary impacts. Environmental footprints provide a quantitative measure of selected impacts including the total environmental pressures related to EU consumption, as well as an accounting framework that enables the integration of environmental, economic and social information. Finally, system assessments inform responses by providing a framework that improves understanding of where and how to intervene. The outputs of each analysis are different in character. They are qualitative and quantitative and address different geographic and time scales. However, integrated assessment processes such as SOER 2020, which involve the assessment of diverse types of knowledge in combination with expert judgement, enable the integration of these outputs and place them in a wider and policy-relevant context.

Figure 8.4. Assessing transboundary impacts through different analytical lenses can inform European policy and action



Drivers of change and global megatrends assessments

It is increasingly recognised that reporting on prospects for the environment in the EU cannot solely rely upon environmental information. Indeed, many drivers of change that impact the environment and sustainability in Europe are not of an environmental nature or of European origin in an increasingly

interconnected world. They are, however, of crucial importance in determining a long-term environmental and sustainability outlook (EEA, (2015[18]; EEA, 2019[1])).

The analysis of drivers of change builds on previous EEA reports on EU-global interactions (EEA, (2010[21]; EEA, 2015[18])) and presents a synthesis of global and EU-scale megatrends with illustrations of key emerging trends, wild cards and uncertainties, with the aim of informing about ongoing, emerging and potential future developments. Understanding these patterns and interconnections provides insightful information concerning possible future scenarios and implications, so as to better support policy makers in anticipating issues, managing risks and identifying opportunities.

Given the broad scope and diverse nature of the drivers of change analysed (i.e. demographic, economic, environmental, geopolitical, technological and social) as well as the explicit consideration of multiple geographical scales, this lens provides useful insights for characterising transboundary impacts occurring at the interface between the European Union and the rest of the world (i.e. Quadrants 2 and 3).

Environmental footprints

Production and consumption in the EU can be assessed using different accounting perspectives (see (EEA, 2013[22])). The production perspective includes environmental pressures exerted within the EU (Quadrants 1 and 2). However, the EU's economy requires both domestic and international inputs. The consumption perspective and indicators such as environmental footprints are used to capture the international dimension and include the total environmental pressures created by domestic consumption irrespective of where they geographically occur (Quadrants 1 and 2).

Substantial progress has been made in quantifying the environmental footprints embodied in internationally traded products through approaches such as multiregional input-output (e.g. (Lenzen et al., 2013[23]; Timmer et al., 2015[24]; Tukker et al., 2016[25])) or life cycle assessment (Frischknecht, R. et al., 2018[26]; Sala et al., 2019[27]). This more comprehensive picture of the EU's environmental performance, including its contribution to environmental pressures and degradation in other parts of the world, is important to informing coherence between internal and external policies, crucial to achieving the 2030 Agenda.

Environmental footprints also inform policy relating to improving the sustainability of complex supply chains. They provide information on the total environmental pressures related to particular countries, sectors, product groups and consumption areas, for example food. In addition, the accounting framework also enables the integration of environmental and socio-economic data which can provide insights regarding synergies and trade-offs across environmental, economic and social dimensions.

Systems assessments – Food system

The many dimensions of societal systems – such as those that meet our needs for food, energy and mobility – create complex analytical and policy challenges. For example, the interdependence of dimensions implies that efforts to alter one (e.g. reducing environmental pressures) are very likely to produce impacts elsewhere (e.g. affecting employment, investments and earnings) (EEA, 2017[20]) . The food system has particularly far-reaching impacts on natural systems and people's health and well-being and influences the outcomes across a range of SDGs, in particular SDGs 2, 12, 14 and 15. It is a cross-cutting issue that connects the goals as the 2030 Agenda cannot be implemented effectively without eliminating hunger, achieving food and nutrition security and improving the health of the world's population.

Achieving system transitions will depend on coherent contributions across policy domains. This complexity requires a framework to better understand where and how to act. Systems assessments can provide such an analytical framework and include the development of system maps, identification of interactions and interdependencies as well as leverage points for intervention. Recognising the food system as a complex adaptive system, which comprises multiple actors with diverse interests and values, provides a richer understanding of the system and the associated sustainability challenges (EEA, 2016[28]). Understanding

the patterns, processes and actors involved allows for more coherent and effective policy interventions to reduce environmental pressures along the entire value chain, including transboundary impacts, with potential co-benefits for human health and well-being.

Illustration of the methodology applied to synergies and trade-offs for transboundary impacts

In this section, Quadrants 1 to 3 are characterised by using the three lenses as introduced above. While Quadrant 1 refers to cross-impact analysis for the EU, hence not directly to transboundary impacts, it is introduced as it represents a full-scale application of the methodology (see (EEA, 2019[1]) and (Weitz et al., 2019[15])). The examples are also helpful for illustrating the nature of the insights provided by this framework.

Quadrant 1 – Synergies and trade-offs within the European Union

As reported in SOER 2020 (EEA, 2019[1]), the SDG framework reveals many synergies. However, the relationship between SDGs 12 –15, crucial for environmental protection and climate action, and other SDGs (such as SDGs 1 and 7 –11) potentially involve trade-offs. The main reason is that increased income (SDG 1), better access to energy (SDG 7), more economic growth (SDG 8) and industrial and infrastructure investments (SDG 9) tend to increase overall consumption and natural resource extraction. They therefore make it harder to achieve targets on the efficient use of natural resources (Target 12.2), better management of chemicals and waste (Target 12.4), climate mitigation (Target 13.2) and protection of terrestrial ecosystems and biodiversity (Targets 15.1 and 15.5). Acknowledging these tensions more explicitly reinforces the call for alternative pathways to sustainable development.

An example is provided by the analysis of the food system (EEA, (2017[20]; EEA, 2019[1])). In addition to meeting various societal needs, like the provision of food and nutrition security (SDG 2), contributing to livelihoods along the food supply chain (SDG 8), the food system is responsible for a vast array of impacts on the environment through emissions of pollutants, depletion of resources, loss of biodiversity and degradation of ecosystems in the EU and beyond (IPES Food, 2019[29]) (SDGs 12 to 15), indicating the existence of important trade-offs between SDG 2 and 8 on the one hand and SDGs 12 to 15 on the other. At the same time, unhealthy diets contribute to increasing levels of obesity, and more than half of the EU's population in 2014 was estimated to be overweight. In the EU today, five of the seven biggest risk factors for premature death – high blood pressure, cholesterol and body mass index, inadequate fruit and vegetable intake and alcohol abuse – relate to how we eat and drink (EC, 2014[30]; EEA, 2017[20]; IPBES, 2019[4]) (SDG 3 – Good health and well-being). This points to important synergies between SDG 3 and SDGs 12 to 15: healthy and sustainable diets can contribute to achieving SDG 3, while reducing pressures on the environment (SDGs 12 –15).

Quadrant 2 – Transboundary effect (on the rest of the world) stemming from the achievement of the SDGs in the European Union

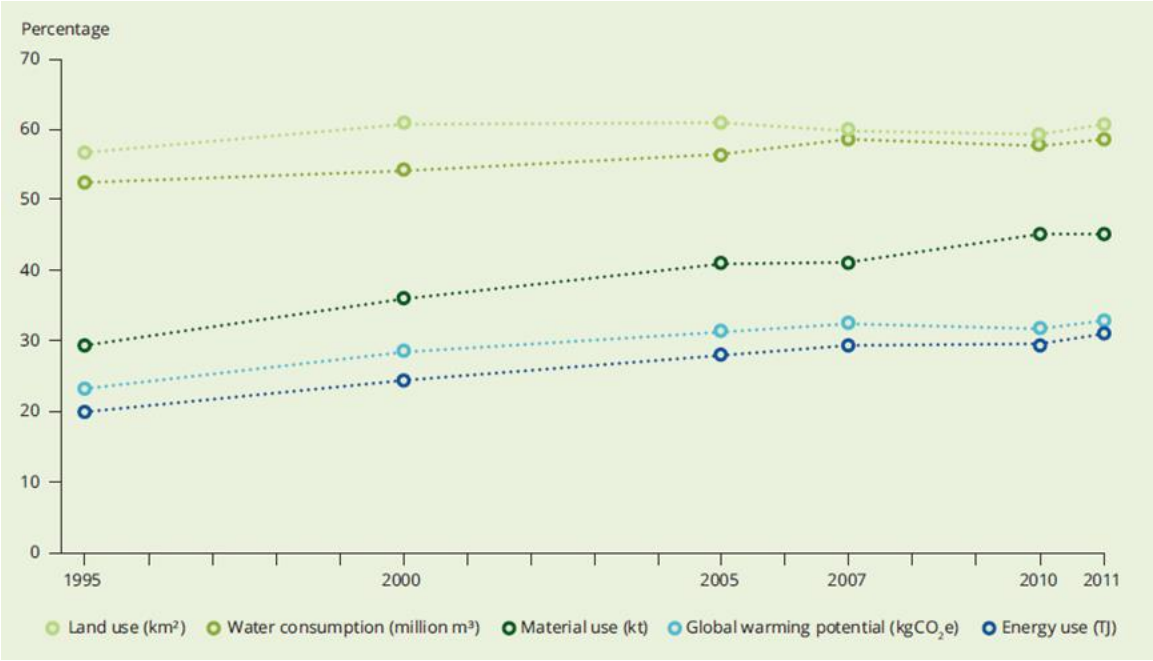
This section builds on the analysis and accounts developed on the geographical scale: 'EU-27 plus Norway, Switzerland, Turkey and the United Kingdom', referred in the text as 'European' and 'Europe', unless specified otherwise. Given the similarity between these findings and those for the EU-27, and considering the illustrative purposes of the application of this lens in the paper, the findings are used to characterise a generic 'European' situation. A variety of transboundary impacts can be identified in this quadrant based on the three lenses indicated above, and an overview is provided below.

First of all, it is important to consider that European consumption patterns are associated with substantial environmental footprints. As reported in SOER (EEA, 2019[1]), carbon, water, land and material footprints per capita are between 1.5 and 2.4 times higher in the EU than at global level (Tukker et al., 2016[25]; Wood et al., 2018[31]). Through trade, European production and consumption patterns contribute significantly to environmental pressures and degradation in other parts of the world. Depending on the type of resource, the associated total environmental footprint of European consumption that occurs outside Europe is estimated to be in the range of 30–60 %. In 2011, this ranged from 31% (energy use) to 61% (land use). Between 1995 and 2011, Europe's footprint increased across all resource or impact categories, with the largest increases being for energy use and material use (see Figure 8.5). However, early estimates for 2012–2015 indicate that overall environmental footprints have further stabilised or slightly decreased (NTNU, 2018[32]). Carbon emissions related to imports grew between 1995 and 2015 with the growing importance of imports from Asia and related pressures in that region (Wood et al., 2019[33]).

With regard to the food system, the share of environmental impacts generated outside the European countries by food consumption of households in European countries also shows an increasing trend between 1995 and 2011. However, compared to the total final demand, the share of resource use and environmental impacts exerted outside European borders is smaller (with the exception of energy use) and the share of added value and jobs generated outside European countries by households' food consumption is larger. In 2011, 16% of the gross value added in the food production chain was generated outside European countries (compared to 11% for total final demand) and 60% of the employment was located abroad. This means that food consumption in European countries generates relatively fewer environmental impacts abroad than the average and creates relatively more added value (ETC-WMGE, 2019[34]). Products with limited supply chains, like food products, are important contributors to impacts induced by imports (Sala et al., 2019[27]).

Overall, Europe is a net importer of commodities such as tropical fruits, coffee, tea, cocoa, soy products and palm oil. The former EU-28 is also the largest importer of seafood and fish products in the world. The largest proportion of food consumed in the EU-28 is still produced within the EU-28 and the majority of EU-28 trade in food and drink products takes place between EU countries. However, European production has an effect outside the EU-28 through the import of feed that is used in both livestock and aquaculture production. In 2013, Europe had net imports of around 27 million tonnes of soybeans and soybean products for oil production and animal feed. This means that Europe is dependent on overseas land for its own production. In 2011, the land footprint of soybean imports was around 11 million hectares, of which 80% was in South America. The vast majority of imported soybeans are genetically modified, which are not permitted for cultivation in the EU. In Brazil and Argentina, expanding soybean cultivation has caused losses of habitat and biodiversity, while fodder production directly competes with Brazil's well-established bioethanol production sector, creating land use conflicts (EEA, 2014[35]).

Figure 8.5. Share of Europe's final demand footprint exerted outside 'European' borders



Note: Geographical coverage: EU-28 plus Norway, Switzerland and Turkey
Source: EEA-ETC/WMGE own calculations based on (Stadler et al., 2018[36]).

In summary, as reported in SOER 2020 (EEA, 2019[1]), key transboundary externalities to be considered in the field of the EU's environment and climate action towards the achievement of SDGs include (Lucas and al, 2016[37]; OECD, 2018[38]):

- unintended consequences of biofuel subsidies (SDG 7) on food prices through competition for land, possibly impacting the food security of the most vulnerable households in developing countries (SDG 2);
- shifting production abroad as a result of stringent EU policies on biodiversity conservation, reduced use of agricultural inputs or climate mitigation (SDGs 2 and 13–15), leading to a potential increase in unsustainable agricultural practices and pollution;
- environmental pressures (e.g. SDGs 6, 7, 12, 14, 15) on resources or conditions in other countries that are attributable to EU consumption (SDGs 8 and 12), for example deforestation in producing countries resulting from EU imports (e.g. palm oil, soybean, exotic woods);
- cross-border impacts of air and water pollution (SDGs 6 and 12);
- adverse impacts of EU reliance on energy-intensive imports (SDG 7) on the decarbonisation efforts of other countries (SDG 13), leading to a potential increase in unsustainable agricultural practices and polluting industries in those countries (SDGs 2, 3, 14, 15). While being coherent and synergistic with climate mitigation globally (SDG 13), there can be trade-offs with the protection of natural capital (SDGs 14 and 15) as renewable energy technologies often rely on a significant amount of raw materials and mining which largely occurs outside the European Union.

The insights provided by the footprint and planetary boundaries reporting (EEA and FOEN, 2020[6]) also suggest that the achievement of some of the SDGs in Europe concerning poverty, hunger, wellbeing and economic growth (SDGs 1, 2, 3 and 8) may lead to an increase in pressures elsewhere and jeopardise the achievement of the 'environmental' SDGs (e.g. SDGs 12, 13, 14 and 15) in exporting countries. There are clearly also many positive externalities, especially those linked to trade, investments, official development

assistance, the diffusion of innovation and exchange of environmental information and knowledge. The EEA's cooperation with the EU's southern and eastern neighbouring countries is a good example of the latter (EEA (2018[39]; 2019[1])).

Quadrant 3 – Transboundary effects (on the European Union) stemming from the achievement of SDGs in the rest of the world

In contrast to the previous quadrant, these interactions are less understood and investigated, but are increasingly more relevant given the change in global power balances and economic relations. An example concerning growing consumerism and resource demand in developing countries and potential implications for the EU is illustrated below.

As reported by the (EEA, 2020[7]), the benefit from a competitive advantage in developing countries because of a cheaper workforce has often meant an increase in labour-intensive manufacturing. Together with access to integrated global production networks, this has led to the rapid emergence of China and other Asian countries as the new 'workshop of the world' (WTO, 2018[40]). Asia is already the world's largest trading region and has the highest continuous growth rate in trade (WTO, 2018[40]). 'South-south' flows between emerging markets doubled their share of global trade during the decade 2005–2015 (McKinsey & Company, 2015[41]). Overall, by 2030, developing countries could be contributing to two thirds of global growth and half of global output, and could be the main destinations of world trade (OECD and DASTI, 2016[42]).

This implies that, across developing countries as well as China, the reduction of poverty (SDG 1) and hunger (SDG 2), improvement of health and wellbeing (SDG 3), access to clean water and sanitation (SDG 6), as well as to energy (SDG 7) enabled by the form of economic and industrial development illustrated above (SDGs 8 and 9) – all positive and synergistic interactions within developing countries (Quadrant 4) – is also driving increased material standards of living. In fact, the rising middle class in developing countries is increasing demand for imported goods.

This represents an opportunity for economic development in the EU, as its economy is increasingly reliant on exports of final products (e.g. food commodities, machinery and cars), potentially creating opportunities for economic growth, jobs and poverty reduction. At the same time, this is likely to require increased production, hence requiring more resources (e.g. energy, land, water, raw materials) and potentially adverse environmental impacts, counteracting policies aimed at achieving SDG 14 and 15, for instance.

If the EU's food system was to respond by increasing its export orientation, this could imply a further establishment of the current 'high volume and low margin' model based on high-tech and intensive agriculture. This trend, together with the current innovation paradigm in EU policies, locks the food system into a vicious cycle of 'techno-fixes' and short-termism that reinforces 'trends towards intensive, large-scale monoculture-based production', motivated by the need to remain competitive on the international market despite their demonstrable harm and trade-offs via environmental and socio-economic issues (IPBES, 2019[4]). This development is likely to lead to potential implications on ecosystems and biodiversity protection and enhancement in the EU, creating an additional burden on life below water (SDG 14) and above land (SDG 15).

Similar to the example above, the increase in consumption levels and increased demand for resources in developing countries is creating new competition for resources, tensions concerning trade and challenges for global governance. As reported by the (EEA, 2020[7]), today there are signs of strain in the global order, with interdependence and the need for collective action conflicting with tensions in the existing multilateral system (ESPAS, 2015[43]) (ESPAS, 2015). This is reflected in a waning of the consensus on the benefits of globalisation and free trade, leading to countries turning away from multilateral agreements towards bilateral or regional trade deals and an increase in protectionist measures (EPSC, 2018[44]), often referred to as 'trade wars'. This trend may also lead to the undermining of current – and act as a barrier to future –

cooperation and agreement on international environmental standards and goals (EPSC, 2018[44]), as well as weakening the role of established institutions (SDGs 16 and 17).

Another example is represented by the achievement of climate and energy objectives (SDG 7 and 13) in countries like China. If a full-scale transformation of the Chinese energy system was to happen without curbing overall energy demand, the competition for those raw materials that enable the transition to renewables (e.g. necessary for batteries, PV panels and wind farms) could hinder the achievement of decarbonisation in the EU (SDG 13). For example, as reported by the (EEA, 2020[7]), a special concern is posed by metals (lithium, cobalt, neodymium, copper and others) needed for the construction of batteries, e.g. to electrify the transport sector, which appear insufficient to meet a global demand (Herrington, R. et al., 2019[45]).

Discussion and conclusions

Added value of the approach and changing policy context

The 2030 Agenda aims for systemic transformation. Improving policy integration and coherence will be essential to achieve sustainability goals. The analytical approaches presented here can support progress in this regard, helping to identify and manage trade-offs and avoid the outsourcing of unsustainable practices that undermine other countries' efforts to achieve the SDGs. It has become common wisdom that sustainable policies and practices in one country or region may have negative spillover effects elsewhere. This shows that the SDGs are truly a shared responsibility and achievable only through multilateralism and global cooperation on multiple scales (Hoff et al., 2019[9]).

With respect to the transboundary impacts associated with the EU's choices, it is important to note that decision-makers and consumers in importing countries are often not fully aware of these displacement effects, partly because of increasingly globalised and complex supply chains that limit awareness concerning the full social, economic and environmental implications of their purchasing decisions (EEA, 2015[18]). In addition, as in other regions, the EU demand for goods and services is growing in proportion to rising levels of affluence (Sala et al., 2019[27]). A consequent increase in global trade would therefore negatively contribute to the achievement of international agreements on climate and biodiversity protection, as it would lead to increased global use of energy and material use and growing environmental impacts (Ekins et al., 2017; Wood et al., 2018).

As reported by the (EEA, 2020[7]), from a policy perspective, focusing solely on the environmental pressures occurring within the EU, without further consideration of additional environmental impacts abroad, can result in an overly positive perception of sustainability. These aspects may substantially hinder the achievement of the SDGs' agenda; therefore, reforms that include impacts associated with trade and trade policies should be included more prominently in the EU's political agenda to address this issue and contribute to the achievement of the SDGs (SDG Watch Europe, 2019[8]).

Recent developments in the political debate and in policy in the EU indicate increasing awareness concerning spillover effects such as indirect land use change associated with 1st generation biofuels and carbon leakage. For example, the introduction of a carbon tax at the EU border was one of the political guidelines introduced by the President of the European Commission (von der Leyen, 2019[46]). As a consequence of that and in view of the EU's increased climate ambition, a Carbon Border Adjustment mechanism for certain sectors is currently being investigated by the European Commission in the context of the European Green Deal (EC, 2020[47]), (EC, 2020[48]). Nevertheless, such awareness is more pronounced in the climate debate than in other areas. For instance, import dependence of materials is mostly understood as potential threats to the EU's security of supply (EC, 2020[49]) and much less as a spillover effect on global biodiversity loss and ecosystem degradation associated with outsourcing highly polluting activities (e.g. mining and refining, intensive agriculture, heavy industry) in non-EU countries.

At the same time, factors outside the direct control of the EU are increasingly gaining importance in shaping the EU's future. As the world is growingly interconnected, increased attention should be paid to developments occurring outside the EU and their implications on its sustainability ambitions. It is fundamental for European policy makers to be aware of these, as recently highlighted by the first Strategic Foresight Report by the European Commission (EC, 2020[49]).

Challenges and opportunities in implementing the approach

The approach proposed in this paper enables the systematic exploration of both dimensions of transboundary effects. The key advantages of this approach that further build upon the work of (Nilsson, Griggs and Visbeck, 2016[16]) as well as (Weitz et al., 2017[13]), are its simplicity, its cross-scale nature and its flexibility. Moreover, its reliance on expert judgement alongside literature review makes it a good candidate for participatory approaches for applications such as strategic foresight and broader engagement with stakeholders.

While the EU is the focus of this methodological proposal, the existence of spillover effects across SDGs and across EU countries is acknowledged. Its application on the country scale could also provide useful insights for policy coherence. For example, the application of the SDG synergies method for country case studies (Weitz et al., 2017[13]); (Weitz, Carlsen and Trimmer, 2019[14]) seems to have led to relevant outcomes concerning countries' policy coherence concerning SDGs.

However, the application of the proposed method for comparisons across single EU Member States needs to take account of factors such as political mandates. The European Commission often speaks for the EU Member States in several international fora (e.g. World Trade Organisation, United Nations General Assembly, United Nations climate negotiations) and has a role in setting legally binding common regulations for all its Member States. Thus, the nature of synergies and trade-offs that can be identified by analysing the EU versus third countries is often different and requires different analytical attention and an analysis of spill over effects across single EU member states.

Therefore, the application of the proposed method at the country scale could follow a multi-scale approach, where the focus would shift across scales in moving from the whole EU to Member States. In practical terms, Quadrant 1 of Figure 8.3 and Figure 8.4 could be further subdivided into 4 sub-quadrants in which SDG achievements in one EU country are compared against the achievement of SDGs in the rest of the EU countries. This analysis could be informed in particular by lenses '2. Environmental footprints' and '3. Systems assessments', as they could highlight issues associated with production and consumption systems, security of supply, bottlenecks and vulnerabilities, outsourcing of economic activity, jobs and related environmental pollution, as well as identify opportunities for policy action by providing a basis for '*priority-setting, cross-sectoral collaboration, and assessing alternative development pathways*' (Weitz, Carlsen and Trimmer, 2019[14]). At the same time, the distinction between intra-EU and extra-EU interactions could also be useful to the identification of the most appropriate policy instruments and governance approaches for action on the country scale.

The main difficulties and limitations of the approach proposed, and even more so in the case of the multi-scale approach proposed above, are represented by the wide range of interactions to be assessed, which increases fourfold (including all quadrants) when adding the RoW to the EU. Its practical implementation in a participatory setting may be hindered by this characteristic, and engagement with stakeholders may be limited to the discussion of the outcomes.

The data, information and knowledge underpinning the assessment of transboundary effects is generally of a distinct and complementary nature. While quantitative assessments (e.g. used in lens 2. Environmental footprint) – often anchored in integrated assessment modelling – provide indications of the scale of the issues at stake, they often fail in describing a comprehensive understanding of the interrelations at play and are often limited by data availability (e.g. like timely multi-regional Input-Output

Tables in the case of environmental footprints). In relation to the latter, it is useful to consider that nowcasting techniques can be used for extending time series through estimates (see (NTNU, 2020[50])) although the results should be interpreted in light of the underpinning assumptions.

On the contrary, qualitative processes based on a systemic understanding of issues are explicitly designed to explore complex interconnections, but the relative scale of different variables is challenging to grasp. Whilst these methods have been often criticised in the past for their lack of numerical precision, there is now a growing recognition of their relevance and adequacy for navigating a growingly interconnected, uncertain and fast-changing world. This is demonstrated, for instance, by increased uptake of foresight in EU policy-making (EC, 2020[49]). Nevertheless, both forms of knowledge (qualitative and quantitative) are defined by, and valid within, certain assumptions and worldviews. Their interplay could turn out to be very useful for informing participatory processes. Qualitative approaches would guide the meaningful application of models by challenging modelling assumptions, for example by pointing to the existence of blind spots. At the same time, sound modelling applications would provide good indications of the magnitude of certain phenomena, facilitating prioritisation. These are an aspect that is important to acknowledge, especially when the outcomes of the analysis are used to support policy-making. Each expert is likely to provide a unique perspective on such complex interactions, depending on both background as well as systems of values and norms. This aspect could also be turned into opportunities for deliberation in the context of participatory processes.

Similarly, while the use of the three lenses presented in this paper could enable the population of many of the cross-interactions within the four quadrants, they may not be sufficient to make full sense of such complexity. Therefore, the use of multiple and complementary lenses would be beneficial for a comprehensive appraisal of transboundary effects (see (Saltelli et al., 2020[51])). How to integrate such different outputs and perspectives is an important consideration in the design of integrated assessment processes, such as the SOER that aims to provide relevant, credible, legitimate and accessible assessments that support policy and decision making.

Further work will explore the feasibility of a full-scale application in view of the development of the EEA knowledge base necessary to fulfil its mandate of providing sound, independent and timely information on the environment to European citizens and policy makers, with the overall aim of supporting sustainable development in the EU and EEA member countries.

References

EC (2020), *2020 Strategic foresight report – Charting the way towards a more resilient Europe*, https://ec.europa.eu/info/strategy/priorities-2019-2024/new-push-european-democracy/strategic-foresight/2020-strategic-foresight-report_en. [49]

EC (2020), *EU Green Deal, carbon border adjustment mechanism*, https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12228-Carbon-Border-Adjustment-Mechanism. [48]

EC (2020), *European Green Deal: what role can taxation play?*, https://ec.europa.eu/taxation_customs/commission-priorities-2019-24/european-green-deal-what-role-can-taxation-play_en. [47]

EC (2014), *EU Action plan on childhood obesity 2014-2020*, European Commission. [30]

EEA (2020), *Drivers of change of relevance for Europe's environment and sustainability*, European Environment Agency, https://www.eea.europa.eu/publications/drivers-of-change. [19]

EEA (2020), *Drivers of change of relevance for Europe's environment and sustainability*, https://www.eea.europa.eu/publications/drivers-of-change. [7]

EEA (2019), *European Environment Agency - State and outlook 2020 - Knowledge for transition to a sustainable Europe*, European Environment Agency, https://www.eea.europa.eu/publications/soer-2020. [1]

EEA (2018), *EEA framework for international engagement*, Corporate Document No 1/2018, European Environment Agency, https://www.eea.europa.eu/publications/eea[1]framework-for-international-engagement/download (accessed on 29 May 2019). [39]

EEA (2017), *Food in a green light: a systems approach to sustainable food*, European Environment Agency. [20]

EEA (2016), *Seafood in Europe: a food system approach for sustainability*, European Environment Agency, https://www.eea.europa.eu/publications/seafood-in-europe-a-food. [28]

EEA (2015), *The European environment — State and outlook 2015 — Assessment of global megatrends*, https://www.eea.europa.eu/soer-2015/global/action-download-pdf. [18]

EEA (2014), *Resource-efficient green economy and EU policies*, European Environment Agency, https://www.eea.europa.eu/publications/resourceefficientgreen-economy-and-eu (accessed on 22 November 2018). [35]

EEA (2013), *European Union CO2 emissions: different accounting perspectives*, European Environment Agency, http://www.eea.europa.eu/publications/european-union-co2-emissions-accounting. [22]

EEA (2010), *Assessment of global megatrends, The European environment — state and outlook 2010*, European Environment Agency. [21]

EEA and FOEN (2020), *Is Europe living within the limits of our planet? An assessment of Europe's environmental footprints in relation to planetary boundaries*, European Environment Agency & Federal office for the environment. [6]

EPSC (2018), *'Geopolitical outlook for Europe – Confrontation vs Cooperation'*, PSC Brief, European Political Strategy Centre, https://ec.europa.eu/epsc/sites/epsc/files/epsc_brief_geopolitical.pdf (accessed on 9 June 2018). [44]

ESPAS (2015), *Global trends to 2030: can the EU meet the challenges ahead?*, European Strategy and Policy Analysis System, https://espas.secure.europarl.europa.eu/orbis/document/global-trends-2030-can-eu-meetchallenges-ahead (accessed on 6 September 2018). [43]

ETC-WMGE (2019), *Environmental pressures from consumption: the case of food*, ETC Working Paper. [34]

EU (2019), *2019 EU report on Policy Coherence for Development*, SWD (2019) 20 final, https://ec.europa.eu/international-partnerships/system/files/swd-2019-20-pcdreport_en.pdf. [12]

Frischknecht, R. et al. (2018), *Umwelt-Fussabdrücke der Schweiz - Zeitlicher Verlauf 1996-2015*, Bundesamt für Umwelt, Bern, https://www.bafu.admin.ch/bafu/de/home/themen/wirtschaft-konsum/publikationenstudien/publikationen/umwelt-fussabdruecke-der-schweiz.html (accessed on 8 June 2019). [26]

Herrington, R. et al. (2019), *Leading scientists set out resource challenge of meeting net zero emissions in the UK by 2050*, https://www.nhm.ac.uk/press-office/pressreleases/ leading-scientists-set-out-resource-challengeof-meeting-net-zer.html) (accessed on 9 March 2020). [45]

Hoff, H. et al. (2019), *'International Spillovers in SDG Implementation: The Case of Soy from Argentina'*, SEI Policy Brief, Stockholm Environment Institute, https://www.sei.org/publications/spillovers-sdg-implementation-soy-argentina. [9]

IPBES (2019), *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the intergovernmental science-policy platform on biodiversity and ecosystem services*, in Arneth, A. et al. (eds), IPBES secretariat, Bonn, https://doi.org/10.5281/zenodo.3553579. [4]

IPCC (2018), *Global warming of 1.5 °C, Intergovernmental Panel on Climate Change*, http://www.ipcc.ch/report/sr15/. [3]

IPES Food (2019), *Towards a Common Food Policy for the European Union: The Policy Reform and Realignment that is Required to Build Sustainable Food Systems in Europe*, http://www.ipes-food.org/_img/upload/files/CFP_FullReport.pdf (accessed on 15 May 2019). [29]

Lenzen, M. et al. (2013), "Building Eora: A Global Multi-Region Input–Output Database at High Country and Sector Resolution", *Economic Systems Research*, Vol. 25/1, pp. 20-49, http://dx.doi.org/10.1080/09535314.2013.769938. [23]

Lucas, K. and E. al (2016), *Sustainable development goals in the Netherlands – Building blocks for environmental policy for 2030*, PBL, Netherlands Environment Assessment Agency, http://www.pbl.nl/en/news/newsitems/2016/unsustainable-development-goals-also-require-policy-effortin-the-netherlands (accessed on 9 October 2018). [37]

McKinsey & Company (2015), *The four global forces breaking all the trends*, McKinsey & Company, https://www.mckinsey.com/business-functions/strategy-andcorporate-finance/our-insights/the-four-global-forcesbreaking-all-the-trends (accessed on 5 December 2019). [41]

Miola, A. et al. (2019), *Interlinkages and policy coherence for Sustainable Development Goals implementation. An operational method to identify trade-offs and co-benefits in a systemic way*, Report, JRC – Scientific and Policy. [17]

Nilsson, M., D. Griggs and M. Visbeck (2016), "Policy: Map the interactions between Sustainable Development Goals", *Nature*, Vol. 534/7607, pp. 320-322, http://dx.doi.org/10.1038/534320a. [16]

NTNU (2020), *Exiobase update 3.8*, https://environmentalfootprints.org/blog/exiobase-update-v3-8 (accessed on 27 November 2020). [50]

NTNU (2018), *Exiobase 3 – environmental footprints – global comparison time series*, http://(https://environmentalfootprints.org/exiobase_3 (accessed on 17 January 2019). [32]

OECD (2018), *Policy Coherence for Sustainable Development 2018: Towards Sustainable and Resilient Societies*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264301061-en. [38]

OECD and DASTI (2016), *An OECD horizon scan of megatrends and technology trends in the context of future research policy*, Organisation for Economic Co-operation and Development; Danish Agency for Science, Technology and Innovation. [42]

Rockström, J. et al. (2009), "Planetary boundaries: exploring the safe operating space for humanity", *Ecology & Society*, Vol. 14/2, p. 32. [5]

Sachs, J. et al. (2019), *Sustainable Development Report 2019*, Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN), http://sdgindex.org/assets/files/2018/01%20SDGS%20GLOBAL%20EDITION%20WEB%20V9%20180718.pdf. [10]

Sala, S. et al. (2019), *Indicators and assessment of the environmental impact of EU consumption – Consumption and consumer footprint for assessing and monitoring EU policies with Life Cycle Assessment*, http://dx.doi.org/10.2760/403263. [27]

Saltelli, A. et al. (2020), "The technique is never neutral. How methodological choices condition the generation of narratives for sustainability", *Environmental Science & Policy*, Vol. 106, pp. 87-98. [51]

Schmidt-Traub, G. et al. (2019), *International spillovers and the Sustainable Development Goals (SDGs) Measuring how a country's progress towards the SDGs is affected by actions in other countries*, SDSN Policy Brief, https://www.unsdsn.org/news/2019/07/19/the-role-of-spillover-effects-i. [11]

SDG Watch Europe (2019), *Wha is paying the bill? (Negative) impacts of EU policies and practises in the world*, https://www.clubofrome.eu/who-is-paying-the-bill (accessed on 9 January 2019). [8]

Stadler, K. et al. (2018), "EXIOBASE 3: Developing a Time Series of Detailed Environmentally Extended Multi-Regional Input-Output Tables", *Journal of Industrial Ecology*, Vol. 22/3, pp. 502-515, http://dx.doi.org/10.1111/jiec.12715. [36]

Steffen, W. et al. (2015), "The trajectory of the Anthropocene: the Great Acceleration", *The Anthropocene Review*, Vol. 2/1, pp. 81-98. [2]

Timmer, M. et al. (2015), "An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production", *Review of International Economics*, Vol. 23/3, pp. 575-605, http://dx.doi.org/10.1111/roie.12178. [24]

Tukker, A. et al. (2016), "Environmental and resource footprints in a global context: Europe's structural deficit in resource endowments", *Global Environmental Change*, Vol. 40, pp. 171-181, http://dx.doi.org/10.1016/j.gloenvcha.2016.07.002. [25]

von der Leyen, U. (2019), *'A Union that strives for more: My agenda for Europe', Political Guidelines for the Next European Commission 2019-2024*, https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf. [46]

Weitz, N. et al. (2017), "Towards systemic and contextual priority setting for implementing the 2030 Agenda", *Sustainability Science*, Vol. 13/2, pp. 531-548, http://dx.doi.org/10.1007/s11625-017-0470-0. [13]

Weitz, N. et al. (2019), *SDGs and the Environment in the EU: A Systems View to Improve Coherence*, Stockholm Environment Institute, https://www.sei.org/publications/sdg-synergies-environment-eu. [15]

Weitz, N., H. Carlsen and C. Trimmer (2019), *SDG Synergies: An approach for coherent 2030 Agenda implementation*, Stockholm Environment Institute, https://www.sei.org/publications/sdg-synergies-factsheet/. [14]

Wood, R. et al. (2019), "The structure, drivers and policy implications of the European carbon footprint", *Climate Policy*, Vol. 20/sup1, pp. S39-S57, http://dx.doi.org/10.1080/14693062.2019.1639489. [33]

Wood, R. et al. (2018), "Growth in Environmental Footprints and Environmental Impacts Embodied in Trade: Resource Efficiency Indicators from EXIOBASE3", *Journal of Industrial Ecology*, Vol. 22/3, pp. 553-564, http://dx.doi.org/10.1111/jiec.12735. [31]

WTO (2018), *World trade report 2018*, World Trade Organization, Geneva. [40]

9 Assessing the transboundary effects of EU consumption: Applying a life cycle perspective to SDG 12

Esther Sanyé Mengual and Serenella Sala
Land Resources Unit, Joint Research Centre, European Commission

This chapter discusses the relevance of life cycle assessment within the context of the SDGs and the European Green Deal as a method to assess transboundary effects within the environmental assessment of consumption. The consumption footprint indicator, developed for assessing the environmental impacts of EU consumption, is employed to illustrate how transboundary effects embedded in trade can be evaluated from supply chain and consumption perspectives. Attention is paid to different approaches to model the trade component of consumption, the role of products in different impacts and the relevance of 'net importer' territories.

This study has been financially supported by the Directorate General for the Environment (DG ENV) of the European Commission in the context of the Administrative Arrangements no. 07.0201/2015/704456/SER/ENV.A1, and no. 070201/2018/790087/AA/ENV.B.1 between DG ENV and the Joint Research Centre.

Addressing the environmental sustainability of production and consumption is a central challenge on the global political agenda, which has also been highlighted in UN Sustainable Development Goal 12 towards ensuring sustainable and responsible consumption and production patterns (UN, 2015[1]). At the European level, new policies within the European Green Deal (von der Leyen, 2019[2]) emphasise the necessity to address in environmental policy not only domestic impacts but also transboundary effects by considering a consumption perspective that encompasses the entire supply chain of goods and services. For example, the Farm to Fork strategy highlights the need to address the entire food value chain to achieving a sustainable and climate neutral food system (EC, 2020[3]), and the Circular Economy Action Plan focuses on key value chains for achieving a more circular and resource-efficient economy (EC, 2020[4]).

A life cycle perspective that considers the entire supply chain in the environmental assessment of goods and services is key to understanding and evaluating the transboundary effects of their consumption in a given territory. For this purpose, Life Cycle Assessment (LCA) is a systematic method to assess the environmental impacts of goods and services that considers the entire life cycle of products and services (ISO (2006[5]), (2006[6])), thereby considering their entire supply chain and those life cycle stages taking place outside the region of final consumption. Therefore, LCA-based assessments of the consumption of products and services in a given territory includes the environmental impacts associated with the raw materials extraction and processing, transportation and manufacturing stages occurring in territories from which raw materials, products and services are imported. For example, evaluating the environmental impacts of consumed textile products in the EU must consider the imported share of raw materials and manufactured products from non-EU countries, such as China or India, by considering the geographical aspects playing a key role in the resulting environmental burdens, e.g. resources availability, land use trends, country electricity mix or water scarcity.

Several studies have addressed the analysis of the environmental impacts of consumption, considering the embedded burdens in imported products and services by using different methodologies. The assessment of the environmental burdens of consumer goods and services from a consumption perspective revealed a displacement of environmental pressures and impacts from developed countries to other world regions through traded goods, e.g. for greenhouse gas emissions (Peters et al., 2011[7]), biodiversity loss (Lenzen, 2012[8]) or eutrophication (Hamilton et al., 2018[9]). For this purpose, a large body of literature has implemented environmentally extended input-output analysis (EEIOA), which is based on economic exchanges (e.g. (Steen-Olsen et al., 2012[10]; Wood et al., 2018[11])), or has combined EEIOA with process-based LCA in a hybrid framework (e.g. (Huppes et al., 2006[12])). Recently, the Consumption Footprint indicator has been developed for assessing the environmental impacts of EU consumption by combining a territorial perspective (domestic resource use and emissions resulting from production) with LCA-based trade footprints (Sala et al., 2019[13]; Sala et al., 2019[14]), employing both EEIO-based LCA (Beylot, Corrado and Sala, 2019[15]; Beylot et al., 2019[16]) and process-based LCA (Corrado et al., 2020[17]).

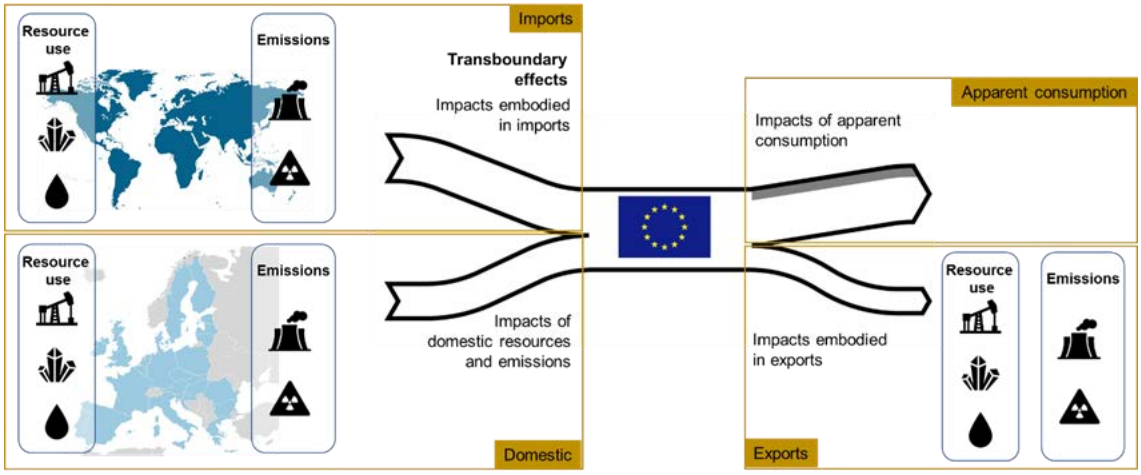
This chapter aims to highlight the relevance of LCA for assessing the transboundary effects within the environmental assessment of consumption in the context of SDG12. To do so, the use of the Consumption Footprint indicator is presented to assess the environmental impacts of EU consumption.

The Consumption Footprint

The Consumption Footprint is a set of LCA-based indicators (also available as single score) developed by the Joint Research Centre of the European Commission with the purpose of quantifying the environmental impacts of apparent consumption in the EU (Sala et al., 2019[13]; Sala et al., 2019[14]). This indicator was designed to assess and monitor SDG 12 at EU level from a consumption-based perspective, i.e. considering both the burdens associated not only with domestic activities (within the territorial boundaries of the EU) but also with trade. The apparent consumption is calculated as the impacts of domestic activities

(Domestic Footprint) plus the embedded impacts in imports (Import Footprint), minus the embedded impacts in exports (Export Footprint). The Domestic Footprint quantifies the environmental impacts due to resource extraction and emissions on the environment in the EU territory based on official statistical sources. The Trade Footprint (including both Import and Export Footprints) is calculated according to two modelling approaches: process-based LCA (bottom-up) and EEIO-based LCA (top-down). The assessment of the environmental impacts of EU production and consumption considers not only the territorial burdens (Domestic Footprint) but also those related to trade, allowing for the integration of the transboundary effects due to EU consumption taking place in countries beyond the EU territory (Figure 9.1).

Figure 9.1. Diagram of the Consumption Footprint elements and the geographical coverage of domestic and import footprints (including transboundary effects



Source: Author's elaboration

The Consumption Footprint bottom-up

The Consumption Footprint bottom-up models the trade component from a bottom-up approach based on process-based LCA: the Trade Footprint bottom-up (Corrado et al., 2020[17]). To quantify the environmental burdens of imported and exported goods, the life cycle of representative products most imported to and exported from the EU are assessed. The life cycle inventory (LCI) model of 20 representative products also considers the most representative countries of origin, according to the COMEXT database (Eurostat, 2018[18]). The impact of each representative product is upscaled to cover the overall impacts of EU imports and exports based on the import or export share of the representative countries, the relevance of the representative products within their product groups and within the total imports or exports. Results are available with respect to four years (2000, 2005, 2010, 2014) while the results for the remaining years are obtained through interpolation.

The methodological aspects of the Trade Footprint bottom-up are detailed in (Corrado et al., 2020[17]) and (Sala et al., 2019[13]). The most critical steps of the Consumption Footprint bottom-up are the selection of representative products, the data compilation of the life cycle of each product and the upscale process to represent the entire trade flow. By employing consumption and trade statistics, the products most imported to and exported from the EU are selected as representative products. The life cycle of these representative products is then modelled. With regard to transportation along the life cycle, the three most relevant exporting countries are identified for each representative product in order to identify the supply chain to be modelled in the life cycle of the product. Finally, the resulting data for the representative product is upscaled

to represent the entire trade flow by product (to upscale the supply chains) and product group (to upscale the overall imported amount).

These three steps add uncertainty to the model. On the one hand, the use of representative products to estimate the environmental impacts of imports and exports relies on the quantification and upscaling of the embedded impacts on 20 representative products and the respective supply chains (i.e. three most relevant exporting countries). Although such approach prevents the underestimation of the overall impact of imports and exports, it is assumed that the diverse products of a specific product group have a similar environmental profile than the representative product. On the other hand, the compilation of life cycle data is based on average data in the market rather than the actual production process and supply chain of each individual product imported and exported. This limitation is mainly relevant in the ability to represent different technologies or innovative manufacturing approaches.

The Consumption Footprint top-down

The Consumption Footprint top-down models the trade component from a top-down approach building upon multi-regional input-output (MRIO) tables: the Trade Footprint top-down (Beylot, Corrado and Sala, 2019[15]; Beylot et al., 2019[16]). The LCI associated with imports and exports is calculated based on MRIO tables, which estimate the resource use and emissions to the environment of economic exchanges between different sectors and countries by employing the Exiobase database (Merciai and Schmidt, 2017[19]; Stadler et al., 2018[20]). Exiobase 3 considers both products and services, divided into 164 categories, and 48 world regions (i.e. 43 countries and 5 rest-of-the-world regions). Results are available for the period 2000 to 2014 (being the period 2011–2014 extrapolated).

The methodological aspects of the Trade Footprint top-down are detailed in (Beylot, Corrado and Sala, 2019[15]; Beylot et al., 2019[16]) and (Sala et al., 2019[13]). The main sources of uncertainty associated with this model are twofold. Firstly, the estimation of the environmental pressures resulting from each economic sector and world region is based on statistics and assumptions required to distribute the overall environmental pressure among the different economic sectors at a national level when sector-level statistics are not available. Secondly, the compilation of environmental pressures in Exiobase is limited to 78 elementary flows, although highly relevant environmental pressures (i.e. resource use, emission to the environment) are modelled. This limited amount of elementary flows can lead to an underestimated calculation of the overall environmental impact of trade.

Inherent differences between trade footprint approaches

The two different approaches employed to calculate the Trade Footprint within the Consumption Footprint indicator are different in specific methodological aspects (Sala et al., 2019[14]), as reported in Table 9.1. In general, process-based LCA entails a realistic picture and a high level of detail at product level. Conversely, it is not designed to be consistent with national or sectoral statistics and their reporting of total emissions and services are excluded. On the other hand, the top-down approach follows a consistent framework for the allocation of environmental burdens from the economic system at macro-scale to the final consumption expenditures. However, MRIO-based LCA models lack detail and realism in representing physical mass balances at product level. Furthermore, the compilation of environmental pressures in Exiobase is limited to 78 elementary flows, while process-based LCA considers more than 1 500 elementary flows.

Table 9.1. Coverage of activities and elementary flows, data sources for emissions and co-production modelling in both Trade Footprint approaches

Methodological aspect	Bottom-up (process-based LCA)	Top-down (MRIO-based LCA)
Activities coverage	Physical products (20 representative products)	Physical products and services (164 product groups)
Elementary flows coverage	More than 1 500 elementary flows	78 elementary flows (36 mineral metal and energy resources; 5 types of land occupation; 3 types of water consumption; and 29 substances emitted to air, 2 to water and 3 to soil)
Data sources for emissions	Process-based LCIs of representative products	Input-output tables (statistic-based)
Co-production modelling	Allocation among co-products	By-product-technology model (system expansion)

Impact assessment

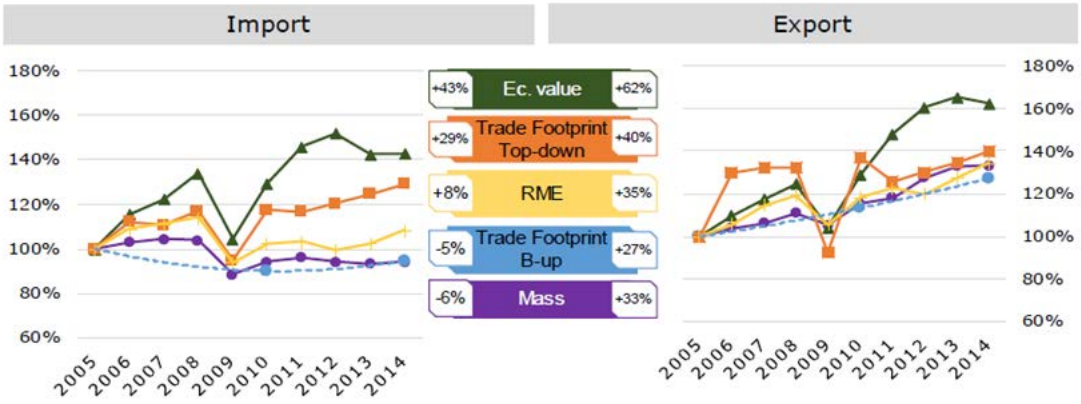
The Consumption Footprint employs the 16 impact categories of the Environmental Footprint (EF) method (EC, 2013[21]); (EC-JRC, 2018[22]); (Fazio et al., 2018[23]): climate change; stratospheric ozone depletion; particulate matter; ionising radiation, human health effects; photochemical ozone formation; acidification, terrestrial eutrophication; freshwater eutrophication; marine eutrophication; freshwater ecotoxicity; human toxicity, cancer; human toxicity, non-cancer; land use; water use; resource use, fossil; and resource use, minerals and metals. Global normalisation factors (Crenna et al., 2019[24]) and the set of EF weighting factors can be applied (Sala et al., 2018[25]) to obtain a single score. A selection of the EF categories are presented in this paper, while the results of the full set of impact categories and the single score is available in (Sala et al., 2019[14]).

Results and discussion

The assessment of the EU Consumption Footprint between 2005 and 2014 revealed that the EU is a 'net importer of environmental impacts' (Beylot, Corrado and Sala, 2019[15]), (Sala et al., 2019[14]). As a result, the environmental burdens of consumption (i.e. Consumption Footprint) are higher than the Domestic Footprint due to a positive trade balance between imports and exports, i.e. the embedded impacts in imports are higher than the embedded impacts in exports. This difference between imports and exports relies on two main aspects: firstly, the quantity of traded products; and, secondly, the environmental profile of the traded goods due to the supply chain of the goods and services and the environmental pressures of the production systems in the different world regions.

The environmental impact of both imports and exports increased throughout the analysed period (29% and 40%, respectively) (Figure 9.2). In fact, an 'export effect' is observed, where the larger increase of the embedded impacts in exports compared to that of imports positively benefits the resulting environmental burdens of the Consumption Footprint, since this considers the apparent consumption (as production + imports – exports). The increasing trend of exports is also observed for the Raw Materials Equivalent (RME) indicator. However, the embedded burdens in exported goods and services from the EU are not reduced on the global scale but allocated to the consumption of another country or world region. The effects of the economic crisis in 2009 can also be observed in both Trade Footprints, which display a significant decrease.

Figure 9.2. Evolution of the Trade Footprint top-down and bottom-up (for both import and export), economic value, mass and raw materials equivalent (RME) between 2005 and 2014

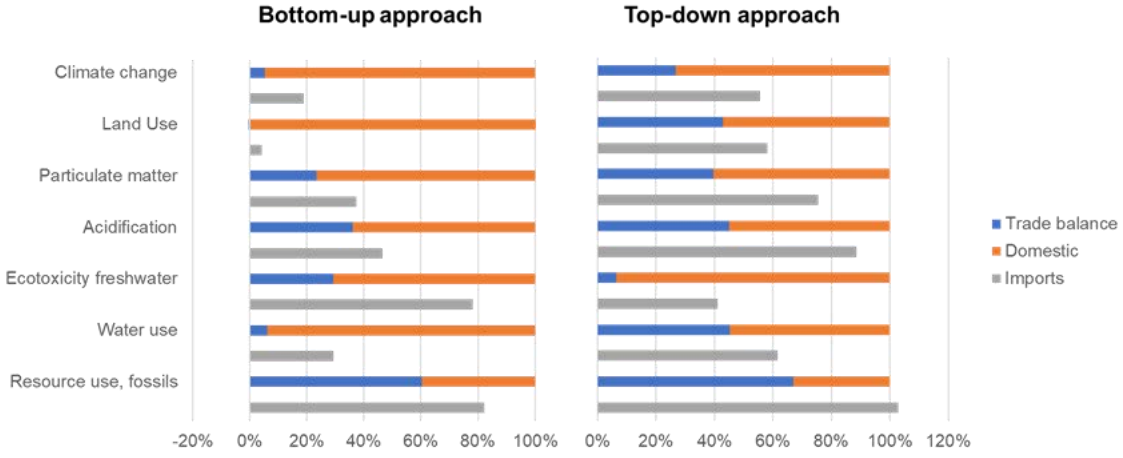


Source: Adapted from Sala et al. (2019[14])

Figure 9.3 displays the contribution of the trade balance and domestic impacts to the overall Consumption Footprint and compares it with the Import Footprint for both bottom-up and top-down approaches for a selection of impact categories. In general, the relevance of the trade balance is larger for the top-down approach than for the bottom-up approach, apart from freshwater ecotoxicity due to a higher coverage of elementary flows related to chemical emissions to the environment in the process-based LCA approach. This is also observed in the comparison between the Import Footprint and the Consumption Footprint. The impact of imports represents more than 50% (apart from freshwater ecotoxicity) and even surpassed (fossil resources use, 103%) the overall impact of the Consumption Footprint top-down. Conversely, this only occurs for two of the displayed impact categories in the bottom-up approach. Among the represented impact categories, only land use showed a negative trade balance for the bottom-up approach (-0.3%), indicating that the embedded impacts in land use of exported goods were higher than those embedded in imports.

Figure 9.3. Contribution of the trade balance (blue) and domestic impacts (orange) to the overall Consumption Footprint and comparison with the Import Footprint (grey) for both Consumption Footprint approaches, by impact category

Results for 2010



Source: Based on Sala et al. (2019[14])

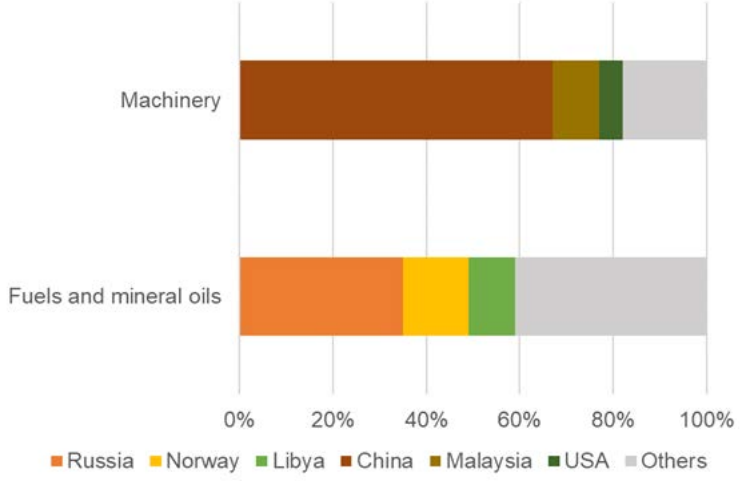
Relevant products in trade impacts

The analysis of the Consumption Footprint reveals that the environmental burdens of the trade balance associated with EU consumption is associated with the imports of raw materials and products with short supply chains and the exports of manufactured goods with larger and more complex supply chains. Both approaches show a larger role for manufactured products than other product groups in the overall impact of exports from the EU. In addition, manufactured goods are more relevant in exports compared to imports. In particular, machinery and vehicles are key contributors in several impact categories, such as acidification or freshwater ecotoxicity. However, in the bottom-up approach, where only representative products are evaluated, other products are also relevant: fossil fuels, mineral oils, and iron and steel. Conversely, food products (and hotels and restaurant services) play a major role in the top-down approach for some categories, such as water use.

With regard to imports, products with limited supply chains are the main contributors to the impacts. The bottom-up approach identifies two main contributors to the embedded impact in imports: fuels and mineral oils, and machineries. Contrarily, fossil fuels are only relevant to the fossil resource use category in the top-down approach, where food products, hotels and restaurants, materials (e.g. metals) and other materials and intermediate products (e.g. plastics, rubber) play a significant role in the different impact categories. In particular, manufactured goods are observed to have a narrow contribution to the overall impact, highlighting the role of products with limited supply chains.

The Trade Footprint bottom-up allows for the assessment of individual supply chains based on the exporting country to the EU. Figure 9.4 analyses the role of the main exporting countries for the two most relevant imported products. Imports of machinery are led by China (67%), Malaysia (10%) and the United States (5%), while imports of fuels and mineral oils are led by Russia (35%), Norway (14%) and Libya (10%). Such an assessment can contribute to a geopolitical analysis identifying the supply risk of products. The machinery market relies on a single country (China), which could affect the EU market in case of events affecting their commercial relation, such as the current COVID pandemic (Eurostat, 2020[26]) The fuels and mineral oils market is more distributed within the three leading exporting countries. At the environmental level, local environmental policies in these countries may have an impact on the resulting environmental impact of EU consumption. For example, ambitious environmental policies in China leading to a decrease in the impacts of machinery production could lead to a decrease in the embedded imported environmental impacts by EU citizens.

Figure 9.4. Contribution of the three main exporting countries to the EU to the amount of traded goods for the groups 'Machinery' and 'Fuels and mineral oils' (Year: 2010)



Source: Based on (Corrado et al., 2020[17]).

Implications of a 'net importer' of environmental burdens

Since the EU is a 'net importer of environmental impacts', the consideration of a consumption-based approach including the environmental burdens of traded goods from and to the EU is essential for assessing the overall magnitude of the environmental burdens originating from the demand of goods and services by EU citizens. When analysing the trends of environmental burdens over time, the inclusion of the transboundary effects associated with imports negatively affects the environmental profile of EU consumption. Analysing the decoupling in the EU between 2005 and 2014, the Consumption Footprint showed a lower level of environmental decoupling compared to the Domestic Footprint (Sanyé-Mengual et al., 2019[27]). This aspect is partly related to two aspects: the consumption intensity in the EU and the different severity of environmental policy around the globe.

With regard to the latter, while EU environmental policy showed positive effects over time with decreasing environmental burdens of the Domestic Footprint, the import of raw materials and manufactured goods from other countries also includes world regions with less rigid environmental policies, thereby delocalising the environmental burdens beyond the EU and enlarging transboundary effects to other world regions. In the same way, the assessment of the environmental impacts of EU production and consumption against the Planetary Boundaries (Rockström and et al., 2009[28]; Steffen et al., 2015[29]) revealed that the Consumption Footprint transgressed more boundaries for the safe ecological space for humanity than the Domestic Footprint (Sala et al., 2020[30]).

In the context of SDG 12, the use of an LCA-based indicator to assess the environmental impacts of EU production and consumption allows for integrating the transboundary effects through embedded impacts in imported goods and services. The current proposed targets and indicators for SDG 12, however, lack such perspective (Schmidt-Traub et al., 2017[31]). In addition, the assessment of progress in SDG 12 with an impact assessment method enables the consideration of the different impact intensity of the resources use, compared to resource footprints, which have been pointed out as a limitation of the framework (Schmidt-Traub et al., 2017[31]).

Conclusions and further research

The EU is a net importer of environmental impacts due to the large amount of imports required to satisfy the demand of EU consumers and the environmental profile of the imported raw materials and manufactured products, including their supply chains. Therefore, the transboundary effects inflicted by EU consumption on the world regions where the extraction and/or production of imported raw materials and manufactured products occurs are relevant and have been highlighted in emerging environmental policy documents under the umbrella of the European Green Deal.

In this context, the consideration of LCA for the environmental assessment of consumption is key to including the overall import supply chain. The Consumption Footprint indicator is a comprehensive indicator to monitor evolution towards SDG 12 from a consumption- and supply chain-based perspective that ensures the consideration of such transboundary effects. The assessment of both imports and exports allows for the observation of the relevance of manufacturing processes and supply chains, such as the role of the EU as an importer of raw materials and semi-finished products with limited supply chains, and as an exporter of manufactured goods with longer and more complex supply chains. The analysis of the relevance of the exporting countries to the EU for the most relevant products can also be employed to unveil geopolitical issues to be considered in the assessment as well as to foresee variations in the embedded impacts in imported products for EU consumption.

However, further research is required in the two approaches presented to assess the Trade Footprint. On the one hand, the bottom-up approach could improve the modelling of imported and exported products by revising the current definition of representative products. On the other hand, Input-Output-based LCA

approaches are required to widen the coverage of elementary flows to offer further detail and a more accurate modelling of the impact of resource use and emissions to the environment associated with economic activities. Such an aspect could be improved through the hybridisation of MRIO models with process-based LCA. Notwithstanding their specific limitations, both approaches would benefit from more dynamic data sources that could represent real-time situations, not only for modelling the consumption intensities but also the LCI models (i.e. particularly for the bottom-up approach). Such advancements would allow for better modelling for nowcasting and forecasting exercises to predict current and future scenarios regarding the EU Consumption Footprint. With regard to the impact assessment, implementing regionalised characterisation factors in the impact assessment models for categories such as land use and water use can enhance the intergradations of local environmental conditions from which raw materials and products are imported to the EU in the assessment of the overall consumption (e.g. water scarcity in different world regions) and the associated transboundary effects.

References

Beylot, A., S. Corrado and S. Sala (2019), "Environmental impacts of European trade: interpreting results of process-based LCA and environmentally extended input–output analysis towards hotspot identification", *The International Journal of Life Cycle Assessment*, Vol. 25/12, pp. 2432-2450, http://dx.doi.org/10.1007/s11367-019-01649-z. [15]

Beylot, A. et al. (2019), "Assessing the environmental impacts of EU consumption at macro-scale", *Journal of Cleaner Production*, Vol. 216, pp. 382-393, http://dx.doi.org/10.1016/j.jclepro.2019.01.134. [16]

Corrado, S. et al. (2020), "Out of sight out of mind? A life cycle-based environmental assessment of goods traded by the European Union", *Journal of Cleaner Production*, Vol. 246, p. 118954, http://dx.doi.org/10.1016/j.jclepro.2019.118954. [17]

Crenna, E. et al. (2019), "Global environmental impacts: data sources and methodological choices for calculating normalization factors for LCA", *The International Journal of Life Cycle Assessment*, Vol. 24/10, pp. 1851-1877, http://dx.doi.org/10.1007/s11367-019-01604-y. [24]

EC (2020), *A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system*. [3]

EC (2020), *A new Circular Economy Action Plan For a cleaner and more competitive Europe*. [4]

EC (2013), *Commission recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations*. [21]

EC-JRC (2018), *Environmental Footprint reference package 2.0 (EF 2.0)*, https://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml. [22]

Eurostat (2020), *Sustainable development in the European Union: Monitoring report on progress towards the SDGs in an EU context*. [26]

Eurostat (2018), *Comext database – detailed statistics on international trade in goods*, https://ec.europa.eu/eurostat. (accessed on June 2020). [18]

Fazio, S. et al. (2018), *Supporting information to the characterisation factors of recommended EF Life Cycle Impact Assessment methods – New models and differences with ILCD*. [23]

Hamilton, H. et al. (2018), "Trade and the role of non-food commodities for global eutrophication", *Nature Sustainability*, Vol. 1/6, pp. 314-321, http://dx.doi.org/10.1038/s41893-018-0079-z. [9]

Huppes, G. et al. (2006), "Environmental Impacts of Consumption in the European Union:High-Resolution Input-Output Tables with Detailed Environmental Extensions", *Journal of Industrial Ecology*, Vol. 10/3, pp. 129-146, http://dx.doi.org/10.1162/jiec.2006.10.3.129. [12]

ISO (2006), *ISO 14040. Environmental management – Life cycle assessment – Principles and framework*, International Organization for Standardization, Geneva, Switzerland. [5]

ISO (2006), *ISO 14044. Environmental management – Life cycle assessment – Requirements and guidelines*, International Organization for Standardization? Geneva, Switzerland. [6]

Lenzen, M. (2012), "International trade drives biodiversity threats in developing nations", *Nature*. [8]

Merciai, S. and J. Schmidt (2017), "Methodology for the Construction of Global Multi-Regional Hybrid Supply and Use Tables for the EXIOBASE v3 Database", *Journal of Industrial Ecology*, Vol. 22/3, pp. 516-531, http://dx.doi.org/10.1111/jiec.12713. [19]

Peters, G. et al. (2011), "Growth in emission transfers via international trade from 1990 to 2008", *Proceedings of the National Academy of Sciences*, Vol. 108/21, pp. 8903-8908, http://dx.doi.org/10.1073/pnas.1006388108. [7]

Rockström, J. and et al. (2009), "Planetary boundaries: exploring the safe operating space for humanity", *Ecology & Society*, Vol. Vol. 14(2),, p. p. 32. [28]

Sala, S. et al. (2019), *Indicators and assessment of the environmental impact of EU consumption – Consumption and consumer footprint for assessing and monitoring EU policies with Life Cycle Assessment*, http://dx.doi.org/10.2760/403263. [14]

Sala, S. et al. (2019), *Consumption and Consumer Footprint: methodology and results - Indicators and Assessment of the environmental impact of EU consumption',*, JRC Technical Reports, Luxembourg: Publications Office of the European Union. [13]

Sala, S. et al. (2018), *Development of a weighting approach for Environmental Footprint, European Commission,*, Joint Research Centre, Publication Office of the European Union, Luxembourg, ISBN 978-92-79-68041-0, http://dx.doi.org/DOI: 10.2760/446145. [25]

Sala, S. et al. (2020), "'Environmental sustainability of European production and consumption assessed against planetary boundaries'", *Journal of Environmental Management,*, Vol. Vol. 269, 110686., http://dx.doi.org/DOI: 10.1016/j.jenvman.2020.110. [30]

Sanyé-Mengual, E. et al. (2019), "Assessing the decoupling of economic growth from environmental impacts in the European Union: A consumption-based approach", *Journal of Cleaner Production*, Vol. 236, p. 117535, http://dx.doi.org/10.1016/j.jclepro.2019.07.010. [27]

Schmidt-Traub, G. et al. (2017), "'National baselines for the Sustainable Development Goals assessed in the SDG Index and Dashboards'", *Nature geoscience,*, Vol. Vol. 10(8),, pp. pp. 547-555. [31]

Stadler, K. et al. (2018), "EXIOBASE 3: Developing a Time Series of Detailed Environmentally Extended Multi-Regional Input-Output Tables", *Journal of Industrial Ecology*, Vol. 22/3, pp. 502-515, http://dx.doi.org/10.1111/jiec.12715. [20]

Steen-Olsen, K. et al. (2012), "Carbon, Land, and Water Footprint Accounts for the European Union: Consumption, Production, and Displacements through International Trade", *Environmental Science & Technology*, Vol. 46/20, pp. 10883-10891, http://dx.doi.org/10.1021/es301949t. [10]

Steffen, W. et al. (2015), "Planetary boundaries: Guiding human development on a changing planet", *Science*, Vol. 347/6223, pp. 1259855-1259855, http://dx.doi.org/10.1126/science.1259855. [29]

UN (2015), *Sustainable development goals*, https://sustainabledevelopment.un.org/. (accessed on June 2020). [1]

von der Leyen, U. (2019), *'A Union that strives for more: My agenda for Europe', Political Guidelines for the Next European Commission 2019-2024.*, https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf. [2]

Wood, R. et al. (2018), "Growth in Environmental Footprints and Environmental Impacts Embodied in Trade: Resource Efficiency Indicators from EXIOBASE3", *Journal of Industrial Ecology*, Vol. 22/3, pp. 553-564, http://dx.doi.org/10.1111/jiec.12735. [11]

10 Measuring countries' impacts on the global commons: A new approach based on production and consumption based accounting

Guillaume Lafortune*, Zachary A. Wendling*, Reed Miller**, Guido Schmidt-Traub*, Dan Esty**, Finn Woelm*, Carmina Baez*, Naoko Ishi***, Akiyuki Kawazaki*** [1]

*Sustainable Development Solutions Network

**Yale University

**Center for the Global Commons at the University of Tokyo

This chapter presents a new approach for measuring the environmental impacts of human activity at country level including both domestic impacts and the transboundary spillover of harms. The new Pilot Global Commons Stewardship Index aims to respond to three major limitations in the existing frameworks and scorecards of national environmental sustainability: *(i)* the absence of metrics to gauge success on SDG 12 on Responsible Consumption and Production; *(ii)* the lack of a methodologically rigorous way to track the environmental impacts embodied in traded goods; and *(iii)* the absence of a comprehensive and reliable set of indicators related to the decoupling of economic activities from environmental impacts at country level.

The state of the Global Commons is poor and worsening. At current rates of atmospheric carbon accumulation, average global temperatures are projected to rise by more than 3 °C before the end of the century. Pollutants cause the premature deaths of 5 million people every year. The combination of high demographic pressure and unsustainable agricultural practices threaten the productive capacity and resilience of key land and water systems. Eight million tonnes of plastic waste enter the oceans every year, and one third of fish stocks are overexploited.

In 2015, world leaders adopted a shared vision for sustainable development by 2030. The 17 Sustainable Development Goals (SDGs) set out time-bound objectives for the economic, social and environmental dimensions of sustainable development. In the subsequent Paris Agreement, countries further committed to address climate change with a goal of keeping the rise in global temperatures to 'well below 2 °C.' Achieving this shared vision will require major transformations of key sectors and industries and investment in new infrastructure and other foundations for a sustainable society. These decisions must be informed by robust and practical metrics that provide signals on policy outcomes, track changes in performance over time, raise accountability and spur action (Schmidt-Traub et al., 2017[1]).

The UN Statistical Commission has proposed indicators for many SDGs, but there are significant gaps. In particular, many indicators for SDG 12 (Responsible Consumption and Production) – but also for SDGs 13–15 (Climate Change, Marine Resources and Terrestrial Biodiversity) – are missing or incomplete, lack established methodologies or do not have frameworks that establish what progress should look like (Sachs et al., 2019[2]). As a result of these flaws, it remains difficult to evaluate in a comprehensive and robust way efforts made by countries to *decouple* economic growth from negative environmental impacts over time. These gaps need to be filled.

We argue that the world community needs metrics that cover all aspects of sustainable consumption and production (SCP) and track countries' impacts on the Global Commons. The data should track environmental impacts within each nation but must also encompass international spillovers. Indeed, the fact that so many of the existing sustainability scorecards do not track transboundary environmental harms has emerged as a critical methodological deficiency. The importance of establishing sustainability metrics that track these spillovers has been highlighted by both policy experts (Bley, et al, 2020[3]; Wendling et al., 2020[4]; Sachs et al., 2020[5]) and environmental advocates, including the Swedish activist Greta Thunberg who in 2019 accused rich countries of 'creative carbon accounting' to the extent that they track only 'production-based' emissions, leaving aside the consumption-based emissions embodied in imported goods (The Economist, 2019[6]).

This chapter, prepared by a group of researchers at SDSN, Yale University and Center for the Global Commons at the University of Tokyo presents the current limitations in existing international benchmarks for environmental impacts and provides the contour of a comprehensive new approach to measuring countries' impacts on Global Commons using production- and consumption-based accounting. The Pilot Global Commons Stewardship Index aims to improve sustainability metrics and policy accountability by: (1) providing a better framework for tracking SDG 12; (2) ensuring that environmental impacts are tracked comprehensively and include the attribution of the production impacts for imported goods as well as the physical spillovers of harm beyond the borders of the producing nation; (3) generating comprehensive and reliable measures of *decoupling* economic growth from environmental impacts at country level.

Improving accountability frameworks for sustainable consumption and production

In reviewing the landscape of existing indicators, frameworks and sustainability metrics, we identify three main challenges that must be addressed to strengthen monitoring and accountability for the environmental impacts of consumption and production.

Absence of a shared frame for measuring SDG 12

On its own, SDG 12 contains no comprehensive framework for tracking environmental impacts from consumption and production. In fact, the goal focuses on the circular economy, waste recycling and efficient use of natural resources. But a sustainable future requires a deeper dive into the environmental impacts of consumption and production – and analytically rigorous measures of these harms. Such metrics would also need to incorporate elements from SDGs 13–15 on climate change action and biodiversity.

The latest update of the Inter-agency Expert Group on SDG Indicators (IAEG-SDG) tier classification in December 2019 recognises these limitations in the existing indicator framework for SDG 12. Notably, the established methodologies track policy commitments, including adherence to international treaties; the existence of action plans and strategic frameworks on circularity; climate and biodiversity protection; and fossil-fuel subsidies. But many of the indicators included are either classified under Tier 2 (data not regularly produced by countries) or Tier 3 (no internationally established methodology).

The main environmental impact measures under SDG 12 are Material Footprint or Domestic Material Consumption (DMC) indicators, which are problematic for two reasons. Firstly, with the exception of fossil fuels, it is not clear how per capita consumption of specific materials, e.g. biomass, construction minerals and metal ores relates to local and global environmental impacts. This makes it impossible to compare the impact of one kilogram of, say, biomass in Brazil with one kilogram of biomass in Mongolia. Secondly, the Material Footprint aggregates consumption across a broad range of different materials on a per-kilogram basis, even though one kilogram of biomass, for example, might have a different environmental impact than one kilogram of iron ore or building stone.

In response, we propose a new framework inspired by the SDGs and the literature on the Global Commons and planetary boundaries that allows policy makers to track responsible consumption and production in a comprehensive way. Our approach aims to provide a robust and comprehensive measure for SDG 12 whilst integrating relevant elements from SDGs 13 – 15. The framework is further described in Part 2 below. The proposed indicator framework focuses on impact measures and goes beyond Material Footprint and DMC. It makes use of new knowledge and measures emerging from the field of Industrial Ecology, using production-based accounting (PBA) and consumption-based accounting (CBA).

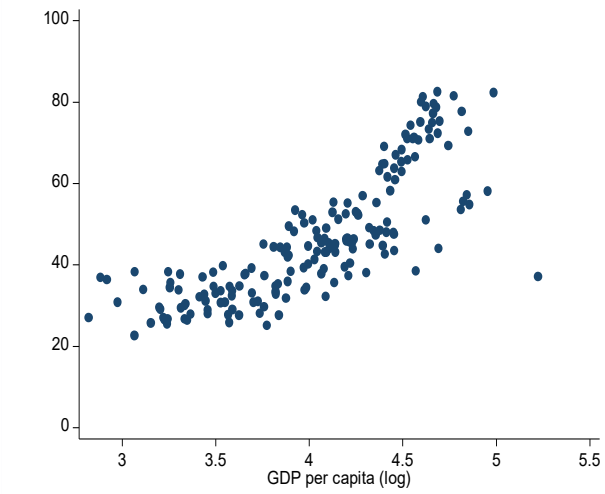
Lack of measures of environmental impacts embodied in trade

As emphasised by the OECD and the European Commission (Nardo et al., 2008[7]), aggregate composite measures are helpful for summarising complex or multi-dimensional issues and placing countries' performance at the centre of policy debates. Several aggregate measures exist for tracking SDGs 12 – 15, including the Environmental Performance Index (EPI) (Wendling et al., 2020[4]), the Green Growth Index (GGI) (Acosta et al., 2019[8]), the Environmental Vulnerability Index (EVI) (SOPAC/UNEP, 2005[9]), the Climate Change Performance Index (CCPI) (Burck et al., 2019[10]), the Happy Planet Index (New Economics Foundation, 2016[11]) and the Ecological Footprint (Wackernagel et al., 2019[12]). They suffer from one or more shortcomings.

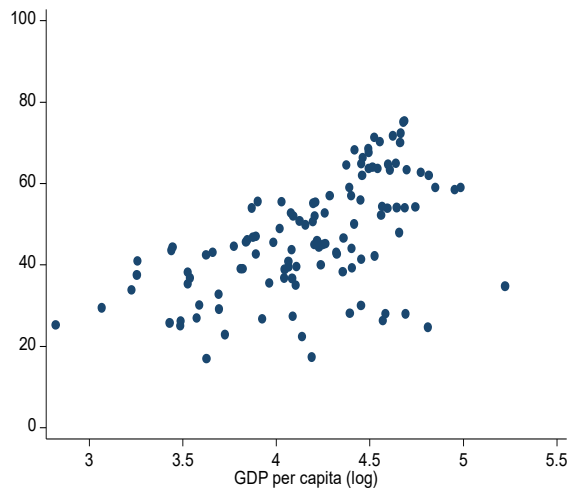
1. **Not truly comprehensive:** A comprehensive measure of environmental impacts should cover climate, biodiversity, pollution and resource use, as illustrated by the EPI and the GGI. Yet other aggregate measures, such as the Ecological Footprint or the CCPI, are not truly comprehensive as they primarily consider greenhouse gas emissions.
2. **Ignore spillovers:** None of these aggregate measures track transboundary spillovers of environmental harm. As some countries adopt ambitious decarbonisation targets and action plans, it is crucial to track spillovers to ensure that decarbonisation targets are not achieved by outsourcing the production of high-emitting industrial sectors, such as cement or steel, to other countries and then re-importing the production. Measures exist to track trade-related spillovers, but these measures tend not to be produced by official statistics agencies. Beyond trade-related environmental harms, it is equally important to track transboundary physical flows – such as air or water pollution – where production or consumption in one nation spills over onto contiguous countries or, more broadly, the world.
3. **Not explicitly linked to the SDGs:** Many of these aggregate measures were designed before the adoption of the SDGs. Hence, they do not assess countries' distance to achieving SDG targets when such targets are available and relevant. They therefore cannot determine whether countries are on- or off-track for achieving the SDGs by 2030.
4. **Confound environmental and broader development issues by including access to resources, infrastructure and policy measures:** Some aggregate indices include metrics that are not directly related to environmental impacts. Examples include variables related to infrastructure investments (wastewater treatment) or policy inputs (adoption of regulations and conventions), both of which tend to be highly correlated with per capita income (Figure 10.1). Rich countries tend to score well on the EPI, for example, as they have the resources to invest in environmental infrastructure (drinking water systems, wastewater treatment, waste management, etc.), which translates into better *environmental public health* scores – even though they account for a higher share of the world's resource use and pollution, particularly if one includes spillovers.
5. **Infrequent updating:** Sustainability indicators must be updated frequently and in a timely manner to be most useful for policy-making and stakeholder engagement. Regular updates provide further confidence among stakeholders that the indicators are up-to-date and have the support necessary to ensure availability in the future. While the EPI has been an ongoing project with biennial updates for over twenty years, the EVI and HPI were last updated in 2004 and 2016, respectively.

Figure 10.1. Correlation between existing environmental country-level benchmarks (latest year available) and GDP per capita (logged)

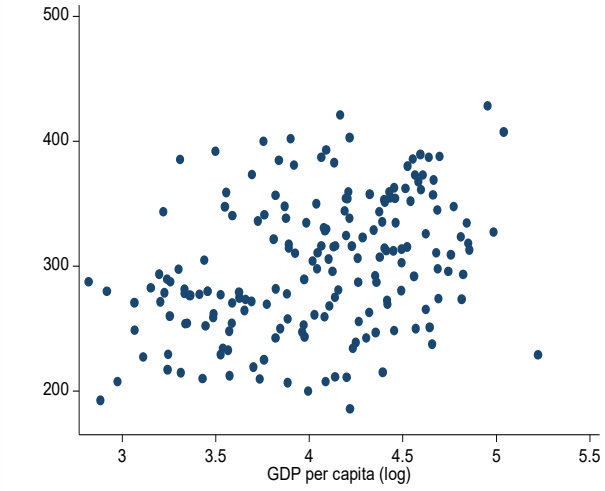
(a) Environmental Performance Index (r = 0.86)



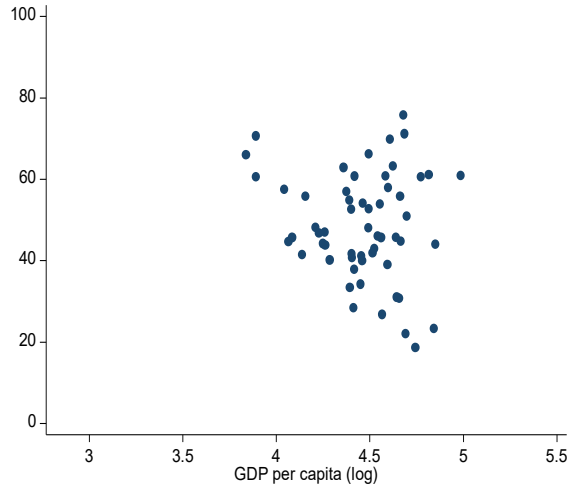
(b) Green Growth Index (r = 0.56)



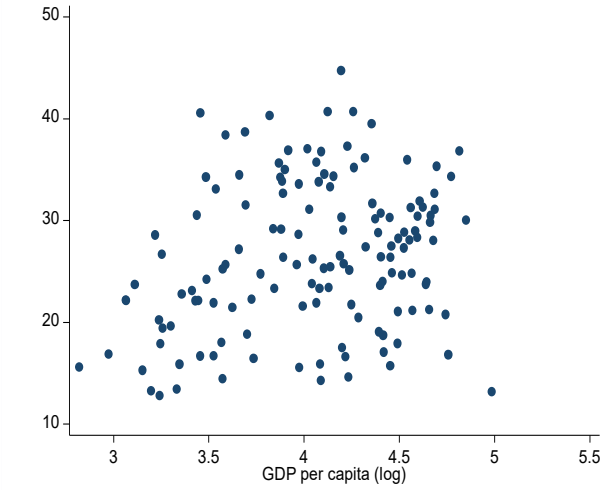
(c) Environmental Vulnerability Index (r = 0.37)



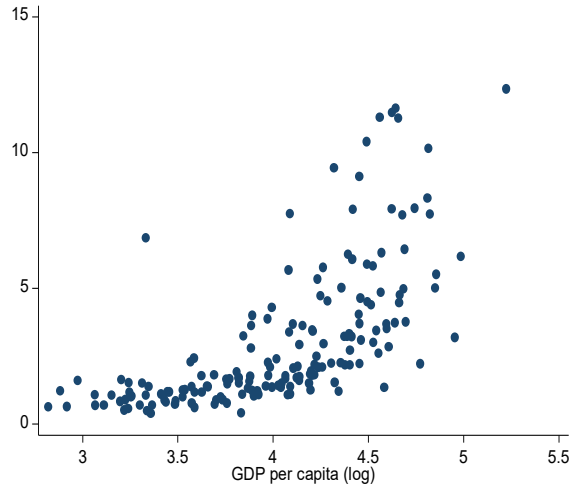
(d) Climate Change Performance Index (r = -0.01)



(e) Happy Planet Index (r = 0.24)



(f) Ecological Footprint (r = 0.66)

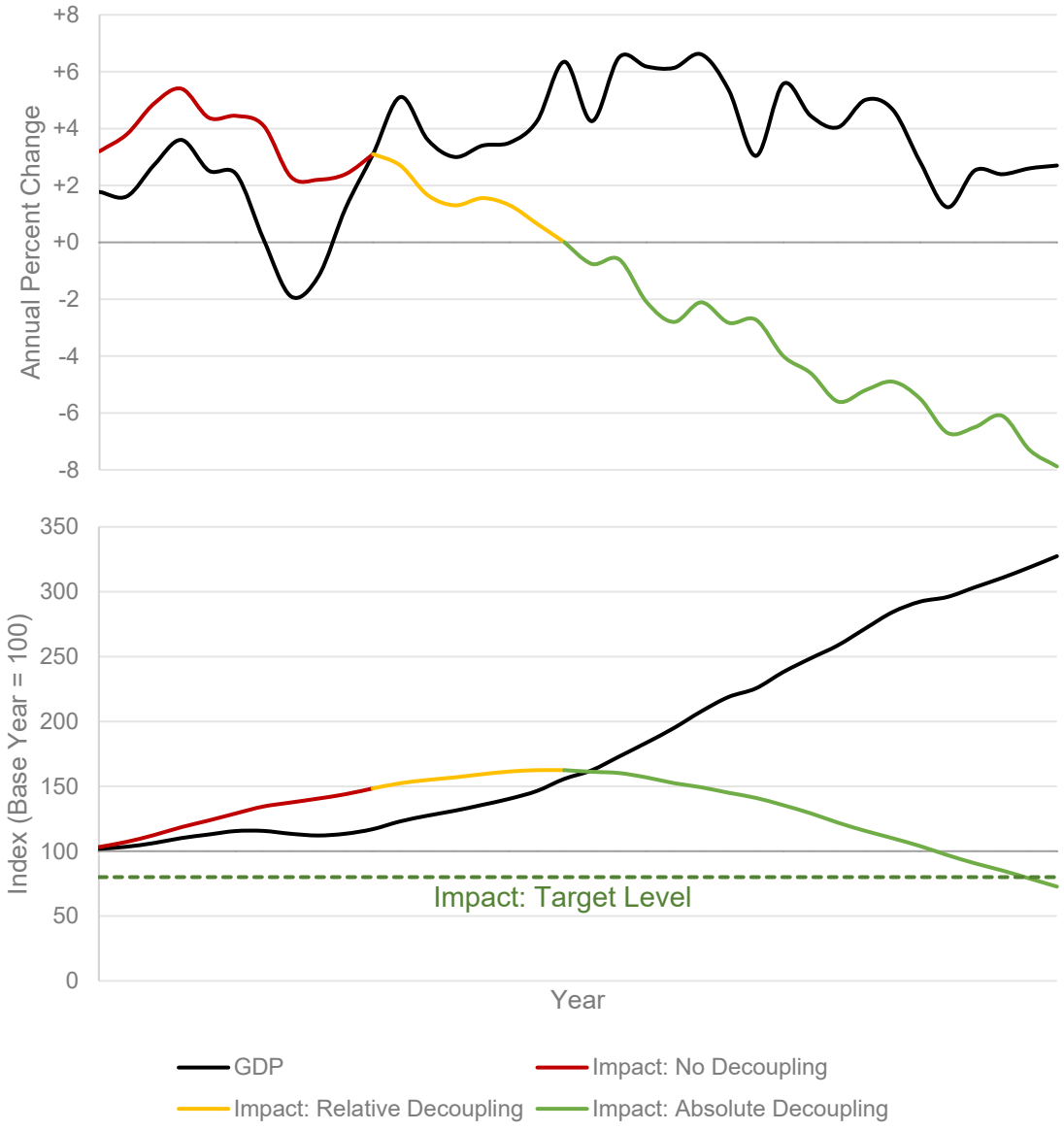


Sources: Authors. Based on Environmental Performance Index (Wendling et al., 2020[4]); Green Growth Index (Acosta et al., 2019[8]); Environmental Vulnerability Index (SOPAC/UNEP, 2005[9]); Climate Change Performance Index (Burck et al., 2019[10]); Happy Planet (New Economics Foundation, 2016[11]); Ecological Footprint (Wackernagel et al., 2019[12]); GDP *per capita* from the World Bank Databank [PPP 2011 International USD].

Poor tracking of decoupling at country level

Achieving the SDGs and implementing the Paris Climate Agreement will require decoupling human well-being and prosperity from the negative environmental effects of human activities including greenhouse gas (GHG) emissions, disruptions to the water cycle, land conversion, biodiversity loss, pollution and other threats to ecosystem services.

Figure 10.2. Illustration of decoupling types, comparing GDP and a generic environmental impact over time



Source: Authors.

Decoupling can be measured in terms of resource use – especially non-renewable resources – or environmental impacts. Absolute decoupling occurs when negative impacts decrease as GDP grows, as shown in Figure 10.2. In the illustration, due to absolute decoupling, the impacts decrease enough to reach the target level towards the end of the time series. Relative decoupling, on the other hand, occurs when resource use or environmental impacts rise but at a slower rate than GDP growth (Haberl et al., 2020[13]). Decoupling does not occur when impacts rise faster than GDP. In many domains, absolute decoupling will be essential to achieving the SDGs and the goals of the Paris Climate Change Agreement; some argue it must be rapid and global (Wiedmann et al., 2020[14]). But absolute decoupling poses tremendous technical challenges to countries, requiring deep transformations of agriculture, industry, energy and transportation.

There are very few examples of absolute decoupling over sustained periods of time (Haberl et al., 2020[13]). The energy transition towards clean and renewable electricity, which is already underway, demonstrates the potential to deliver transformative decoupling (Deep Decarbonization Pathways Project, 2015[15]). Our proposed measure supports evidence-based discussions on decoupling economic growth from a broad range of environmental impacts.

A new approach for measuring domestic and transboundary environmental impacts

General guiding principles and objectives

We provide the outline of a methodology that aims to improve international benchmarks for environmental impacts and track countries' domestic and spillover impacts on the Global Commons. We tentatively call this new measure the Pilot Global Commons Stewardship Index ('Pilot GCS Index'). We also highlight areas for future work and research and invite readers to share feedback and comments.

We are guided by five major guiding principles and objectives. These are meant to address gaps in existing country-level benchmarks highlighted in the previous section.

1. **Provide a comprehensive multi-dimensional assessment of countries' impacts on the Global Commons** to track countries' impacts on aerosols, biodiversity, climate change, land degradation, oceans and water
2. **Track domestic impacts *and* transboundary spillovers**
3. **Estimate distance to pre-defined targets (benchmark resource use against the SDGs and downscaled planetary boundaries)** using a decision tree described in Sachs et al. (2020[5]; 2019[2]; 2018[16]; 2017[17]) which is similar to the decision tree also used by the OECD (OECD, 2020[18]).
4. **Focus on outcome metrics from official and unofficial statistics** (including MRIO databases such as Full Eora and data from recognized research centers and institutions)
5. **Use timely data and regular updates**

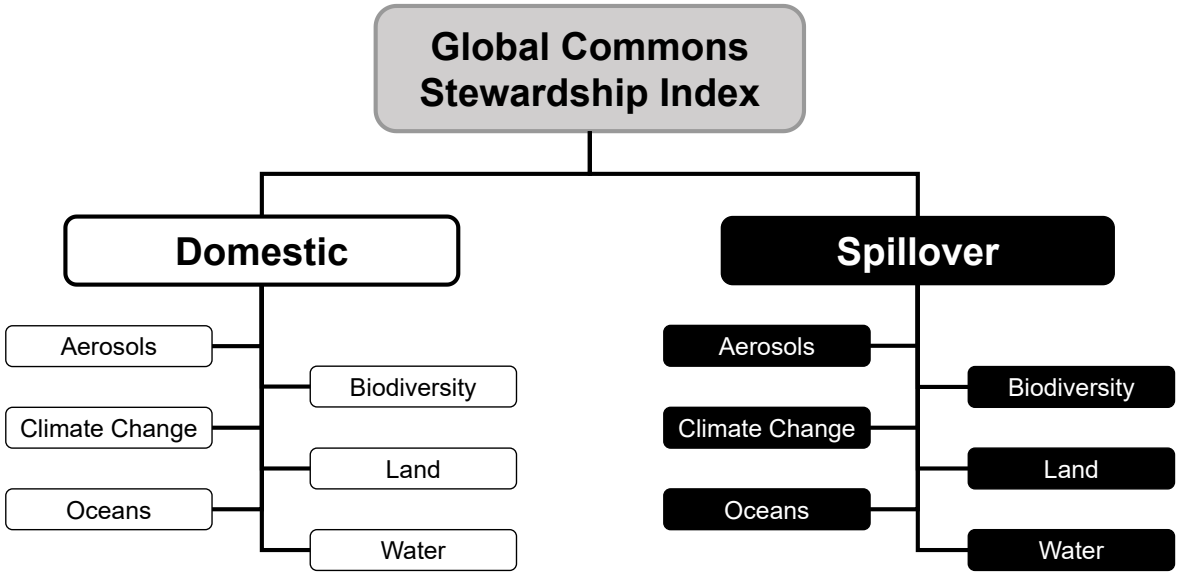
Conceptual framework

Currently, there is no widely accepted definition of the Global Commons. As such, one of the main purposes of the newly established Center for the Global Commons (CGC) is to develop analytical and operational frameworks for the Global Commons to enable the concept to be commonly used by stakeholders across government, business, civil society and academia.

The preliminary conceptual framework is inspired by the planetary boundaries framework and emerging definition of the Global Commons. We do not aim to measure the status of Global Commons but countries' impacts, through emissions, biodiversity threats or unsustainable consumption and production on Global Commons. We draw upon the science-based definition of 'Global Commons in the Anthropocene' from the Stockholm Resilience Centre (Nakicenovic et al., 2016[19]) which refers to the ecosystems, biomes and processes that regulate the stability and resilience of the Earth system. Planetary boundaries include stratospheric ozone depletion; biodiversity loss and extinctions; chemical pollution; climate change; ocean acidification; nitrogen and phosphorous overload; and atmospheric aerosol loading – all of which are critical to supporting life on Earth.

The two-pillar approach aims to emphasise the need for urgent action both on the *supply/production* side and the *demand/consumption* side. Within these two pillars, we categorise impacts into six areas: aerosols, biodiversity, climate change, land, oceans and water (Figure 10.3). The spillover pillar captures both impacts embodied in trade and physical flows (cross-border air or water flows, for example).

Figure 10.3. Preliminary Conceptual Framework for the Pilot Global Commons Stewardship Index



Source: Authors. Based on SDSN et al. (2020[20]).

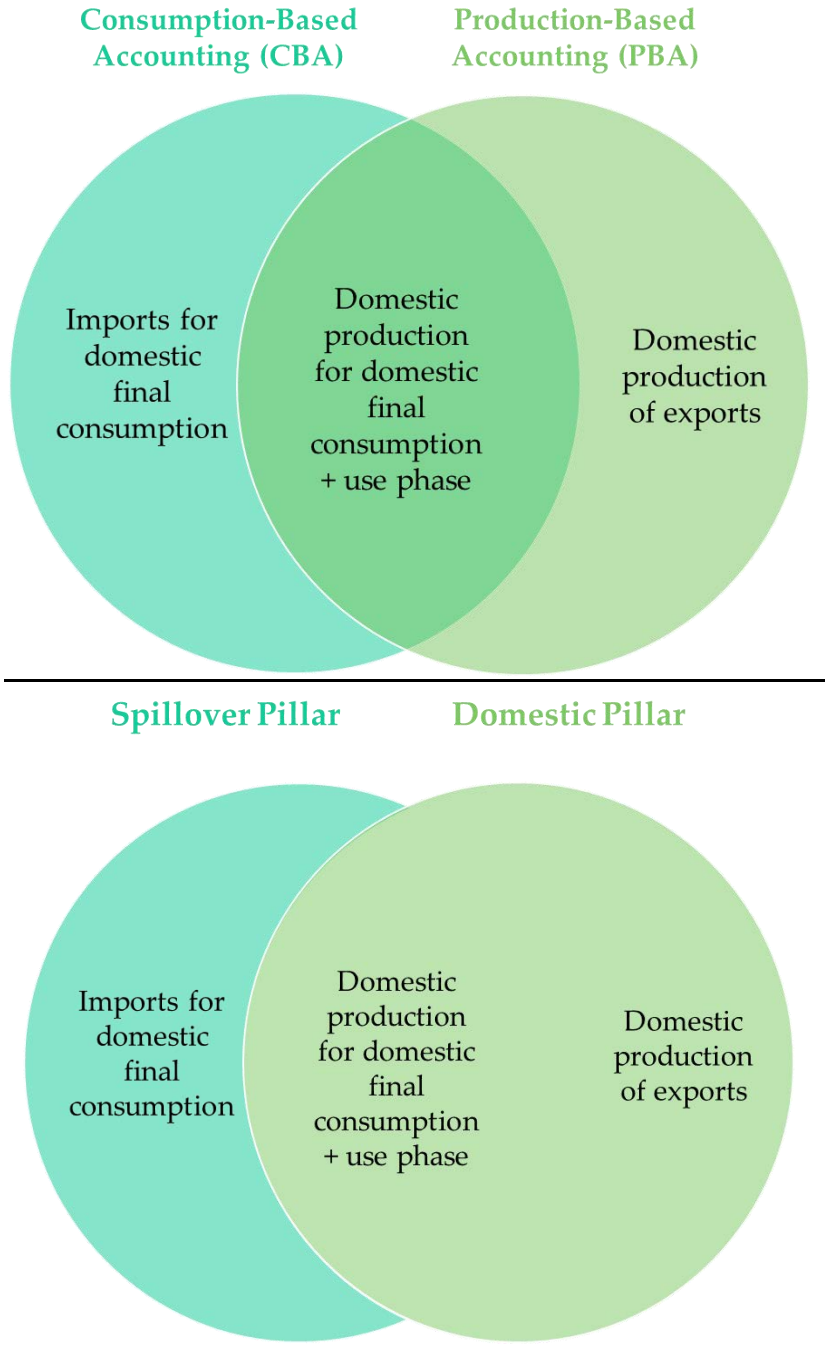
PBA vs CBA accounting to capture cross-border environmental impacts

Our approach builds on the existing literature in the field of Industrial Ecology and earth sciences. Two major accounting methods (Kanemoto et al., 2012[21]) exist for attributing environmental impacts across countries: production-based accounting (PBA) and consumption-based accounting (CBA). Both accounting methods overlap. The terms are defined in the following way and illustrated in Figure 10.3:

- **Production** = domestic production for domestic final consumption + domestic production for exports + use phase
- **Consumption** = domestic production for domestic final consumption + imports for domestic final consumption + use phase

Both methods include use-phase emissions associated with household and government consumption. For instance, tailpipe emissions from driving personal vehicles or combustion emissions from home heating and cooking. The import dimension includes imports that are directly consumed, as well as those that are purchased by domestic industries to create products that are consumed domestically (*e.g.* tyres imported from Mexico, incorporated into cars in the U.S. and sold to American consumers).

Figure 10.4. Consumption-based accounting versus production-based accounting



Source: Author's elaboration

Figure 10.4 shows how the two accounting frameworks overlap, and indeed there is a high level of correlation between PBA and CBA. For this reason, our conceptual framework departs from a straightforward bifurcation into these two pillars. Instead, our domestic pillar focuses on domestic production for domestic final consumption and exports, whereas the spillover pillar isolates 'imports for domestic final consumption', hence making importing countries accountable for negative environmental impacts generated abroad.

PBA is the most commonly used framework. Under the Paris Climate Change Agreement, the methods used to track the evolution of GHG emissions as part of the National Inventory Report of the Intergovernmental Panel on Climate Change (IPCC) and the UN Framework Convention on Climate Change (UNFCCC) focus, for practical reasons, on PBA (Afionis et al., 2017[22]). Methods used to generate PBA estimates of CO_2 emissions (or other types of impacts) are rather straightforward and uncontested. In contrast, CBA relies on more complex input-output matrices and sophisticated modelling techniques, and it is therefore generally subject to more debates among experts than PBA.

However, there is a crucial need to better integrate CBA into monitoring and policy frameworks, including tracking and reducing GHG (Kander et al., 2015[23]). CBA has the advantage of incorporating the impacts generated by international transportation – but also tourism activities based on countries of residency (Kanemoto et al., 2012[21]). It also incorporates carbon leakages and attributes them to the countries that externalise CO_2 emissions. While PBA rightfully emphasises the principle of 'product liability', which states that producers are responsible for the quality and safety of their products, CBA emphasises the responsibility of consumers and international trade policies and agreements. In the SDG and Agenda 2030 contexts, domestic decarbonisation should not be achieved by outsourcing certain high-emitting sectors to other countries, such as cement or steel, and then re-importing the final production (Sachs et al., 2017[17]; Schmidt-Traub et al., 2019[24]).

A problem with the first generation of consumption-based emissions metrics is that they do not encourage countries to reduce emissions in their export sectors since these emissions are assigned to the importing country only. They also do not incentivise countries' specialisation in low-emission technologies (Kander et al., 2015[23]). (Gallego and Lenzen, 2005[25]) describe variants of MRIO modelling approaches to allow for shared assignment of environmental impacts between producers and consumers. This is done by assigning a fraction of environmental impacts to upstream intermediate producers and the remaining fraction to those further downstream.

Technology-adjusted consumption-based accounting (TCBA) adjusts environmental impact measures by the carbon efficiency of a country's export sector. Instead of subtracting all emissions embodied in exports, TCBA only subtracts the average global carbon intensity for that sector (Kander et al., 2015[23]). If a country uses relatively CO_2-intensive technologies in its export sector, it will have a higher TCBA balance sheet than suggested by a simple carbon footprint. As a result, the TCBA measure encourages countries to invest in low-emission production technologies in their export sector. TCBA fully assigns imported emissions to the importing country to maintain the incentive to source from carbon-efficient exporters.

The TCBA measure is not without criticism (Domingos, Zafrilla and López, 2016[26]) and introduces additional measurement challenges, particularly with regards to measuring technology standards across countries. However, in our view, the TCBA represents a conceptually better metric than simple carbon footprinting. We will try to integrate TCBA data and methodologies into our new measure (Kander et al., 2015[23]); (Lenzen, Moran, et al., 2012); (Lenzen, M. et al., 2013[27]); (Tukker et al., 2014[28]); (Wood et al., 2014[29]). The requirement for implementing TCBA is that the global average intensity can be determined. For an MRIO model, that would require the use of a dataset that has common sectors across all countries. EXIOBASE and GTAP might provide the best available estimates with standardised sectors, but the former has a lower country resolution compared to the full Eora, and the latter has few environmental impact metrics (Wood et al., 2014[29]; Carrico, et al., 2020[30]).

Measuring international spillovers

Economists have studied extensively positive and negative spillovers, or *externalities*. For instance, A. C. Pigou (1920[31]) conducted pioneering work in the first half of the 20th century on negative externalities including pollution (Schmidt-Traub et al., 2019[24]). International spillovers occur when one country's actions generate benefits or impose costs on another country that are not reflected in market prices, and are therefore not *internalised* by the actions of consumers and producers (Sachs et al., 2017[17]). These

benefits or costs may be referred to as positive or negative externalities. Much economic work focuses on how these can be *internalised*, e.g. through cross-border taxes for commodities that come with significant environmental or socio-economic footprints or the widely proposed *carbon tax* to internalise the externality of CO_2-induced global warming.

We divide international spillovers into two broad categories: (a) consumption-based impacts embodied in trade and (b) transboundary physical pollution flows.

Measuring consumption-based impacts embodied in trade

As described in Schmidt-Traub et al. (2019[24]), methods for assessing international trade-related spillovers fall into three broad categories:

1. **Multi-Regional Input-Output (MRIO):** MRIO combines internationally harmonised input-output tables and trade statistics for sectors or groups of products and services. MRIOs quantify trade-related spillovers related to environmental; socio-economic; security; and governance and finance spillovers. This top-down method offers comprehensive global coverage of the full supply chain, operating at high levels of aggregation. It generally measures average impacts and cannot distinguish between context-specific technologies, efficiencies and intensities of resource use and pollution. As a result, MRIO methods are best suited for assessing aggregate spillovers at sectoral level or for product groups. Results can be presented for each country. A major advantage is the relative ease with which analyses can be conducted and represented for different countries once the MRIO tables have been set up.

   There are five major MRIO databases that can be used to track trade-related spillovers. Table 10.1summarises their scope and coverage. In terms of country coverage, Eora26 and Full Eora provide the most comprehensive databases with 190+ countries covered. GTAP covers 121 countries and EXIOBASE3 and WIOD provide data for around 40 countries plus 'Rest of the World' (ROW) categories which aggregate results for a large range of countries. Most databases have standardised the main sectors covered across countries, with the exception of Full Eora, which uses country-specific sectors. The number of sectors varies from 26 in Eora26 to 200 in EXIOBASE3. The aggregation or disaggregation into common sectors involves a logical classification made by the database managers. Data is typically available for 2014 or 2015. In the case of EXIOBASE3, the latest data available is from 2011, although there are estimates based on trade and macro-economic data up to 2016 (Stadler et al., 2019[32]).

   The robustness of the modelling approaches and documentation provided can also vary across databases. For instance, the Eora26 website mentions that 'this simplified model is considerably easier to work with than the full Eora MRIO, but it is known to be slightly less accurate. Both the step of aggregating sectors from the higher sectoral detail of Eora to the lower detail of Eora26, and the step of converting Supply-Use IO tables into product-by-product IO tables, involve a net information loss and the introduction of some new assumptions' (Eora26, www.worldmrio.com). The full Eora is considered to be superior to Eora26 when it comes to accuracy and modelling approaches. Comparisons of modelling approaches in MRIO analyses are relatively well documented (Inomata and Owen, 2014[33]; Giljum et al., 2019[34]).

   Finally, the availability of socio-environmental extensions can also vary quite significantly across MRIO databases. Depending on resources and capacities, socio-environmental extensions can be integrated into all these databases. Currently, GTAP is the database with the fewest extensions available. Ultimately, while data on economic transactions is based on national statistics, which are quite robust, the reliability of the socio-environmental extensions, such as a Social Hotspots Database (for GTAP) or PSILCA (for the full Eora), depends on the quality of data collected and

reported by other organisations, including international governmental and non-governmental organisations. Industry sectors in the IO tables of MRIO models may not match the sector disaggregation of socio-economic and environmental databases used as extensions and, hence, may need some adjustments.

Table 10.1. Main characteristics of five MRIO databases

Database	Eora26	Full-Eora	EXIOBase3	WIOD	GTAP
Website	www.worldmiro.com	www.worldmiro.com	www.exiobase.eu	www.wio.org	www.gtap.agecon.purdue.edu
Country coverage	190	190	44 + 5 ROW	43 + ROW	121
Sectors	Standardised	Country-specific	Standardised	Standardised	Standardised
Number of Sectors	26	Not applicable	200	56	65
Years	1990-2015	1990-2015	1995-2011	2000-2014	2004-2014
MRIO Model Certainly	Poor	Good	Good	Good	Good
Environmental extension	Good	Good	Good	Good	Poor

Note: ROW = 'rest-of-world'
Source: Authors' elaboration. Based on (Cabezas, et al, 2019[35]).

The Pilot GCS Index primarily uses estimates based on the full Eora database due to country coverage, timeliness, robustness of the model and availability of environmental extension. Yet there might be exceptions for a few indicators, and this may evolve over time as MRIO databases continue to improve.

2. **Life Cycle Assessment (LCA):** LCA uses a bottom-up approach to assess the environmental impact of individual products and their production processes across geographic and temporal scales. LCA is also increasingly being applied to socio-economic impacts. The principal advantage of this method lies in the high product resolution and the ability to consider different production technologies. However, the analytical scope of the LCA method is limited by the system boundary or cut-off, the so-called *truncation* problem (Reap et al., 2008[36]), which needs to be defined for any product. As a result, LCA cannot be as comprehensive as MRIO. It also requires vast volumes of data, which may be unavailable, particularly where information is commercially sensitive. Owing to these constraints, LCA is less suitable than MRIO for quantifying spillovers at national level.
3. **Material Flow Analyses (MFA):** MFA offers an additional approach for assessing spillovers, by tracking specific material flows along supply chains and across countries. This tracking can be done at high spatial resolution, but primarily for raw or less processed commodities. To some extent, this limitation can be overcome by including conversion factors (*e.g.* from feed to livestock products). As for the MRIO and LCA methods, there have been more applications of the MFA methodology to environmental impacts than to socio-economic impacts so far. Like LCA, MFA also suffers from the truncation problem, so it cannot be as globally comprehensive as MRIO, and it is hard to estimate country-level impacts (Schmidt-Traub et al., 2019[24]).

The Pilot GCS Index uses country-level data based on hybrid approaches. Hybrid approaches seek to combine advantages of the different methods to overcome individual constraints. Over time, our initiative aims to strengthen the measurement of trade-related spillovers in four broad ways.

Firstly, we seek to strengthen data quality and coverage at national level. Major data challenges are common across all methods. Data relating to systems of national accounts (SNA) remains weak, particularly in middle- and low-income countries. This is one of the reasons why developing countries are less represented in research on international spillovers (Tian et al., 2018[37]). Better SNA data, especially

in low-income countries, is critical to filling key knowledge gaps related to spillovers, including context information on production and consumption.

Secondly, we seek to increase the availability of longitudinal analyses of trade-related spillovers. Research groups which develop new, or improve existing, methods for spillover analyses often lack the resources or incentives to continue their work by updating datasets and producing continued time series over many years, which are critical for policy analysis and advocacy around international spillovers.

Thirdly, we seek to complement multi-sector national estimates with specific supply chain analyses. Industry- and supply chain-wide approaches, including, for instance, Structural Path Decomposition (Wood and Lenzen, 2009[38]), are needed to understand the impact of commodities like cocoa, coffee, palm oil, soybeans or textiles on the SDGs, Agenda 2030 and the Paris Climate Change Agreement. There are persisting challenges in comparing country results at the level of specific sectors and supply chains which our initiative aims to contribute to address.

Fourthly, we seek to apply these methods at subnational level. Considering that a significant and growing share of total consumption takes place in cities, it is relevant to explore ways to produce subnational estimates of trade-related spillovers. Although subnational authorities do not have full responsibility on trade policies, regional and local policy makers can contribute to addressing unsustainable consumption via public procurement policies and product labelling requirements.

Physical transboundary flows

A second type of spillover is related to transboundary physical flows of environmental harms. These flows take two major forms. The first such flow arises from the diffusion of pollutants through air and water. Wind carries airborne pollutants into jurisdictions that have no control over the source, as is often the case when factories and other activities are located near to country borders, though in some cases airsheds cover hundreds of kilometres. Pollutants dumped in waterways not only affect local communities but all downstream users. As tributaries join higher-order streams, the effects of these pollutants accumulate, ultimately to the detriment of marine resources. Hypoxic dead zones, largely due to fertiliser runoff, are a notorious example.

The second transboundary issue relates to the consumption of natural resources. In particular, where *common pool* resources span national borders, one nation's extraction may affect others. Aquifers, for example, may be shared by different territories, meaning withdrawal in one locale might result in water scarcity in another. Likewise, upstream water withdrawal – for irrigation, power generation or industrial use – may deprive downstream users of riverine ecosystem services. More indirectly, habitats that are critical for biodiversity also cross boundaries, and degradation in one country can threaten entire populations of species or their genetic diversity. This problem is especially apparent in fisheries, for example, including activity on the high seas.

Our new measure aims to incorporate the best available data and indicators and hold countries accountable for negative impacts generated through these physical flows. Prospective metrics include phosphorus runoff and spillovers of toxic chemicals that highlight contamination of transboundary rivers and watercourses.

However, attributing the responsibility of physical flows to a particular country is still very challenging. While air pollution and river pollution are relatively well measured internationally and at country level, methods that isolate transboundary physical flows between countries are not yet as developed.

This challenge represents the most important data gap in our framework. Using various data sources, including satellite imagery and censor data, and working with partners, we seek to close this data gap over time and to support efforts that help measure transboundary flows.

Method summary and preliminary results

This section provides an overview of the method and preliminary findings of the Pilot GCS Index. It builds on a recent paper published by SDSN, Yale and the University of Tokyo (2020[20]).

The construction of the Pilot GCS Index follows the steps identified in the JRC and OECD Handbook (Nardo et al., 2008[7]). The Pilot GCS Index is an initial prototype, and all results are provisional. We put forth this Pilot Index as an invitation to expert communities to provide critiques, feedback and recommendations for improving the data, methodology and presentation of the GCS Index.

Indicator selection

The data in the Pilot GCS Index come from a variety of sources, including international agencies, academia and non-governmental organisations. Where possible, we integrate indicators that are used to monitor international agreements like the SDGs, 2030 Agenda, Paris Climate Change Agreement and the UN Convention on Biological Diversity. The indicator selection will evolve over time as new data and statistics become available. We selected data for inclusion based on five selection criteria:

1. **global relevance and applicability to a broad range of country settings**
2. **statistical adequacy**
3. **datatimeliness**
4. **data quality**
5. **country coverage.**

Illustrative indicators for OECD, G20 and large countries

For the initial Pilot GCS Index, we have identified a total of 34 indicators from a variety of sources – 23 domestic indicators and 11 spillover indicators (Table 10.2). The indicators are globally relevant; valid and reliable; up-to-date; collected according to internationally approved methods; and available for a large range of countries.

The initial Pilot GCS Index covers 50 countries. We focus on rich and large countries that are likely to have the highest per capita or absolute impacts on Global Commons. Results are presented in per capita terms to allow for comparison across countries. We also highlight the absolute impacts of the 10 countries with the greatest impact on Global Commons.

The initial Pilot GCS Index aggregates countries' performance on the Global Commons into ratings. Ratings on all indicators are first aggregated for each sub-pillar, then by pillar, and finally into an overall rating for the country. Ratings range from fully protecting Global Commons (AAA) to severely lacking (CCC). In future editions of the GCS Index, we plan to introduce quantitative scores for each country and country rankings.

Standardisation, aggregation and ratings

We present the indicators in two forms: proportional and absolute. Proportional indicators are standardised to allow cross-country comparison, regardless of country size. We standardise most metrics by population rather than GDP. Population sizes tend to be more stable over time, and the MRIO databases from which the CBA indicators are calculated use GDP as a denominator.

Absolute indicators present unstandardised metrics of environmental impacts. While the proportional indicators emphasise that governments and citizens in small countries can strengthen policies and actions for sustainable development, the absolute indicators emphasise the efforts and leadership needed from large countries that have the greatest global impacts. This two-track approach reflects the growing trend

in the field of industrial ecology, where researchers tend to present both per capita and absolute results in peer-reviewed papers (e.g. (Lenzen, M. et al., 2018[39])).

To make the data comparable across indicators, we rescale each variable between 0 and 100, with 0 being the lowest bound denoting very poor performance and 100 denoting targets fully achieved. We winsorise each dataset so that all countries exceeding the target score 100 and all falling below the lowest bound score 0.

We select the target, or upper bound, using a decision tree presented in Sachs et al. (2020[5]). Optimally, indicator targets should be based on the SDGs or some other international agreement. When such a target is not available, we rely on scientific inputs and expert judgment. Finally, if neither of these two options is available, the upper bound is based on current best global performers. Likewise, the lower bound is also based on current worst performance.

We rescale all indicators using a distance-to-target technique described by Equation 1.

$$\textit{Indicator Score} = (X - L) / (U - L) \times 100 \qquad [1]$$

where X is a raw data value; U and L denote the upper and lower bounds, respectively. Our selection of bounds ensures that for all rescaled variables, higher values indicate better performance (Table 10.2). Thus, a country that scores 50 on an indicator is half-way towards achieving the optimum value; a country with a score of 75 has covered three quarters of the distance from the lower to the upper bound.

Table 10.2. Initial list of indicators and associated upper and lower bounds for rescaling indicators

	Proportional			Absolute		
Indicator	**Units**	**Upper**	**Lower**	**Units**	**Upper**	**Lower**
Aerosols						
NO_X emissions, domestic	kg/capita	0[a]	20[c]	Gg	0[a]	700[c]
NO_X emissions, spillover	kg/capita	0[a]	10[c]	Gg	0[a]	400[c]
SO_2 emissions, domestic	kg/capita	0[a]	200[c]	Gg	0[a]	3 500[c]
SO_2 emissions, spillover	kg/capita	0[a]	45[c]	Gg	0[a]	11 600[c]
$PM_{2.5}$ concentration	µg/m³	6[b]	35[d]	µg/m³	6[b]	35[d]
Biodiversity						
Terrestrial spp. Threatened, domestic	per million people	0[a]	45[c]	number	0[a]	11 000[c]
Terrestrial spp. Threatened, spillover	per million people	0[a]	5[c]	number	0[a]	150[c]
Freshwater spp. Threatened, domestic	per million people	0[a]	10[c]	number	0[a]	200[c]
Freshwater spp. Threatened, spillover	per million people	0[a]	1[c]	number	0[a]	25[c]
Marine spp. Threatened, domestic	per million people	0[a]	10[c]	number	0[a]	125[c]
Marine spp. Threatened, spillover	per million people	0[a]	2[c]	number	0[a]	25[c]
Red List Index	scale 0 to 1	1[a]	0.65[c]	scale 0 to 1	1[a]	0.65[c]
Unprotected terrestrial sites	%	0[a]	67[d]	%	0[a]	67[d]
Unprotected freshwater sites	%	0[a]	67[d]	%	0[a]	67[d]
Unprotected marine sites	%	0[a]	67[d]	%	0[a]	67[d]
Climate Change						
GHG emissions, domestic	t CO2e/ capita	0[a]	20[c]	Tg CO2e	0[a]	900[c]
GHG emissions, spillover	t CO2e/ capita	0[a]	10[c]	Tg CO2e	0[a]	500[c]

	Proportional			Absolute		
Indicator	**Units**	**Upper**	**Lower**	**Units**	**Upper**	**Lower**
Black carbon emissions	kg/capita	0[a]	1.2[c]	Gg	0[a]	150[c]
CO_2 emissions, fossil fuel exports	t CO2/ capita	0[a]	20[c]	t CO2/ capita	0[a]	20[c]
Land						
NH_3 emissions, domestic	kg/capita	0[a]	25[c]	Gg	0[a]	850[c]
NH_3 emissions, spillover	kg/capita	0[a]	10[c]	Gg	0[a]	400[c]
SNMI	scale 0–1.4	0[a]	1.4[e]	scale 0–1.4	0[a]	1.4[e]
Non-recycled waste	kg/capita/day	0[a]	1.5[c]	Gg	0[a]	150[c]
Deforestation	%	0[a]	1.5[c]	10^3 ha.	0[a]	300[c]
Human trophic level	scale 2 to 3	2[a]	3[e]	scale 2 to 3	2[a]	3[e]
Oceans						
Fish stocks, collapsed or overexploited	%	0[a]	50[f]	%	0[a]	50[f]
Fish caught by trawling	%	0[a]	60[f]	%	0[a]	60[f]
OHI: clean waters	scale 0–100	100[a]	25[c]	scale 0–100	100[a]	25[c]
Water						
Untreated wastewater	%	0[a]	100[e]	%	0[a]	100[e]
NH_3 emissions, domestic	kg/capita	0[a]	30[c]	Gg	0[a]	11 400[c]
NH_3 emissions, spillover	kg/capita	0[a]	20[c]	Gg	0[a]	11 200[c]
Scarce water, domestic	10^3 m³/capita	0[a]	35[c]	trillion m³	0[a]	2.5[c]
Scarce water, spillover	10^3 m³/capita	0[a]	9[c]	billion m³	0[a]	600[c]
Water stress	% renewable	0[a]	100[f]	billion m³	0[a]	100[f]

Note: Sources for upper and lower bounds noted as (a) technical optimum, (b) average of top 5 countries, (c) 2.5th-percentile, (d) expert-based, € worst performer, (f) SDG Index. OHI = Ocean Health Index, SNMI = Sustainable Nitrogen Management Index.
Source: For indicator sources and detailed references, see SDSN et al. (2020[20]).

While there are several methods for weighting and aggregating individual indicator scores, we present our new pilot framework in the simplest terms. We aggregate indicator scores into sub-pillar scores and sub-pillar scores into pillar scores. At each level of aggregation, indicators and sub-pillars are given equal weight – with the exception of the domestic Climate Change sub-pillar, wherein GHG emissions are given 95% weighting and black carbon emissions 5%.

Because our pilot results are by definition preliminary, we display country ratings and not scores and rankings at this stage. We want to avoid singling out the performance of one country and the feeling of false precision. Future versions of the GCS Index, following further refinements to the methodology and the addition of new indicators, may well provide a sufficient basis for rankings and scores. We use the following scale (Table 10.3). The ranges for each category may be further refined to better reflect the underlying distribution of each indicator.

Table 10.3. Ratings categories as defined by score ranges in the Pilot GCS Index

Rating	Score Range
AAA	100
AA	90–99
A	80–89
BBB	70–79
BB	60–69
B	50–59
CCC	0–49
no data	n/a

Preliminary results

Table 10.4 summarises the initial Pilot GCS ratings for 50 countries. We present ratings for domestic impacts, spillovers and the overall scores. Rich countries have the greatest negative impacts on Global Commons. Small wealthy countries, such as Luxemburg and Switzerland, perform particularly poorly on spillovers. Detailed results by country are also available (SDSN et al., 2020[20]).

Table 10.4.Country ratings in the overall Pilot GCS Index and by pillar using proportional indicators

	Overall	Domestic	Spillover		Overall	Domestic	Spillover
Argentina	BB	CCC	A	Japan	B	BB	CCC
Australia	CCC	CCC	CCC	Korea, Rep.	B	B	B
Austria	B	BB	CCC	Latvia	BB	BB	BB
Bangladesh	BBB	BBB	A	Lithuania	BB	BB	B
Belgium	CCC	BB	CCC	Luxembourg	CCC	B	CCC
Brazil	BBB	BB	A	Mexico	BB	B	A
Canada	CCC	CCC	CCC	Netherlands	CCC	BB	CCC
Chile	BBB	BB	A	New Zealand	CCC	CCC	BB
China	BB	B	A	Nigeria	BBB	BBB	A
Colombia	BBB	BB	A	Norway	CCC	BB	CCC
Czechia	BB	BB	BB	Pakistan	BBB	B	A
Denmark	B	BB	CCC	Philippines	BBB	BBB	A
Estonia	BB	BB	BB	Poland	BB	BB	BBB
Ethiopia	BBB	BB	A	Portugal	B	B	CCC
Finland	BB	BBB	B	Russia	BB	B	BBB

France	B	BBB	CCC	Saudi Arabia	CCC	CCC	B
Germany	B	BB	CCC	Slovakia	BB	BB	B
Greece	B	B	B	Slovenia	B	BB	CCC
Hungary	BBB	BB	BBB	South Africa	BB	B	BBB
Iceland	CCC	CCC	CCC	Spain	B	B	B
India	BBB	BB	A	Sweden	B	BBB	CCC
Indonesia	BBB	BB	A	Switzerland	CCC	BBB	CCC
Ireland	B	BB	CCC	Turkey	BB	B	BBB
Israel	CCC	CCC	CCC	United Kingdom	B	BBB	CCC
Italy	B	BB	CCC	United States	B	CCC	B

Source: (SDSN et al., 2020[20])

Table 10.5 lists the 10 countries with the largest absolute impacts on the Global Commons. In absolute terms, Table 7 shows that the relatively large countries, by population or wealth, have the greatest impacts on the Global Commons. The relationship between domestic and spillover ratings can sometimes be comparable, as with China or India, though some countries exhibit a divide as to whether their impacts are mostly occurring within their borders or through transboundary activities, as with France or the United Kingdom.

Table 10.5. Ten countries with the greatest absolute impacts on Global Commons

	Overall	Domestic	Spillover
China	CCC	CCC	CCC
France	CCC	BB	CCC
Germany	CCC	B	CCC
India	CCC	CCC	CCC
Italy	CCC	B	CCC
Japan	CCC	CCC	CCC
Mexico	CCC	CCC	B
Russia	CCC	CCC	CCC
United Kingdom	CCC	BB	CCC

Source: SDSN et al. (2020[20]), *Pilot Global Commons Stewardship Index,* SDSN/Yale Center for Environmental Law & Policy/Center for Global Commons at the University of Tokyo; Paris/New Haven, CT/Tokyo.

Four key findings emerge from the Pilot GCS Index

Most countries generate large negative impacts on the Global Commons, but variations across countries are substantial. No country in our sample has successfully mitigated its impacts to the Global Commons. In fact, no surveyed country obtains the highest or second highest possible ratings (AAA and AA) on the overall index or its constituent pillars and sub-pillars. However, there is high variability in country performance, which can help poor performers understand how to do better. Many developing countries

have smaller impacts on the Global Commons than wealthier countries, buoyed in large part by better ratings in the spillover pillar. Small, rich countries with high trade intensity, however, score notably worse in this pillar due to imported goods that have negative impacts on the Global Commons throughout the supply chain.

International spillovers account for a large share of country impacts. Countries primarily affect the Global Commons through impacts within their borders, but transboundary spillovers do play a large role. Switzerland, for example, emits 6.0 tonnes of CO_2 eq. per person domestically, and imports 4.8 tonnes of CO_2 eq. per person through the products and services it consumes, which represent 44% of its total footprint. Likewise, for every species threatened within Belgium, environmental spillovers from the country threaten 186 terrestrial species, 60 freshwater aquatic species and 91 marine species elsewhere in the world. Stakeholders need to closely examine how domestic performance compares to spillovers in order to improve the stewardship of the Global Commons.

Absolute impacts. Results in absolute terms identify the greatest negative impacts from the world's largest economies: China, the United States, India, Japan, the EU and Russia. Within the sub-pillars of the Pilot GCS Index, we find the greatest absolute negative impacts from the following countries:

- **aerosols**: China, Japan, United States, India, United Kingdom
- **biodiversity**: China, USA, Japan, India, France
- **climate change**: Australia, USA, China, India, Germany
- **land**: USA, Japan, China, Germany, France
- **oceans**: Israel, Belgium, Slovenia, Poland, Italy
- **water**: India, China, USA, Russia, Saudi Arabia.

Major data gaps. Despite an abundance of data on environmental performance and new tools for tracking spillover impacts, there are major gaps in availability and data coverage, particularly in relation to biodiversity loss at the genetic and population levels; disruptions to the phosphorus cycle; land degradation, especially from agriculture; hazardous waste; and water quality and scarcity.

Conclusions and next steps

Growing evidence suggests that further actions are needed in developed and developing countries alike to respond to climate change, biodiversity, plastic pollution and other environmental crises. The COVID-19 crisis demonstrates how vulnerable our societies are to impacts from environmental changes, such as zoonotic diseases transmitted by animals, which become more likely through deforestation and other environmental destruction (Johnson et al., 2020[40]; Carroll et al., 2018[41]).

This Working Paper argues that existing environmental benchmarks of environmental impacts at country-level are currently insufficient because they leave out the important issue of transboundary impacts and spillover generated through trade and physical flows. We present a Pilot Global Commons Stewardship Index for measuring countries' environmental impacts that uses both production-based accounting and consumption-based accounting to capture domestic and spillover environmental impacts of countries on the global commons. We believe that such a measure can help to address flaws in existing measures of environmental impact at country level and will support more evidence-based policy-making for achieving major international agreements and conventions including the SDGs, 2030 Agenda, the Paris Climate Change Agreement and the Convention on Biological Diversity.

We welcome comments and feedback on our approach. In the coming months, the authors aim to:

- conduct further consultations with experts and stakeholders;
- refine the indicator selection and provide an indication on trends over time;
- develop an online and interactive platform for users;
- connect with sovereign credit ratings and companies' ratings;
- strengthen communication and outreach including to policymakers.

References

Acosta et al. (2019), *"Green Growth Index: Concepts, Methods and Applications"*, No. 5 GGGI Technical Report, Seoul: Green Growth Performance Measurement (GGPM) Program, Global Green Growth Institute, http://greengrowthindex.gggi.org/. [8]

Afionis, S. et al. (2017), "Consumption-based carbon accounting: does it have a future?", *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 8/1, p. e438, http://dx.doi.org/10.1002/wcc.438. [22]

Bley, et al (2020), *Sustainable Development in the European Union: Monitoring Report on Progress towards the SDGS in an EU Context — 2020 Edition*, Luxembourg: Publications Office of the European Union, https://ec.europa.eu/eurostat/web/products-statistical-books/-/KS-02-20-202. [3]

Burck et al. (2019), *Climate Change Performance Index Results 2020*. [10]

Cabezas, et al (2019), *"Towards More Sustainability in the Soy Supply Chain: How Can EU Actors Support Zero Deforestation and SDG Efforts?"*, Climate Focus, Global Canopy, SDSN and GIZ, https://irp-cdn.multiscreensite.com/be6d1d56/files/uploaded/Sustainability%20in%20Soy%20supply%20chain_consolidated%20study%20%282%29_final.pdf. [35]

Carrico, et al. (2020), *"The GTAP Version 10AMulti-Region Input Output (MRIO) Data Base"*, Department of Agricultural Economics, Purdue University, West Lafayette, in Global Trade Analysis Project (GTAP). [30]

Carroll, D. et al. (2018), "The Global Virome Project", *Science*, Vol. 359/6378, pp. 872-874, http://dx.doi.org/10.1126/science.aap7463. [41]

Deep Decarbonization Pathways Project (2015), *Pathways to Deep Decarbonization 2015 Report*, Sustainable Development Solutions Network (SDSN) and the Institute for Sustainable Development and International Relations (IDDRI), http://deepdecarbonization.org/. [15]

Domingos, T., J. Zafrilla and L. López (2016), "Consistency of technology-adjusted consumption-based accounting", *Nature Climate Change*, Vol. 6/8, pp. 729-730, http://dx.doi.org/10.1038/nclimate3059. [26]

Gallego, B. and M. Lenzen (2005), "A consistent input–output formulation of shared producer and consumer responsibility", *Economic Systems Research*, Vol. 17/4, pp. 365-391, http://dx.doi.org/10.1080/09535310500283492. [25]

Giljum, S. et al. (2019), "The impacts of data deviations between MRIO models on material footprints: A comparison of EXIOBASE, Eora, and ICIO", *Journal of Industrial Ecology*, Vol. 23/4, pp. 946-958, http://dx.doi.org/10.1111/jiec.12833. [34]

Haberl, H. et al. (2020), "A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: synthesizing the insights", *Environmental Research Letters*, Vol. 15/6, p. 065003, http://dx.doi.org/10.1088/1748-9326/ab842a. [13]

Inomata, S. and A. Owen (2014), "Comparative Evaluation of MRIO Databases", *Economic Systems Research*, Vol. 26/3, pp. 239-244, http://dx.doi.org/10.1080/09535314.2014.940856. [33]

Johnson, C. et al. (2020), "Global shifts in mammalian population trends reveal key predictors of virus spillover risk", *Proceedings of the Royal Society B: Biological Sciences*, Vol. 287/1924, p. 20192736, http://dx.doi.org/10.1098/rspb.2019.2736. [40]

Kander, A. et al. (2015), "National greenhouse-gas accounting for effective climate policy on international trade", *Nature Climate Change*, Vol. 5/5, pp. 431-435, http://dx.doi.org/10.1038/nclimate2555. [23]

Kanemoto, K. et al. (2012), "Frameworks for Comparing Emissions Associated with Production, Consumption, And International Trade", *Environmental Science & Technology*, Vol. 46/1, pp. 172-179, http://dx.doi.org/10.1021/es202239t. [21]

Lenzen, M. et al. (2018), "The carbon footprint of global tourism", *Nature Climate Change*, Vol. 8/6, pp. 522-528, http://dx.doi.org/10.1038/s41558-018-0141-x. [39]

Lenzen, M. et al. (2013), "Building Eora: A Global Multi-Region Input–Output Database at High Country and Sector Resolution", *Economic Systems Research,*, Vol. Vol. 25 (1), pp. 20-49. [27]

Nakicenovic, N. et al. (2016), *Global Commons in the Anthropocene: World Development on a Stable and Resilient Planet*, http://pure.iiasa.ac.at/id/eprint/14003/. [19]

Nardo, M. et al. (2008), *Handbook on Constructing Composite Indicators: Methodology and User Guide*, JRC47008. OECD, Paris, https://www.oecd.org/std/42495745.pdf. [7]

New Economics Foundation (2016), *Happy Planet Index*, http://happyplanetindex.org/. [11]

OECD (2020), *How's Life? 2020: Measuring Well-being*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9870c393-en. [18]

Pigou, A. (1920), *The Economics of Welfare*, London: Macmillan. [31]

Reap, J. et al. (2008), "A survey of unresolved problems in life cycle assessment", *The International Journal of Life Cycle Assessment*, Vol. 13/5, pp. 374-388, http://dx.doi.org/10.1007/s11367-008-0009-9. [36]

Sachs et al. (2020), *Sustainable Development Report 2020*, Cambridge University Press. [5]

Sachs et al. (2019), *"Sustainable Development Report 2019"*, New York: Sustainable Development Solutions Network (SDSN). [2]

Sachs et al. (2018), *SDG Index and Dashboards Report 2018 – Global Responsibilities. – Implementing the Goals"*, Gütersloh and New York: Bertelsmann Stiftung and Sustainable Development Solutions Network, http://sdgindex.org/. [16]

Sachs et al. (2017), *"SDG Index and Dashboards Report 2017"*, New York: Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN)., http://www.sdgindex.org/assets/files/2017/2017-SDG-Index-and-Dashboards-Report--full.pdf. [17]

Schmidt-Traub et al. (2019), *"International Spillovers and the Sustainable Development Goals (SDGs)"*, SDSN Policy Brief, New York: Sustainable Development Solutions Network (SDSN). [24]

Schmidt-Traub, G. et al. (2017), "National baselines for the Sustainable Development Goals assessed in the SDG Index and Dashboards", *Nature Geoscience*, Vol. 10/8, pp. 547-555, http://dx.doi.org/10.1038/ngeo2985. [1]

SDSN et al. (2020), *Pilot Global Commons Stewardship Index*, SDSN/Yale Center for Environmental Law & Policy/Center for Global Commons at the University of Tokyo; Paris/New Haven, CT/Tokyo. [20]

SOPAC/UNEP (2005), *Environmental Vulnerability Index*. [9]

Stadler et al. (2019), *"EXIOBASE 3"*, Zenodo, http://dx.doi.org/10.5281/zenodo.3583071. [32]

The Economist (2019), "Greta Thunberg Accuses Rich Countries of 'Creative Carbon Accounting'", *The Economist*, http://www.economist.com/finance-and-economics/2019/10/17/greta-thunberg-accuses-rich-countries-of-creative-carbon-accounting. [6]

Tian, X. et al. (2018), "Trends and features of embodied flows associated with international trade based on bibliometric analysis", *Resources, Conservation and Recycling*, Vol. 131, pp. 148-157, http://dx.doi.org/10.1016/j.resconrec.2018.01.002. [37]

Tukker et al. (2014), *"The Global Resource Footprint of Nations", Carbon, Water, Land and Materials Embodied in Trade and Final Consumption Calculated with EXIOBASE 2: 8*. [28]

Wackernagel, M. et al. (2019), *Ecological Footprint: Managing Our Biocapacity Budget*, https://www.footprintnetwork.org/. [12]

Wendling et al. (2020), *2020 Environmental Performance Index*, New Haven, CT: Yale Center for Environmental Law & Policy. epi.yale.edu. [4]

Wiedmann, T. et al. (2020), "Scientists' warning on affluence", *Nature Communications*, Vol. 11/1, http://dx.doi.org/10.1038/s41467-020-16941-y. [14]

Wood, R. and M. Lenzen (2009), "Structural path decomposition", *Energy Economics*, Vol. 31/3, pp. 335-341, http://dx.doi.org/10.1016/j.eneco.2008.11.003. [38]

Wood, R. et al. (2014), "Global Sustainability Accounting—Developing EXIOBASE for Multi-Regional Footprint Analysis", *Sustainability*, Vol. 7/1, pp. 138-163, http://dx.doi.org/10.3390/su7010138. [29]

Further Reading

BirdLife International et al. (2019), “World Database of Key Biodiversity Areas” http://www.keybiodiversityareas.org/site/search.

Curtis et al. (2018), ‘Classifying Drivers of Global Forest Loss.”Loss’, Science, Vol. 361 (6407): 1108–11. https://doi.org/10.1126/science.aau3445.

Food and Agriculture Organization (2016), “AQUASTAT Main Database”, AQUASTAT 2016. http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en.

Global Burden of Disease Collaborative Network (2017), Global Burden of Disease Study 2016 (GBD 2016): Health-Related Sustainable Development Goals (SDG) Indicators 1990-2030, Seattle, United States: Institute for Health Metrics and Evaluation, http://ghdx.healthdata.org/record/ihme-data/gbd-2016-health-related-sdgs-1990-2030.

Gütschow, Johannes, M. LouiseJ., Jeffery, RobertM. L., Gieseke, RonjaR., Gebel, DavidR., Stevens, MarioD., Krapp, M. and Marcia Rocha. , M. (2016. “), ‘The PRIMAP-Hist National Historical Emissions Time Series.”Series’, Earth System Science Data, Vol. 8 (2): 571–603. https://doi.org/10.5194/essd-8-571-2016.

Halpern et al. (2015), “Patterns and Emerging Trends in Global Ocean Health” Edited Health, edited by Athanassios C. Tsikliras., PLOS ONE 10 (3): e0117863. https://doi.org/10.1371/journal.pone.0117863.

Häyhä et al. (2016), “From Planetary Boundaries to National Fair Shares of the Global Safe Operating Space — How Can the Scales Be Bridged?”, Global Environmental Change, Vol. 40 (September): 60–72. https://doi.org/10.1016/j.gloenvcha.2016.06.008.

IUCN (2020), The IUCN Red List of Threatened Species. – Version 2020-1, https://www.iucnredlist.org.

Joint Research Centre (2016), “Atmospheric Particles-Equivalent Black Carbon MAAP (2016)”. Knowledge for Policy -– European Commission 2016, https://ec.europa.eu/knowledge4policy/dataset/jrc-abcis-ap-ebcma-2016_en.

Lafortune et al. (2018), ‘SDG Index and Dashboards. Detailed Methodological Paper’, Paris: Bertelsmann Stiftung and Sustainable Development Solutions Network. http://sdgindex.org/assets/files/2018/Methodological%20Paper_v1_gst_jmm_Aug2018_FINAL.pdf.

Lenzen et al. (2014), ‘Compiling and Using Input–Output Frameworks through Collaborative Virtual Laboratories’, Science of The Total Environment, Vol. 485–486 (July): 241–51. https://doi.org/10.1016/j.scitotenv.2014.03.062.

Lenzen et al. (2012), ‘Mapping the Structure of the World Economy’, Environmental Science & Technology, Vol. 46(15)), pp. 8374–8381. DOI: 10.1021/es300171x.

Lenzen et al. (2020), ‘The Global Environmental Footprint of Healthcare’, The Lancet Planetary Health (under review).

Lenzen et al. (2012), ‘International Trade Drives Biodiversity Threats in Developing Nations’, Nature, Vol. 486 (7401): 109–12.

Malik et al. (2019), ‘Advancements in Input-Output Models and Indicators for Consumption-Based Accounting’, Journal of Industrial Ecology, Vol. 23 (2): 300–312. https://doi.org/10.1111/jiec.12771.

Miao, G.,. and F. Fortanier (2018), Nowcast TiVA Estimates: Methodology”, Paris.

Oita et al. (2016), “Substantial Nitrogen Pollution Embedded in International Trade”, Nature Geoscience, Vol. 9 (2): 111–15. https://doi.org/10.1038/ngeo2635.

Pauly et al. (eds) (2020), Sea Around Us Concepts, Design and Data”, seaaroundus.org.

South Pacific Applied Geoscience Commission and United Nations Environment Programme (2005), Environmental Vulnerability Index”, http://www.vulnerabilityindex.net/.

Stadler et al. (2018), “EXIOBASE 3: Developing a Time Series of Detailed Environmentally Extended Multi-Regional Input-Output Tables: EXIOBASE 3”, Journal of Industrial Ecology, Vol. 22 (3): 502–15. https://doi.org/10.1111/jiec.12715.

Wendling, Zachary Z. A., John W. Emerson, Daniel C.J. W., Esty, Marc A.D. C., Levy, AlexM. A., de Sherbinin, andA. et al. (2018.), 2018 Environmental Performance Index., New Haven, CT: Yale Center for Environmental Law & Policy. epi.yale.edu.

Wiebe et al. (2018), “Implementing Exogenous Scenarios in a Global MRIO Model for the Estimation of Future Environmental Footprints”, Journal of Economic Structures, Vol. 7: 20.

World Health Organization (2017), “Prevalence of Obesity among Adults, BMI ≥ 30, Age-Standardised Estimates by Country”, Global Health Observatory Data Repository. 2017., https://apps.who.int/gho/data/view.main.CTRY2450A?lang=en.

Zhang, Xin, and Eric Davidson (2019), “Sustainable Nitrogen Management Index” Preprint, Soil Science. https://doi.org/10.1002/essoar.10501111.1.

Note

[1] The authors would like to thank experts consulted for this paper: these include Dr Jorge Gómez-Paredes (Duke University), Dr Arunima Malik (University of Sydney), Dr Naoko Ishii (University of Tokyo) and Akiyuki Kawasaki (University of Tokyo). We also thank the team at the Center for the Global Commons (CGC) at the University of Tokyo, SYSTEMIQ, the World Resources Institute (WRI) and the Potsdam Institute for Climate Impact Research (PIK) for feedback and comments. We would also like to thank Grayson Fuller and Sophie Tyack for excellent research assistance. Support for the research team at the SDSN was provided by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). We are particularly grateful to Maren Bernlöhr and Nora Loehr. Support for the research team at Yale was provided by the McCall MacBain Foundation, Roberta Gordon, the Ida and Robert Gordon Family Foundation, as well as Marshall Ruben and Carolyn Greenspan. The views expressed in this paper are those of the authors and may not reflect the view of the SDSN Leadership Council.

11 Policy priority inference for sustainable development: A tool for identifying global interlinkages and supporting evidence-based decision making

Annabelle Sulmont, Maite García de Alba Rivas and Stephanus Visser[1]

United Nations Development Programme (UNDP) in Mexico - Strategic Initiatives Project

This chapter presents the Policy Priority Inference model. It describes how this model, through the identification of positive and negative spillovers between policy dimensions within and between countries, as well as agent-based modelling, can inform policy and budgeting decision-making processes to accelerate development. It also describes how the model, developed by academia, was adapted to the SDGs and piloted with real-world data in Mexico. Building on the outcomes of the pilot project, the chapter reflects on the various historical and prospective analyses the tool can generate to help governments make evidence-based decisions to optimise progress on the SDGs.

Currently, many of the tools used by governments and development partners are unable to manage the complexity of the SDGs. This is due to the fact that they rely on techniques that are not designed to account for the positive and negative spillovers between indicators or to adequately model the processes of policy design and implementation. With this in mind, researchers from the Alan Turing Institute and the Centre for Research and Teaching in Economics (CIDE, for its acronym in Spanish) in Mexico developed the Policy Priority Inference (PPI) model. One of the core components of this innovative tool is the identification of complex spillover networks between development issues, which allows it to estimate the impact of a variety of policy decisions on development indicators. In line with the 2030 Agenda, in this paper we understand development to refer to the harmonisation of three interconnected elements – economic growth, social inclusion and environmental protection – that are required to meet the needs of the present without compromising the ability of future generations to meet their own needs.

Through this article, we seek to determine the added value of the PPI model for identifying policy interlinkages within and between countries to foster sustainable development. In order to do so, we will firstly present the model, its main components, including estimated conditional dependency networks that enable the identification of transboundary spillovers between policy dimensions and the data it uses to inform policy and budgeting decision-making processes to accelerate development. Secondly, we will present the 'Policy Priority Inference for Sustainable Development' (PPISD) initiative implemented by the Office of the United Nations Development Programme (UNDP) in Mexico, which adapted the PPI model to the SDGs and tested its application with real-world data to identify how its results can inform decision-making. Thirdly, building on the outcomes of the PPISD project, we will reflect on the various ways in which the PPI model can generate information to help governments optimise progress on the SDGs at local, national and global levels. Lastly, we will offer some ideas for future research and application.

The PPI model: foundations and data to address interlinkages within and between countries in a systemic way

PPI is a computational tool, developed by Omar A. Guerrero, senior researcher at the Alan Turing Institute, and Gonzalo Castañeda, professor at CIDE, that aims to (i) address the complexities attached to the budgeting prioritisation process towards sustainable development (characterised by multiple and simultaneous objectives, multiple interrelations and implementation inefficiencies that are observed at a transboundary and national level) through the use of data; (ii) inform policy design and guide the establishment of a given administration's targets; (iii) assess the feasibility of certain development targets in a given period of time; (iv) identify policy issues that could perform as accelerators; (v) assess the coherence of governments' actions and goals; and (vi) account for context specific interlinkages between development indicators and policy dimensions. In this section, we will briefly describe the reasoning that underlies the PPI model and the data used for the retrospective and the prospective analyses. Nonetheless, readers are strongly encouraged to consult the detailed methodological framework of the model (UNDP Mexico, 2020[1]).

The PPI model is based on the conception that, in order to understand policy results, it is crucial to identify dependencies between development indicators. In different contexts, the indicators' relative 'level' cannot be interpreted merely as a result of the minimum and maximum values observed in the other network units (these are, in the case of a country analysis, for example, the other states that belong to the network). However, this approach is not sufficient, which is why the model also incorporates the relation between micro-level processes and aggregate dynamics as a necessary dimension of decision-making. Policy priorities generate micro-level policy interventions, which, in turn, lead to aggregate outcomes in non-linear ways. In order to account for these dynamics, the PPI model builds upon spillover networks between countries (for a national analysis) and between regions (for a subnational analysis), as well as on agent-based modelling. Below we detail the micro and macro dynamics.

At micro level, the PPI tool accounts for the technical inefficiencies derived from a principal-agent problem that arises between a central authority that allocates resources to accomplish a set of development targets, and the public officials in charge of implementing policies for the accomplishment of the targets set by the central authority. Public officials have incentives to divert public resources for personal gain, especially when public governance mechanisms are weak enough to reduce the probability of being spotted and of being penalised. In this regard, it is important to mention that Mexico performs poorly in the global rule of law indices, scoring near the bottom on issues such as corruption, transparency and judicial system effectiveness. According to the 2020 Rule of Law Index published by the (World Justice Project, 2020[2]), Mexico ranks 104th out of 128 countries. In its 2015 annual report, the Mexican Institute for Competitiveness (IMCO) estimated that corruption costs the national economy as much as 5% of its GDP (OECD, 2017[3]). The current federal administration has made the fight against corruption a centrepiece of its governing platform.

The PPI tool mimics the process by which public officials learn how much corruption or technical inefficiency goes unnoticed or is tolerated by the central authority, and infers the level of efficiency in the use of transformational resources in a given policy issue. It is important to mention that technical inefficiencies in resource allocation, defined here as the gap between the resource received and those assigned to government programmes, can be caused by corruption but also by the mismanagement of resources.

At macro level, the PPI focuses on the development indicators' evolution over a certain period of time. It is important to note that we classified indicators in two categories: instrumental and collateral. Instrumental indicators are those that can be directly addressed and affected by policy interventions. Collateral indicators, on the other hand, are those that cannot be directly intervened due to their aggregated nature (i.e. gross domestic product). Annex 11.A presents the list of 141 indicators used for piloting the model in Mexico at country level. These indicators are observed for all the countries that belong to the network and their results for a country are dependent on the results of others.

The evolution of a given instrumental indicator is a function of four components:

- the transformative resources allocated to the corresponding policy issue (this is the level of prioritisation);
- the efficiency in the use of those transformative resources;
- the incoming spillover effects; and
- a calibrated growth factor (α) that accounts for other observable and unobservable determinants that are not explicitly stated in the model.

This means that the initial conditions, the targets and the country's context matter for policy-making and for country-specific estimations. As we can see, the macro and the micro dynamics are closely linked. In period *t,* the central authority opts for a budgetary profile aimed at reducing major gaps between indicators' values and the established development targets. In period *t+1,* the central authority will continue addressing major gaps through budgetary allocations and will add the inefficiency factor to the equation. The larger the gap, the greater the amount of allocated resources. Conversely, the higher the observed inefficiency, the fewer the resources that will be allocated to a certain policy issue. It is worth noting that inefficiencies will not always be observable for the central authority, especially if an indicator receives positive spillovers from other policy areas. Through its capacity to account for positive and negative spillover effects, the PPI tool lends itself well to address, in an innovative and realistic way, the integrated nature of the 2030 Agenda.

It is worth noting that the spillover network is constructed using international data[2] in order to provide a sense of comparability between countries' outcomes and to model the environment in which agents make decisions and interact. The spillover network can be estimated for national contexts to analyse the relations between indicators in a certain country, but it can also be estimated for international scenarios.[3] This implies that through the estimation of a global or regional spillover network, it is possible to observe how

development issues are related and how transformational spending in a certain area affects the behaviour of different development indicators at regional or global level, considering a broader conditional dependency network. Understanding the way in which policy issues are interrelated is crucial to allocating resources efficiently, taking the aforementioned spillover network as a given element in the decision-making process.

The conditional dependency network of a country or region under investigation is estimated via a Sparse Gaussian Bayesian Networks Approach using time series constructed from its development indicators. This approach was developed by (Aragam, Gu and Zhou, 2018[4])and is accessible in a package for the R programming language (UNDP Mexico, 2020[5]). 'The method estimates a structural equation model and returns a weighted directed network of conditional dependencies where the edges have been filtered in order minimise potential overfitting' (Guerrero and Castañeda, 2020[6]). These networks partly determine the observed development gaps in instrumental and collateral indicators. Additionally, as mentioned before, they represent the scenario in which the central authority and the public officials make decisions over budgetary allocations and policy implementations.

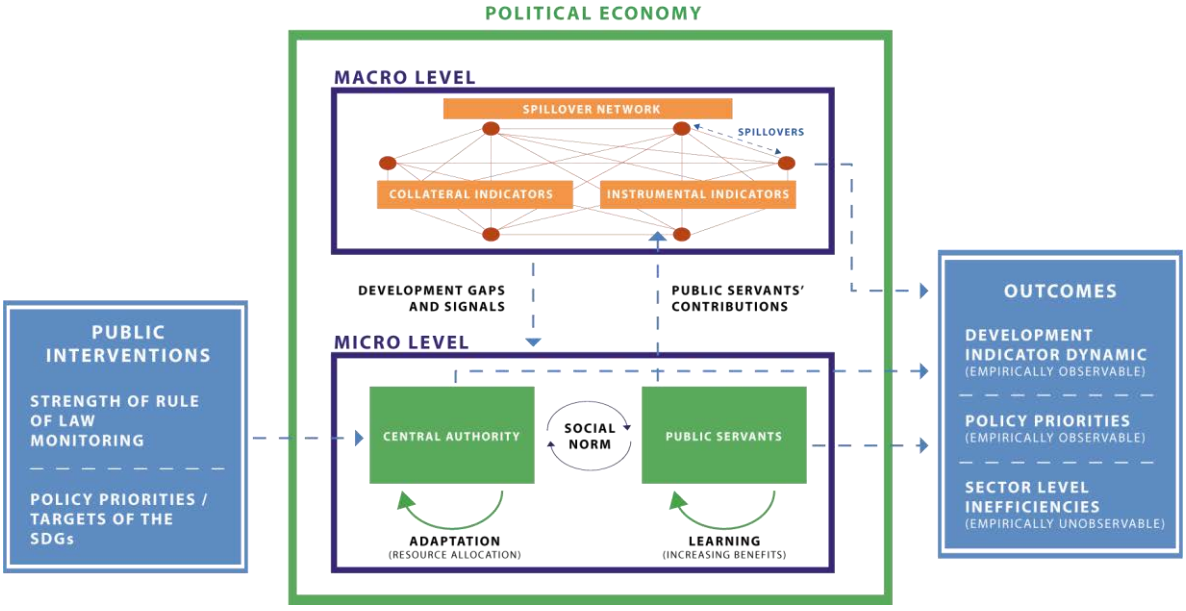
The network estimation is crucial to policy design and the definition of priorities, as some policy issues may constitute accelerators of development whenever they have many positive outgoing spillovers. On the other hand, some policy issues may entail trade-offs: while improving a certain dimension, negative outgoing spillovers may deteriorate the evolution of other indicators, subtracting effectiveness from the transformative resources allocated to the affected dimensions. From this, we can derive that even if two countries display a similar development profile (i.e. with similar indicator levels) and identical targets, the recommended priorities profile may be entirely different when accounting for spillovers and interlinkages between SDGs indicators, as well as governance parameters.

Figure 11.1 provides a diagram of the model. The panel on the left side presents some components that feed the PPI model. Examples include government reforms to strengthen the rule of law or governments aligning their development goals to the SDGs. It is important to note that all the public interventions take place at micro-level, which means that they are relevant to the civil servants responsible for implementing government policies (Guerrero and Castañeda, 2020[6]) (UNDP Mexico, 2020[1]).

In the box at the centre of the illustration we can see that these public interventions affect the distribution of resources between the different programmes. These budgetary (re)allocations can change the conditions under which the public officials who are responsible for implementing the programmes operate. This behavioural game (i.e. principal-agent problem) occurs in the arena of public administration, whose micro component is modelled by two types of computational agents: central authority and public servants. On the one hand, the civil servants try to learn what proportion of public resources they should use to finance a programme to improve development indicators and how much they can divert. On the other hand, the central authority adapts its decisions through a heuristic that is based on different criteria: (i) relative lags in development indicators and (ii) signs of possible inefficiencies in the implementation and financing of the programmes. The learning process between government and public servants gives rise to the construction of a social norm regarding the collective tolerance for inefficiency (Guerrero and Castañeda, 2020[6]). In addition, we can observe two vertical mechanisms that connect the micro level with the macro level:

- upward causality that modifies the value of the development indicators through the vector of contributions and that fosters the set of spillovers, which are generated in the network of interdependencies between indicators and between the network units (countries or subnational regions);
- downward causality that provides new information regarding changes in development gaps, as well as benefits for public officials and scandals arising from resource deviation by civil servants.

Figure 11.1. Structure of the PPI model



Source: Author's elaboration, based on Guerrero, O.A. and Castañeda, G. (2020[6]) and UNDP Mexico (2020[1]).

In summary, the PPI model uses the following exogenous inputs (Guerrero and Castañeda, 2020[6]).

- Initial conditions;
- Spillover network (i.e. the estimated conditional dependency network);
- Development targets or goals set by a government;
- A set of governance parameters, which can be obtained from international datasets such as the Worldwide Governance Indicators;
- Calibrated growth factors of the development indicators.

The panel on the right side specifies the different results that can be obtained through the models' simulations (Guerrero and Castañeda, 2020[6]) (UNDP Mexico, 2020[1]). On the one hand, it can produce a retrospective priority profile derived from the observed data and the growth factor of indicators, which enables a coherence analysis between priorities (actions) and targets (exogenous goals). On the other hand, it allows for a series of prospective results regarding the feasibility of a given vector of development targets, policy guidance for resource allocation that enhances the accomplishment of targets in a given context, as well as the identification of development accelerators. Before offering a series of practical examples of retrospective and prospective analyses using PPI, we will discuss how we adjusted the model to the SDGs and piloted it in Mexico.

Adaptation of the PPI model to the SDGs and pilot implementation

2030 Agenda framework

One of the key innovations of the 2030 Agenda lays in its conception of the integrated and multidimensional nature of development. The 2030 Agenda, through its 17 SDGs, 169 targets and 232 indicators, reflects

the understanding that the dimensions of social development, economic growth and environmental protection are intrinsically connected, and that peace, justice and strong institutions are necessary conditions for sustainable development.

The adoption of the SDG has generated important progress in the development of new indicators and tools to support governments in the analysis of local, national and regional development challenges and in the design of the public policies that seek to address them. In the complex environment posed by the multiple interdependencies between the SDGs, the need to prioritise policies becomes fundamental. Such prioritisation poses a formidable challenge as the sophisticated feedback between development indicators gives rise to non-linear relationships, which, in turn, depend on local contexts and are not easy to anticipate. In addition, the weight of positive or negative spillover effects between indicators, in a complex network, thereby further differ, complicating estimations of the degree to which governments' investments have the desired result. As indicated by Guerrero and Castañeda (2020[6]), 'in the macro scale of international agendas, causation between policy interventions and development outcomes is almost impossible to infer from available data sources such as development indicators. This is so because policy interventions take place at a micro-level, while development indicators are typically macro-level variables.'

Adapting tools to support governments to make sense of the multidimensionality of development

Given the complexity of the multidimensional relations between development challenges and the policies that seek to address them, the effective implementation of the 2030 Agenda requires the use of innovative analytical tools for the design of strategies that can map the complex positive and negative spillover networks that exist between development indicators at local, national and international level. With this in mind, in recent years UNDP has collaborated with academics and professionals from different disciplines to study the problem of how to best accelerate progress across the 17 SDGs by developing and implementing policies that allow governments to formulate their policies based on evidence.

As part of these efforts, UNDP Mexico, with the support of UNDP's Regional Bureau for Latin America and the Caribbean (RBLAC), implemented the PPISD project. This initiative focused on adapting the PPI model presented in the previous section to the 2030 Agenda and piloting it at federal and state level in Mexico in order to test its potential to generate empirically sound policy prescriptions of how governments can prioritise resource allocation and fine tune their development targets to achieve the SDGs. Testing the model not only at national but also subnational level was considered of particular relevance as, in many countries, a large share of public policies are implemented by local governments (UNDP Mexico, 2020[1]).

In this regard, it is worth mentioning that in Mexico the distribution of federal resources to its 32 state governments follows formulas defined in the Fiscal Coordination Law. Some resources are allocated in proportion to states' participation in economic activity and tax collection efforts. Other federal funds, for example those related to education, health, social development and infrastructure, are allocated in direct proportion to the states' identified development gaps and needs.

By aiming to adapt the PPI model to the SDGs and piloting it, we sought to address two key challenges of development planning. First of all, official policy-making processes tend to focus on achieving short-term tangible goals that match electoral cycles and therefore do not allow for structural transformations. This disincentivises the development and use of tools suitable for long-term policy-making. Secondly, many of the innovative methodologies that have the potential to strengthen evidence-based policy-making generally remain in the academic sector where they were created and are not modified to allow for easy implementation by governments. By focusing on adapting and piloting the PPI model, the PPISD project aimed at enabling cross-fertilisation between academic institutions, government, international organisations and think tanks to allow for the development of a tool that can support real-world decision-making.

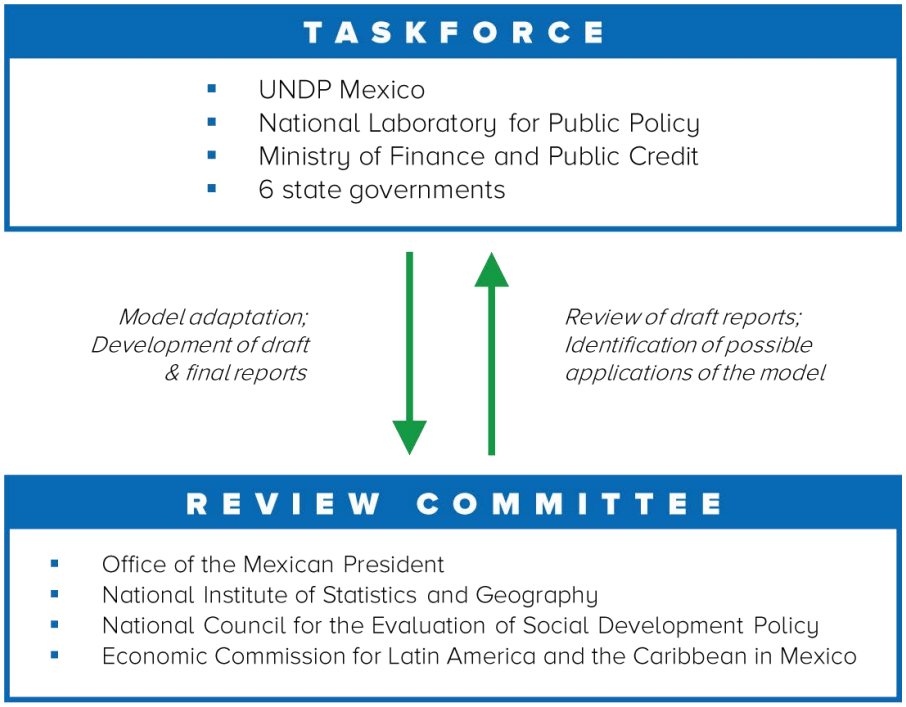
Project design

The PPISD project, which was implemented over the course of 2019, consisted of three subsequent phases:

- Conformation of a project Taskforce and Review Committee;
- Adaptation of the model to the SDGs; and
- Pilot implementation of the model with real-world data.

In the first phase of the project a multisectoral Taskforce was created that was charged with adapting the model and its subsequent implementation. At the same time, we installed a Review Committee that was responsible for scrutinising the draft products developed by the Taskforce and issuing recommendations on possible improvements. Figure 11.2 details the different actors that participated in the implementation and review of the project.

Figure 11.2. Governance structure of the PPISD project



Source: Author's elaboration, based on (UNDP Mexico, 2020[5]) and (UNDP Mexico, 2020[7])

The creation of the multi-stakeholder Taskforce and Review Committee facilitated constructive feedback loops between academia, government and international organisations, assuring that the adaptation of the PPI model would match national and local capacities and challenges in terms of data gathering and processing, as well as governments' planning and budgeting cycles.

Model adaptation and pilot implementation

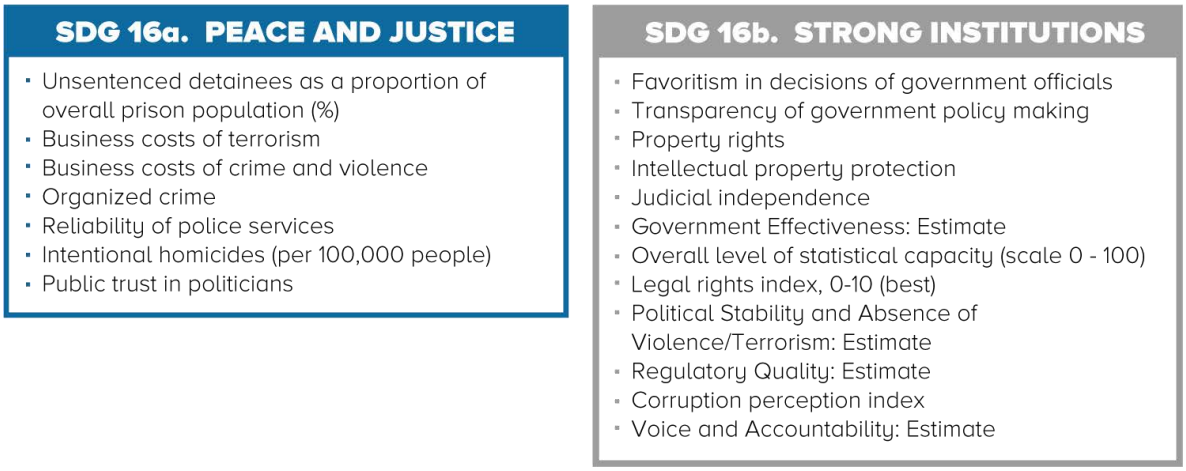
As we mentioned before, one of the main exogenous sources of information and inputs of the model is the data on development indicators. For the national application of the PPI, we used 141 indicators for the period 2006–2016. Each of these indicators was linked to one of the 17 SDGs, based on its capacity to assess the progress of the matter addressed by the SDG. The data predominantly came from international databases, with information of countries from all around the globe (see Annex 11.A). This allowed, in the

first place, for the data to be standardised in a range [0, 1] – where values closer to 1 refer to better development outcomes – to assess the national indicators' status over the different periods of time and in relation to other countries' development levels[4]. This is the use of international data enabling benchmarking, comparability and the identification of potential lags.

Additionally, the use of international data is crucial for the (exogenous) target setting process carried out by governments and, thus, for the budget allocation profiles. The selection of targets for each indicator of the SDGs may be determined by numerous factors such as international agreements, internal political considerations, campaign promises and society's preferences and claims, among others. But it can also be the result of governments' aspirations to resemble certain successful countries in terms of sustainable development and SDGs performance. Nonetheless, the PPI model recognises that adopting other country's development levels as one's targets does not mean the automatic and direct adoption of that country's priority profile, given each country's own context: the SDG network, the initial conditions and the governance aspects (that shape the behaviour of public officials).

Likewise, based on the feedback received from government we decided to increase the number of indicators covered by SDG 16. In order to adequately represent this in the model, SDG 16 was split into its two main components: (1) peace and justice and (2) strong institutions (see Figure 11.3). This separation is important in the Mexican context as the former covers topics related to violence, while the latter touches upon anti-corruption issues, both of which are national priorities (UNDP Mexico, 2020[5]).

Figure 11.3. Indicators used for both components of SDG 16, as used in the PPISD project



Source: Author's elaboration, based on Guerrero, O.A. (2020[8])

Subsequently, a workshop was organised in which the members of the Taskforce and Review Committee, UNPD's RBLAC, as well prominent national think tanks participated. The objective was threefold:

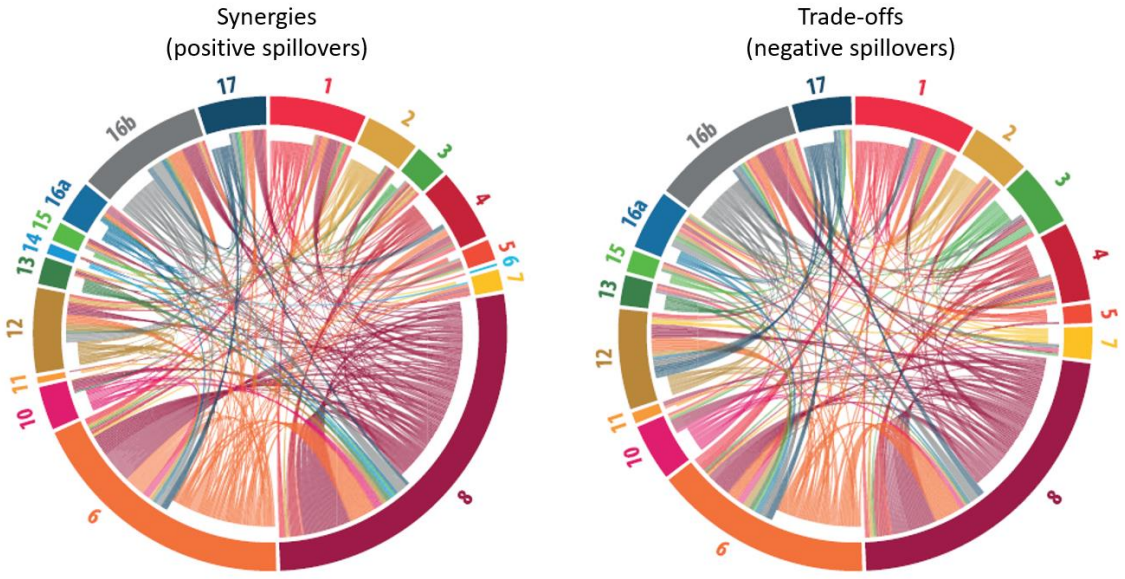
- To create a solid understanding of the theory behind the PPI model, as well as its main components;
- To review the indicators selected, verify their relevance, identify duplicities and jointly classify them as either instrumental or collateral;
- Io identify possible pilot applications of the model at state level.

Based on the outcomes of the workshop a final dataset was composed, allowing for the PPI model to be piloted at national level. In order to test the adapted PPI model at local level, the Taskforce worked with the state governments to analyse their multi-year development plans, linking local indicators to those of the PPI model and identifying historical data on each development indicator.

Piloting the model at national and subnational level

Based on the data gathered in the adaptation phase, we were able to establish the unique spillover networks at national and local level. These do not only show the multiple synergies and trade-offs between indicators, but also their respective 'weight'. Figure 11.4 shows the positive and negative spillover networks between indicators for Mexico (federal level). The indicators are ordered according to their SDGs. Outgoing spillovers are those that are furthest from the circle, while inbound spillovers are the closest (UNDP Mexico, 2020[5]). This particular illustration does not show the weight of the spillovers.

Figure 11.4. Interdependency network between development indicators of Mexico



Source: UNDP Mexico (2020[5])

The circle on the right demonstrates that it is possible for pairs of indicators belonging to the same SDG, for example SDG 8, to have a negative relationship. In addition, it is common to find economic factors (e.g. SDGs 8 and 9) that are negatively related to environmental variables (e.g. SDGs 12 and 13). Also, improvements in some health indicators (SDG 3) turn out to be negatively associated with several indicators of SDGs 1, 4, 7, 8, 9 and 10. These are just some of the findings that highlight the fact that conditional dependency relationships of indicators are highly complex and can be counterintuitive and are therefore not easy to anticipate through traditional expert analysis (ibidem).

Spillover networks such as the one presented above, which can also be generated for the regional and even global level, form the basis of a wide range of practical applications through which the PPI model can help governments make informed decisions on how to accelerate progress across the SDGs. Using examples of the outcomes of the PPISD, which was implemented at national and subnational level, we will discuss the different possible applications of the PPI model in the next section.

Practical applications of the PPI model to support progress on the SDGs

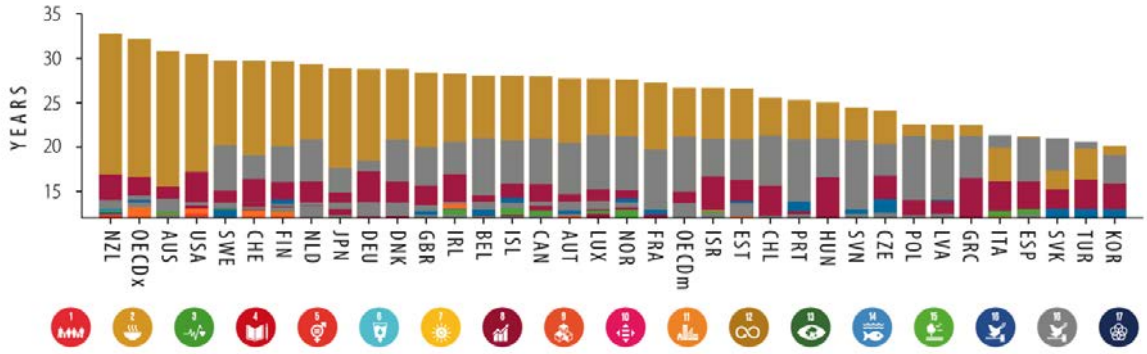
Using other countries' or regions' models to guide development strategy

One of the practical applications of the PPI model is related to its capacity to assess if a country or a region would be able to reach the 'mode of development' of others and estimate how much time this would take.

The PPI model can identify the specific mode of development of countries and regions by mapping their relative strengths and weaknesses on a wide set of development indicators linked to the SDGs. Obviously, some countries present more strengths than others. If a government aims to bridge a particular development gap it can use the PPI model to identify those countries that have already achieved this target and estimate the time it would take to reach their respective mode of development. This allows governments to analyse the feasibility of reaching the development mode of others.

To illustrate this, we can use an example from the PPISD project in which we assessed how long it would take Mexico to reach the 2016 development indicators of other member countries of the Organisation for Economic Co-operation and Development (OECD). In Figure 11.5, the height of each colour segment, inside the different bars, indicates how long it would take Mexico to reach the corresponding indicators of each SDG. The OECDm label corresponds to average indicators of OECD members (excluding Mexico), while the OECDx label corresponds to the highest indicators among these countries (the maximum). The chart shows that it would take Mexico between 20 (in the case of the Republic of Korea) and 32 years (in the case of New Zealand) to reach the development models of different OECD countries.

Figure 11.5. Feasibility of the OECD development models (Ten 'slowest' indicators).



Source: UNDP Mexico (2020[5])

Examining coherence between public strategic plans and budget assignation

Through counterfactual exercises, the PPI tool can identify the coherence between a country's budget allocation and the targets established in its strategic development plan. PPI can infer the areas the governments prioritise, which enables it to determine to what extent the distribution of public resources matches governments' discourse on their supposed priorities. Furthermore, it allows for the detection of how the distribution of public resources could be modified in order to ensure greater coherence between its development targets and real priorities (as reflected in the governments' public resource allocations).

The PPI methodology, building on its identification of both complex spillover networks between development indicators and estimated spending inefficiencies, can infer priority indicators. For example, negative spillover effects, combined with agency problems, can prevent a country that is investing heavily in poverty reduction from reaching its corresponding development targets. This means that limited progress on certain development indicators may not be caused by a lack of funding, but rather by other aspects which are often not considered in budget allocation decision-making procedures.

Based on the identification of the complex interdependencies between development indicators, the PPI tool can help governments identify how to reorient public resources to reach their targets. This also contributes to governments' understanding of the 2030 Agenda's integrality principle which implies that the dimensions of social, economic and environmental development are intrinsically connected.

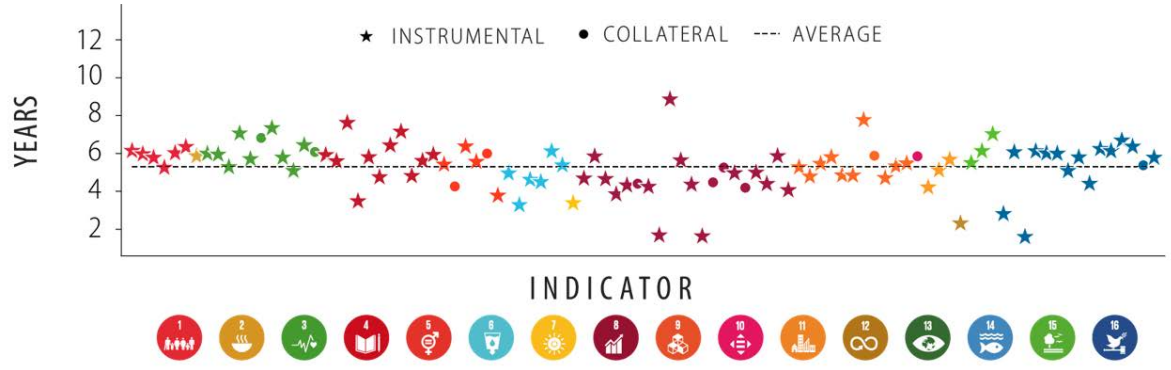
Assessing the feasibility of established targets

Even if it is well-known that planning for development requires adopting mid- and long-term perspectives, governments' planning processes are often tied to electoral calendars. In Mexico, for example, the president and state governors are elected for one six-year period and their development plans generally prioritise policies that are able to generate concrete results that match this time span. In such a context, it is primordial to assure that the targets set by a government can in fact be achieved within this six-year period. However, this is not always the case as the tools traditionally used for determining development targets often do not allow for accurate prospective analyses.

That said, the PPI tool, building on the identification of the spillover network and historical analyses, allows for the estimation of the time it will take governments to reach their development targets. This enables governments, whether they are in the process of writing their strategic plans or revising them, to make informed decisions on the level of ambition of their development targets and ensure that they can be reached within a certain timeframe. That way, they are more able to meet the 2030 Agenda's goals of increasing the effectiveness of public policies.

As an example, the PPISD project assessed the feasibility of the targets set by the State of Jalisco. The results of this exercise are shown in Figure 11.6. The different stars and dots plotted represent instrumental and collateral indicators, respectively, and their vertical position indicates the estimated time it takes for the State of Jalisco to reach the target for each indicator. According to the model, the majority of the targets can be reached in about six years. At the same time, we observe that one target related to an instrumental indicator of SDG 8 will likely not be reached for at least eight years. Others, for example two indicators of SDG 8, one of SDG 12 and two of SDG 16, can be met within approximately two to three years. Findings such as these allow governments to fine tune their development targets, either by increasing the level of ambition for those that are expected to be reached very soon and lowering the ambition for those that will likely not be met by the current administration.

Figure 11.6. Estimated convergence time of the State of Jalisco's development indicators, per SDG



Source: UNDP Mexico (2020[7])

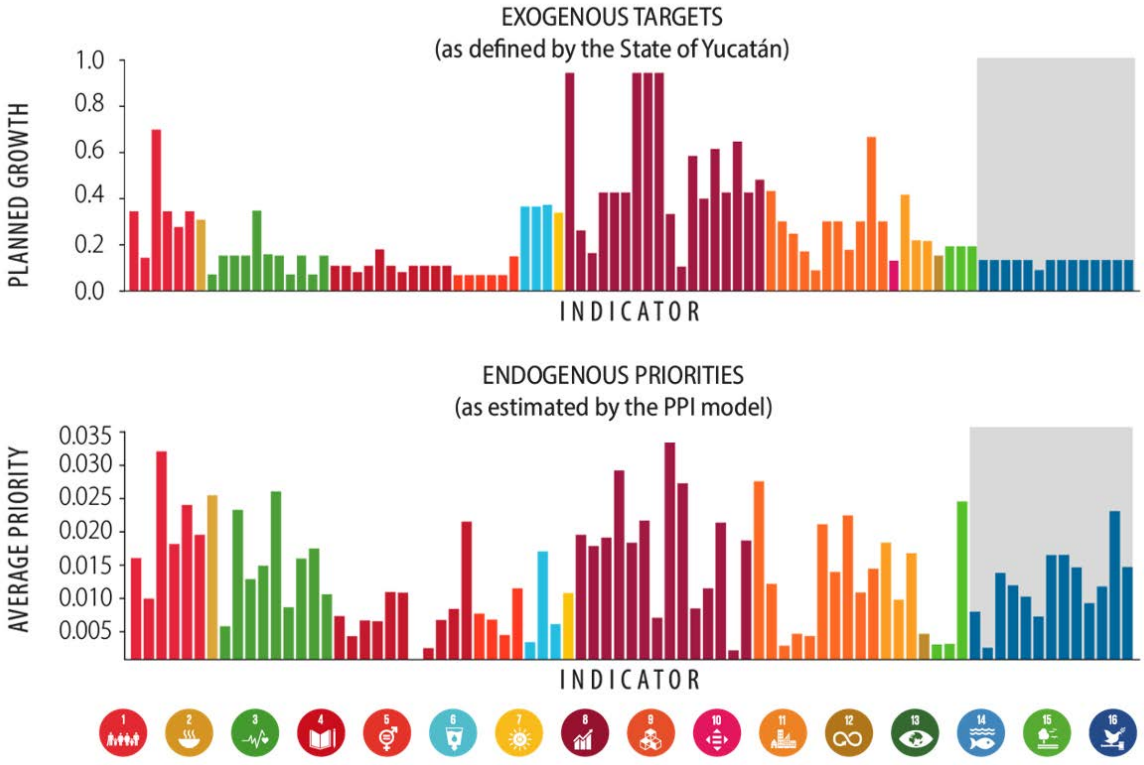
Identifying SDG accelerators and bottlenecks

Based on both the identification of the unique dependency network of a country or region and the estimation of spending efficiencies, the PPI model is able to detect certain programmatic areas that can either catalyse or hinder the improvements of other indicators, depending on whether they are associated with large positive or negative spillover effects.

Development targets established by the State of Yucatán were examined as part of the PPISD project. The first chart in Figure 11.7 presents the progress the government aims to achieve on indicators related

to different SDGs. It shows that Yucatán is aiming to achieve significant improvements related to SDGs 1 (poverty reduction), 8 (decent work and economic growth) and 9 (industry, innovation and infrastructure). At the same time, it is not prioritising indicators linked to SDG 16 (peace, justice and strong institutions). However, when applying the PPI model to infer which programmatic areas Yucatán should prioritise to achieve its development targets (chart below), we observed that, due to the positive spillover effects linked to SDG 16, as well as spending efficiencies, investment in indicators linked to this SDG is required to reach its development targets. This means that even though SDG 16 is not an explicit priority for the government, it is fundamental to invest, or keep investing, in this SDG to reach its targets in the fields of poverty reduction, economic growth and innovation, amongst others.

Figure 11.7. Identification of accelerators and bottlenecks in the State of Yucatán



Source: UNDP Mexico (2020[71])

Guiding decision-making in a context of earmarked budgets

In addition to the various applications of the PPI model that are based on the analysis of governments' development indicators and targets, it can also process data on public finances to identify opportunities for accelerating sustainable development. For example, as part of the PPISD project, we identified both how much the State of Nuevo León spends on each SDG and what percentage of the available federal and local funds is earmarked for a specific policy issue or can be redirected if needed. When applying the PPI model, we observed that even though SDG 4 (quality education) is a priority for the state government, in order for it to reach its development targets, it should not prioritise spending on this SDG as it is almost solely covered by earmarked federal funds. On the contrary, SDG 6 (clear water and sanitation), which the state government did not consider a particular priority, merits additional investment as few federal earmarked funds are assigned to it.

Similar analyses could be conducted to assess the impact of budget shortages that result from austerity measures. Likewise, the tool also allows for examining how public spending should be modified due to changes in the capacity of governments to generate tax revenue as a consequence of, for example, the ageing of its population.

Future research and application

The various applications mentioned earlier demonstrate that the PPI model, through its innovate methodology for identifying policy complex interlinkages between development indicators, is able to provide governments with state-of-the-art information allowing them to make policy and budget decisions that accelerate the 2030 Agenda.

Whereas the PPISD project focused on testing the model at national and subnational level, provided with the adequate data, it can easily be applied regionally and globally. In this sense, we encourage academics, governments and other development partners to use the publicly available PPI code (https://bit.ly/33eoPz3) and reports on the methodologies used and results obtained in the PPISD project to apply the model to different contexts. In particular, we encourage researchers to use the outcomes of the PPISD project, especially those concerning the model's application at national level, to assess how conditional dependency networks between and within countries and regions can foster sustainable development.

References

Aragam, B., J. Gu and Q. Zhou (2018), *Learning Large-Scale Bayesian Networks with the Sparse bn Package (forthcoming)*, Journal of Statistical Software. [4]

Guerrero, O. (2020), *Policy Priority Inference for Sustainable Development (PPI4SD)*, National data, https://github.com/oguerrer/PPI4SD/tree/master/National_data. [8]

Guerrero, O. and G. Castañeda (2020), *Policy Priority Inference: A Computational Method for the Analysis of Sustainable Development*, https://ssrn.com/abstract=3604041. [6]

OECD (2017), *OECD Integrity Review of Mexico 2017 – Highlights*, https://www.oecd.org/corruption/ethics/mexico-integrity-review-highlights.pdf. [3]

UNDP Mexico (2020), *Inferencia de Prioridades de Política para el Desarrollo Sostenible: El Caso Subnacional de México*, https://www.mx.undp.org/content/dam/mexico/docs/Publicaciones/PublicacionesReduccionPobreza/inferenciapoliticapublica/200520IPPReporteEstatal.pdf. [7]

UNDP Mexico (2020), *Inferencia de Prioridades de Política para el Desarrollo Sostenible: Reporte Metodológico*, https://www.mx.undp.org/content/dam/mexico/docs/Publicaciones/PublicacionesReduccionPobreza/inferenciapoliticapublica/200520IPPReporteMetodologico.pdf. [1]

UNDP Mexico (2020), *Inferencia de Prioridades de Política para el Desarrollo Sostenible: Una Aplicación Para el Caso de México*, https://www.mx.undp.org/content/dam/mexico/docs/Publicaciones/PublicacionesReduccionPobreza/inferenciapoliticapublica/200520IPPReporteFederal.pdf. [5]

World Justice Project (2020), *Rule of Law Index 2020*, http://worldjusticeproject.org/sites/default/files/documents/WJP-ROLI-2020-Online_0.pdf. [2]

Further reading

Cámara de Diputados (2017), Criterios que se utilizan para la asignación presupuestal a entidades federativas y municipios en la Ley de Coordinación Fiscal. Available at: http://cefp.gob.mx/publicaciones/documento/2017/eecefp0042017.pdf.

Notes

[1] This article and the PPISD project that it refers to were made possible thanks to the efforts of many. Firstly, we would like to acknowledge the work of Omar A. Guerrero and Gonzalo Castañeda, who developed PPI and helped adapt it to the SDGs. Secondly, we would like to express thanks to the National Laboratory for Public Policy (LNPP, for its acronym in Spanish) of CIDE in Mexico for its support in adapting the model and piloting it in Mexico. We also want to express our gratitude to UNDP's RBLAC, and in particular to its Director, Luis Felipe López-Calva, and his team for financing the implementation of the project and providing crucial recommendations. We also acknowledge the invaluable collaboration of Mexico's Ministry of Finance and Public Credit and the state governments of Chiapas, Guanajuato, Jalisco, Nuevo León, Yucatán and the State of Mexico whose input allowed the PPI model to be piloted and its different practical applications to be identified. Finally, we acknowledge the unwavering support of the Office of the Resident Representative of UNDP Mexico and of all of the members of its Strategic Initiatives Project during the implementation of the PPISD initiative.

[2] Provided by the United Nations, the World Bank, the World Economic Forum, the Conference Board, the World Travel and Tourism Council, the Observatory of Economic Complexity and Transparency International.

[3] During the implementation of the PPISD project in Mexico, three different networks were estimated: for the national level, for the OECD member countries and for Latin American countries.

[4] For the subnational report, the use of data from other states was crucial in the standardisation process.

Annex 11.A. List of indicators used to pilot the PPI model

Annex Table 11.A.1. PPISD project indicators

The following table lists the 141 indicators used in the PPISD project and shows their links to the SDGs, as well as their classification as either collateral (Col.) or instrumental (Ins).

G	Indicator	Source	Type	Link
1	Poverty gap at 5.50 dollars a day (2011 PPP) (%)	WB	Ins.	datacatalog.worldbank.org/dataset/poverty-and-equity-database
1	Population in moderate poverty	CONEVAL	Ins.	coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx
1	Population in extreme poverty	CONEVAL	Ins.	coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx
1	Population that is vulnerable due to poor social capital	CONEVAL	Ins.	coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx
1	Population that is vulnerable due to poor income	CONEVAL	Ins.	coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx
1	Lack of health services	CONEVAL	Ins.	coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx
1	Lack of social security	CONEVAL	Ins.	coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx
1	Lack of quality and space in the dwelling	CONEVAL	Ins.	coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx
1	Lack of basic house services	CONEVAL	Ins.	coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx
2	Plant breeds for which sufficient genetic resources are stored (number)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
2	Proportion of local breeds classified as being at unknown level of risk of extinction (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
2	Cereal yield (kg per hectare)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
2	Food production index (net, per capita)	FAO	Ins.	fao.org/faostat
2	Prevalence of anemia among women of reproductive age (% of women ages 15-49)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
3	Under-five mortality rate, by sex (deaths per 1 000 live births)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
3	Number of new HIV infections per 1 000 uninfected population, by sex and age (per 1 000 uninfected population)	UN	Col.	unstats.un.org/sdgs/indicators/database/
3	Tuberculosis incidence (per 100 000 population)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
3	Malaria incidence per 1 000 population at risk (per 1 000 population)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
3	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (probability)	UN	Col.	unstats.un.org/sdgs/indicators/database/
3	Suicide mortality rate, by sex (deaths per 100 000 population)	UN	Col.	unstats.un.org/sdgs/indicators/database/
3	Alcohol consumption per capita (aged 15 years and older) within a calendar year (litres of pure alcohol)	UN	Col.	unstats.un.org/sdgs/indicators/database/
3	Proportion of the target population with access to 3 doses of diphtheria-tetanus-pertussis (DTP3) (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
3	Proportion of the target population with access to measles-containing vaccine second dose (MCV2) (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
4	Participation rate in organised learning (one year before the official primary entry age), by sex (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/

G	Indicator	Source	Type	Link
4	Internet access in schools	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
4	Quality of the education system	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
4	Quality of primary education	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
4	Quality of math and science education	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
4	Quality of management schools	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
4	Extent of staff training	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
4	School enrollment, secondary (gross), gender parity index (GPI)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
5	Proportion of seats held by women in national parliaments (% of total number of seats)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
5	Proportion of women in managerial positions (%)	UN	Col.	unstats.un.org/sdgs/indicators/database/
6	Water body extent (permanent and maybe permanent) (% of total land area)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
7	Proportion of population with access to electricity, by urban/rural (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
7	Proportion of population with primary reliance on clean fuels and technology (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
7	Access to clean fuels and technologies for cooking (% of population)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
8	Annual growth rate of real GDP per capita (%)	UN	Col.	unstats.un.org/sdgs/indicators/database/
8	Number of commercial bank branches per 100 000 adults	UN	Col.	unstats.un.org/sdgs/indicators/database/
8	Unemployment rate, by sex and age (%)	UN	Col.	unstats.un.org/sdgs/indicators/database/
8	Foreign direct investment, net inflows (% of GDP)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
8	Index of economic complexity	OEC	Col.	oec.world/en/rankings/country/eci/
8	Efficiency of government spending	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Burden of government regulation	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Burden of customs procedures	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Regulation of securities exchanges	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Business impact of rules on FDI	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Strength of auditing and reporting standards	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Protection of minority shareholders' interests	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Intensity of local competition	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Effectiveness of anti-monopoly policy	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Extent of market dominance	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Efficacy of corporate boards	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Cooperation in labor-employer relations	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Flexibility of wage determination	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-

G	Indicator	Source	Type	Link
				2018/#topic=data
8	Pay and productivity	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Tax revenue (% of GDP)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
8	New business density (new registrations per 1 000 people ages 15-64)	WDI	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
8	Imports as a percentage of GDP	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Strength of investor protection, 0-10 (best)	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Patent applications, residents	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
8	Contribution of Labor Quality to GDP growth	CB	Col.	conference-board.org/data/economydatabase
8	Exports of goods and services (% of GDP)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
8	GDP, PPP (constant 2011 international dollars)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
8	Wage and salaried workers, total (% of total employment) (modelled ILO estimate)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
8	No. days to start a business	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	No. procedures to start a business	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
8	Rate of informal employment	INEGI	Col.	inegi.org.mx/temas/empleo/
8	Growth of Total Factor Productivity	CB	Col.	conference-board.org/data/economydatabase
9	Number of fixed Internet broadband subscriptions, by speed (number)	UN	Col.	unstats.un.org/sdgs/indicators/database/
9	Internet users per 100 inhabitants	UN	Col.	unstats.un.org/sdgs/indicators/database/
9	Manufacturing value added per capita (constant 2010 United States dollars)	UN	Col.	unstats.un.org/sdgs/indicators/database/
9	Available airline seat km/week, millions	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Quality of overall infrastructure	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Quality of roads	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Quality of air transport infrastructure	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Quality of electricity supply	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Availability of latest technologies	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Firm-level technology absorption	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	FDI and technology transfer	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Quality of scientific research institutions	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Government procurement of advanced tech products	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Soundness of banks	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Venture capital availability	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Financing through local equity market	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data

G	Indicator	Source	Type	Link
9	Availability of research and training services	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Company spending on R&D	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Capacity for innovation	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Availability of scientists and engineers	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Quality of port infrastructure	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Fixed telephone lines per 100 people	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
9	Investment in energy with private participation (current United States dollars)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
9	Investment in transport with private participation (current United States dollars)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
9	Mobile telephone subscriptions per 100 people	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
10	Labour share of GDP, comprising wages and social protection transfers (%)	UN	Col.	datacatalog.worldbank.org/dataset/poverty-and-equity-database
10	Ease of access to loans	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
10	Income share held by lowest 10%	WB	Col.	datacatalog.worldbank.org/dataset/poverty-and-equity-database
10	GINI index (World Bank estimate)	WB	Col.	povertydata.worldbank.org/poverty/home/
11	PM2.5 air pollution, population exposed to levels exceeding WHO guideline value (% of total)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
12	Material footprint per capita, by type of raw material (tonnes)	UN	Col.	unstats.un.org/sdgs/indicators/database/
12	Domestic material consumption per capita, by type of raw material (tonnes)	UN	Col.	unstats.un.org/sdgs/indicators/database/
12	Degree of customer orientation	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
12	Ethical behavior of firms	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
12	Adjusted net savings, excluding particulate emission damage (% of GNI)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
12	Coal rents (% of GDP)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
12	Forest rents (% of GDP)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
12	Mineral rents (% of GDP)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
12	Natural gas rents (% of GDP)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
12	Oil rents (% of GDP)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
12	Total natural resources rents (% of GDP)	WB	Col.	datacatalog.worldbank.org/dataset/world-development-indicators
13	Intensity of emissions, meat and cattle	FAO	Ins.	fao.org/faostat
13	Temperature variation	FAO	Col.	fao.org/faostat
14	Average proportion of Marine Key Biodiversity Areas covered by protected areas (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
15	Average proportion of Terrestrial Key Biodiversity Areas covered by protected areas (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
15	Average proportion of Mountain Key Biodiversity Areas covered by protected areas (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/

G	Indicator	Source	Type	Link
15	Red List Index	UN	Ins.	unstats.un.org/sdgs/indicators/database/
16a	Unsentenced detainees as a proportion of overall prison population (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
16a	Business costs of terrorism	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16a	Business costs of crime and violence	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16a	Organised crime	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16a	Reliability of police services	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16a	Intentional homicides (per 100 000 people)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
16b	Public trust in politicians	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16b	Favoritism in decisions of government officials	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16b	Transparency of government policymaking	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16b	Property rights	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16b	Intellectual property protection	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16b	Judicial independence	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16b	Government Effectiveness: Estimate	WB	Ins.	datacatalog.worldbank.org/dataset/worldwide-governance-indicators
16b	Overall level of statistical capacity (scale 0 - 100)	WB	Ins.	datacatalog.worldbank.org/dataset/world-development-indicators
16b	Legal rights index, 0-10 (best)	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
16b	Political Stability and Absence of Violence/Terrorism: Estimate	WB	Ins.	datacatalog.worldbank.org/dataset/worldwide-governance-indicators
16b	Regulatory Quality: Estimate	WB	Ins.	datacatalog.worldbank.org/dataset/worldwide-governance-indicators
16b	Corruption perception index	TI	Col.	transparency.org/research/cpi/overview
16b	Voice and Accountability: Estimate	WB	Ins.	datacatalog.worldbank.org/dataset/worldwide-governance-indicators
17	Debt service as a proportion of exports of goods and services (%)	UN	Ins.	unstats.un.org/sdgs/indicators/database/
17	Prevalence of foreign ownership	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
17	Prevalence of trade barriers	WEF	Ins.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
17	Gross national savings, % GDP	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
17	Inflation, annual % change	WEF	Col.	reports.weforum.org/global-competitiveness-index-2017-2018/#topic=data
17	Travel and Tourism direct contribution to GDP Percentage share of total GDP	WTTC	Ins.	tool.wttc.org/

Source: (Guerrero, 2020[8]).

Conclusion

The interconnected, multidimensional and intergenerational nature of the 2030 Agenda and the Sustainable Development Goals (SDGs) calls for integrated policies across countries and dimensions. The improvements achieved in a particular socio-economic or environmental dimension or SDG could generate a large set of synergies and trade-offs across dimensions (spillover effects), and the large interconnections existing between countries could contribute to amplifying the cross-country or cross-regional effects generated by policies (transboundary effects). Multidimensional and cross-border assessments of policies have become even more urgent due to the wide range of impacts resulting from COVID-19 containment measures.

To move society in the direction of sustainability and design sustainable and resilient recovery plans, policy actions need to be fostered through a set of principles, including – amongst others – inter and intra-generational equity, and based on evidence. This report offers a comprehensive framework of different governance and analytical tools to identify and manage spillovers and transboundary effects, which are challenging governments in the design and implementation of their strategy towards sustainability.

Each chapter offers a single and autonomous contribution, but also enables the formulation of common findings and recommendations, which practitioners, policy makers and scientists can integrate into their efforts to design long-term recovery strategies that are aligned with the SDGs. For example:

- The adoption of a Policy Coherence for Sustainable Development (PCSD) approach can provide the overall institutional context for enhancing coordination mechanisms for managing spillovers and transboundary impacts. Importantly, the multi-dimensional and global nature of the 2030 Agenda requires comprehensive frameworks that guide not only the design of external (international) policies but also internal (domestic) policies, with a view to build mutual commitments and joint ways forward for managing interconnected and multi-dimensional policy challenges.
- The complexity of managing spillovers and transboundary impacts in the 2030 Agenda is linked to the difficulty that lies in identifying such impacts, which in turn is dependent on the availability of both tools and data. This book has introduced a number of innovative analytical tools that can contribute to filling this gap; at the same time, it calls for strengthening national statistical capacity to identify, collect and analyse relevant data.

One consequence of the on-going COVID-19 crisis is a widespread re-awakening of the importance of international co-operation to address shared global challenges (and opportunities). The recommendations in this report aims at facilitating the implementation of the global and holistic partnership required by the 2030 Agenda and accelerating a sustainable and resilient recovery from the COVID-19 crisis.

Understanding the Spillovers and Transboundary Impacts of Public Policies

IMPLEMENTING THE 2030 AGENDA FOR MORE RESILIENT SOCIETIES

The multidimensional and intergenerational nature of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) calls for integrated policies. Progress made in a particular social, economic or environmental area or individual goal may generate synergies and trade-offs across dimensions (spillover effects), and steps taken in one country could have positive or negative impacts beyond national borders (transboundary effects). Assessing the multidimensional and cross-border effects of policies has become even more urgent in the context of COVID-19 containment measures. However, there are gaps in governance and analytical tools for identifying and managing spillover and transboundary effects, posing challenges for governments in designing and implementing sustainability strategies. This book, a collaborative effort by the OECD and the European Commission-Joint Research Centre (EC-JRC) presents a set of new governance and analytical tools, lessons learned from country experiences, and good emerging practices for managing spillover and transboundary effects in the implementation of the 2030 Agenda.

PRINT ISBN 978-92-64-93513-6
PDF ISBN 978-92-64-76550-4