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EXPLORATIVE RESEARCH STUDY ON APPROACHING DFI'S DEVELOPMENT IMPACTS FROM A NET PERSPECTIVE

Final Report

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LIST OF ABBREVIATIONS

CDC	**DFI of the UK, "British International Investment"**
DD	**Due Diligence**
DEG	**Deutsche Investitions- und Entwicklungsgesellschaft mbH**
DERa	**Development Effectiveness Rating**
DFI	**Delvelopment Finance Institution**
ESG	**Environmental, social, and corporate governance**
FMO	**DFI of the Netherlands, Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden**
GDPR	**General Data Protection Regulation**
GHG	**Greenhouse Gas**
GIIN	**Global Impact Investing Network**
HIPSO	**Harmonized Indicators for private Sector Operations**
IFC	**International Finance Cooperation**
IPCC	**Intergovernmental Panel on Climate Change**
MDGs	**Millennium Development Goals**
NDC	**Nationally Determined Contributions under the Paris Climate Agreement**
NGO	**Non-Governmental Organisation**
OECD-DAC	**Organisation for Economic Co-operation and Development – Dev. Assistance Committee**
OeEB	**Oesterreichische Entwicklungsbank AG**
OPIM	**Operating Principles for Impact Management**
SDGs	**United Nations Agenda 2030 Sustainable Development Goals**
ToC	**Theory of Change**
UN	**United Nations**
WEF	**Water-Energy-Food**

1 Executive Summary

Development Finance Institutes (DFIs) are at the forefront of delivering on the United Nation's Sustainable Development Goals (SDGs) via the private sector because they invest with the aim to create impact in developing markets. As such, they have come under increased scrutiny internally and externally in the past years. With impact investing becoming more mainstream, the industry is in the process of establishing better standards and definitions for managing impact.

Global megatrends such as climate change and rising global inequality, flanked by corresponding policies, regulations, and international agreements such as the UN Agenda 2030 with its 17 SDGs and the Paris Agreement on Climate, put **increasing pressures on the private sector to play a more central role in delivering results for development and the environment**, which is increasingly seen as benefitting financial success of firms as well. DFIs support these trends by investing for impact.

Measuring and managing impact is central to impact investing because it allows evidence-based decisions and portfolio steering to maximise impact. Impact rating systems are used at many DFIs to measure and report on their achieved (positive) impacts. Avoiding and reducing negative impacts is included in bank's systems, via exclusion lists, in due-diligence, and by providing technical assistance to improve on certain aspects – but this is often not reflected in the corresponding impact measurement systems. The measurement of investment impacts would **benefit from taking a net-perspective**, thereby **not only including positive effects, but also incorporate negative impacts into their rating systems and assessments**. Taking a net-impact perspective allows DFIs to take more informed decisions on maximising their impacts, providing more credibility in reporting and disclosure, and avoiding long-term risks for their business. Various DFIs have started to explore and implement a net perspective when it comes to assessing their development impacts. Analysing current trends, we conclude that **net-impact is here to stay** and will become increasingly important, for example in the context of reporting on the progress towards achieving the SDGs. However, a net-perspective comes with the challenge of having to explicitly weigh positive and negative impacts against each other when making investment decisions.

This explorative study thus highlights common trade-offs within SDGs and also within various investment sectors. We link them to influencing factors, such as the geographical and political context, technology, and policy. Implications for DFIs are significant for almost all interactions. A **key challenge is the complexity of interwoven impacts that realise on different scales and time-horizons**. DFIs approaching impact from a net perspective should incorporate it across their organisation and throughout the investment lifecycle, refining processes of selection and exclusion, due-diligence, investment, advisory services, as well as exit.

For organisations taking a net perspective, net-impact rating systems can be utilised to make informed decisions and measure the net-impact of investments. Key elements for such rating systems are **deductions in scoring** based on negative impacts, **accepting accuracy trade-offs** in complexity by mixing blanket assessments based on sectors or countries with individual client-level assessment, and **including various scopes** (firm, local, global/societal) when assessing impacts.

When developing such a system, it can **build upon existing models** and a phased approach to introduction is recommended. Initial development should be understood as a **process of experimenting, learning, and refinement**. The measurement system and its incorporation into impact measurement should be externally validated line with the Operating Principles for Impact Management. Rating systems can **inform public disclosures** on the portfolio level, including negative impacts to provide a more accurate picture of DFIs operations. The SDGs are found to be a fitting framework to assess and communicate impacts. You can click here to jump directly to the full conclusions and recommendations.

2 Introduction

The **United Nations Agenda 2030** was adopted in 2015 – it includes 17 interlinked Sustainable Development Goals (SDGs), to be achieved by the year 2030. The SDGs include social aspects, such as eradicating poverty, improving health, gender equality and education, as well as reducing inequalities. They also cover the economic sphere, including decent work and economic growth, energy, infrastructure and industries. And finally, the SDGs also incorporate environmental preservation, related to life on land and marine ecosystems, as well as climate action.

The final SDG, number 17, is the "Partnerships for the goals" and calls upon the private sector and developed economies to **mobilise financial resources and invest** in least developed countries to enhance the capacity of developing countries to achieve the SDGs. Development Finance Institutions (DFIs) worldwide are at the forefront of providing finance for sustainable private sector development in developing countries and are key contributors to Goal 17. The Oesterreichische Entwicklungsbank AG (OeEB)'s investments, for example, pursue the overarching objective of "contributing to poverty reduction and implementing the SDGs in developing- and emerging countries by strengthening the private sector"[1].

Investing for development impact **is more crucial than ever**. The Covid-19 pandemic has put a significant dent into the progress towards achieving these goals. For the first time in a generation, extreme poverty has risen again. Global hunger is on the rise and global life expectancy has been shortened by the pandemic. 20 years of progress on education were eradicated by Covid and the equivalent of more than 255 million full-time jobs were lost (United Nations, 2021). At the same time the Climate Crisis is putting increasing pressure on societies and economies to transform their economies, with global emissions still rising largely unabated. Many developing countries are already facing stark impacts from climate change beyond their adaptive capacity today.

With nine years remaining to fulfil the SDGs, a key question is how to use financial resources to the best effect. Fuelled by the SDGs, investing with the intent to contribute to positive social and environmental change alongside financial returns has now become mainstream under the term of "**Impact Investment**", which is also increasingly attractive for private sector financial institutions. The current market size is estimated at USD 715 billion.

Following this development, initiatives like the Global Impact Investing Network (GIIN) were formed, with the intent on working on joint definitions, indicators (such as the IRIS+ system), management systems and verification schemes. Within this context, several institutions developed the **Operating Principles for Impact Management (OPIM)**, which are now adopted by 148 signatories in 37 countries, among them OeEB and the Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG). The signatories work on implementing a global standard for managing investments for impact following nine principles. A key component in the framework is the assessment of expected and actual impact of each investment, based on a systematic approach (Principle 4), as well as to assess, address, monitor and manage potential negative impacts of each investment (Principle 5).

Most of the impact measurement systems and ratings in place today have an exclusive focus on the positive impacts, with negative aspects mostly considered in internal systems under a risk- or ESG-lens. To explore the possibilities of approaching impact measurement from a **net perspective**, i.e., both **incorporating positive and negative development impacts** in one system, Syspons was commissioned by OeEB to conduct a research study.

As OeEB and DEG are cooperating closely in their impact measurement methodology this study was conducted jointly.

[1] OeEB OPIM disclosure statement February 2021

The goals of this explorative study are as follows:

(1) to **expand the knowledge base** and make the case for adopting a net-impact approach;
(2) to **create awareness of the wider context** of investments in relation to the SDGs;
(3) to **provide options and building blocks** for integrating net-impact in DFI operations and impact management.

2.1 Report structure

This report is separated into four main parts.

Followed by this introduction that includes methodological approach and limitations, the **first part (chapter 3)** provides the synthesis of results from SDG research and investment sectors. It follows the guiding question of what net-impact encompasses and – using various examples – why it is important to take a net perspective when assessing impacts. We start by briefly presenting the results of the SDG literature research and sector impact analyses, before discussing various impact trade-offs and what they mean for DFIs. From this chapter, we derive some key considerations that guides the following.

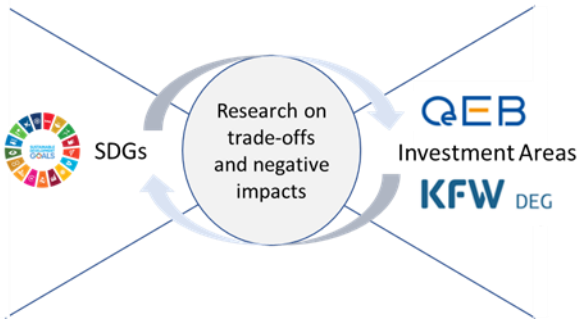
The **second part (chapter 4)** asks how DFIs can incorporate net-impacts into their operations, providing insights into both the investment lifecycle (Impact Management) as well as building blocks for impact rating systems (Impact Measurement).

This is followed by our overall **conclusions and recommendations (chapter 5)**

2.2 Methodological approach

Our study is of an explorative nature, utilising SDG interactions & sector impact analyses with the aim to expand the knowledge base and derive implications for DFI operations, particularly on options and approaches to measure and manage impact from a net perspective.

Figure 1: Approach



We analysed known interactions and trade-offs between SDGs through a literature review to perform an analysis of the positive and negative impacts of various sectors for investment. Our hypothesis is that SDGs are a useful lens to assess various impact trade-offs.

The main benefit of this approach is that we could **tap into established literature** on SDGs, which discusses possible trade-offs between SDGs in numerous relevant development contexts. Ranging from academic research to reports by bilateral & multilateral development organisations and think tanks, existing findings and experiences regarding SDG trade-offs provide key insights and context. We then relate this to an analysis of 26 DFI-relevant investment sectors.

For each sector, we categorised (potential) positive and negative impacts systematically using up to three positive and three negative SDG interactions per sector. The underlying assumption is that research in the SDG context is likely **too general** while the research and impact studies on concrete investment activities are often too (context-) specific and focuses on the firm-level. However, the combination of both factors allows us to **produce results that are at the right level of (dis)aggregation** to inform the net-impact study and make results relevant for DFI's operations.

The SDG research is based on an extensive literature review consisting of academic, peer-reviewed research as well as grey literature from international organisations, think tanks and other institutes. The SDG framework provides the wider context for the impact of private sector operations. To analyse the latter with the intent to expand the knowledge base on various sectors, we assessed SDG interactions for a total of 26 sectors, which are presented in chapter 3. The detailed methodology for the sector analysis is included in Annex I.

The SDG and sector analysis was flanked by validation interviews with practitioners and other DFIs on their views and rating systems regarding net-impact. We also conducted several workshops with OeEB and DEG teams to approach net-impact trade-offs and develop options for rating systems.

2.3 Study limitations

Given the scope of the study (time and resources) and considering the breadth and wide scope of the topic and its related literature, the assessment conducted by this research study should be considered as a first step to systematise existing research and knowledge, to serve as a foundation for further in-depth analysis and feed into decision-making processes regarding the pursuit of a net-impact perspective. There are some caveats and limitations that should be mentioned here:

- The amount of literature available differs significantly between different investment scenarios and SDGs. While some are featured prominently with hundreds of studies, others are severely under-researched. At the same time, the geographical horizon and the exact context of studies must often be interpreted widely, and some generalisation of results must be made to make the results tangible. Finding the right depth and aggregation level for the assessment of investment scenarios is a challenge – locating the middle ground between very generalised statements and specific technical specificities is a challenge and could limit the applicability of results in some cases. At the same time, for many of the analysed sectors, there is more literature on tangible environmental factors as opposed to more indirect social effects, including aspects of gender equality and inclusion. This limits the applicability of results in this area.
- Depending on the sector, the impact scope in the sector analysis varies: In some sectors, wider societal and global implications can be focused on, whereas for other sectors, more direct aspects such as working conditions or construction emissions at the firm level are more prevalent in the literature.
- Some of the existing SDG research is done on a (1) very theoretical or (2) very policy-focussed level, leaving questions as to their practical usability for our study on DFI sector investments.
- Mitigation options for negative impacts are sometimes hard to find, and their value-add is questionable given that they include both very context-specific recommendations, as well as general limitations that play a role during selection, but not after investment (e.g., sustainable agriculture is a mitigation option when choosing among agricultural investments, but not after having chosen an "unsustainable" option).
- The possible options and elements for rating systems heavily depend on DFIs resources, expertise, current rating systems and priorities, which puts a significant conditionality on the corresponding recommendations.

3 SDG and sector trade-offs

What are common trade-offs within SDGs and investment sectors and why is it important for DFIs to approach impact from a net perspective?

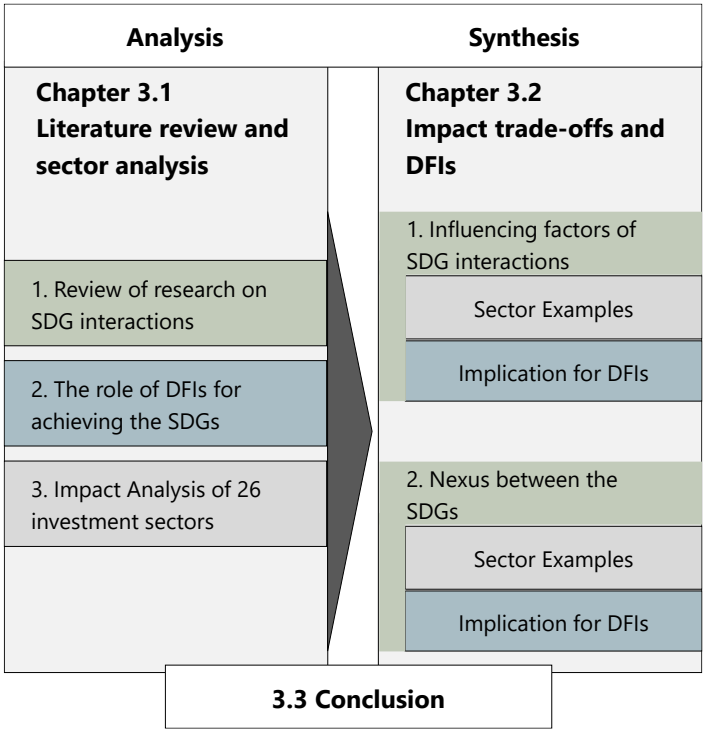
In this chapter, we present results of our **analysis** into SDGs, DFIs and selected sectors, followed by a **synthesis** part in which we combine the three aspects.

To this end, chapter 3.1 briefly outlines results of the SDG literature review (3.1.1), the role of DFIs in achieving the SDGs (3.1.2) and the sector impact analysis (3.1.3) to give an insight into our research results.

Chapter 3.2 then combines and applies these results, using SDG influencing factors and SDG nexuses as the guiding framework. The synthesis highlights the complexities that are featured in the SDGs and their interrelations and how they relate to various sectors in which DFIs invest in.

Both chapters also feature selected "Spotlights" on current topics and how they relate to the themes of this report – We spotlight criticism issued against DFIs, the Covid-19 pandemic and the topic of climate change.

Figure 2: Overview of chapter 3.



Chapter 3.3 then contains the key takeaways drawn from our research analysis and synthesis. The chapter structure is introduced in figure 2.

3.1 Literature research and sector analysis

The following subsection briefly presents our approach and results for the SDG and sector analysis. We first review the status quo of the literature on SDG interactions (3.1.1) and then take a closer look at their general implications for DFIs (3.1.2). The insights gained are made more tangible by applying them to sectors relevant to DFIs (3.1.3).

3.1.1 SDG interaction review

The Sustainable Development Goals

The 17 Sustainable Development Goals (SDGs) with their 169 corresponding targets are political targets set by the United Nations (UN) to ensure sustainable development at the economic, social, and environmental levels worldwide (see figure 2) (United Nations, 2012). They were drafted in line with the development process of the Millennium Development Goals (MDGs) and came into force on 1 January 2016 for 15 years (until 2030) (ibid.). In contrast to

the MDGs, which applied in particular to developing countries, the SDGs apply to all states and are intended to guide the development of the world for the next fifteen years (Schneider et al., 2018) until 2030. Central aspects of the goals and targets are the advancement of economic growth, the reduction of disparities in living standards, the creation of equal opportunities as well as the sustainable management of natural resources that ensures the preservation of ecosystems and strengthens their resilience. In shaping the goals, the importance of people, who are at the centre of sustainable development, is emphasised (United Nations, 2012). Furthermore, the fulfilment requires the consideration of country-specific circumstances and development stages, making the SDGs universally applicable and implementable (Schneider et al., 2018).

Figure 3: Sustainable Development Goals (SDGs) taken from UNDP (2021).

The Sustainable Development Goals Report 2018 revealed that fulfilling the SDGs, thus transitioning towards more sustainable and resilient societies, requires an integrated approach that recognises that **challenges of sustainable development — and their solutions — are interrelated** (United Nation, 2018). Hence, it is necessary to not only consider each SDGs separately but to view SDGs as interacting with each other.

Existing research on SDG interactions

Existing studies on interactions of SDGs are generally very diverse and not bound to a specific field or methodology. Even though discipline-specific approaches (for example from the fields of economics, development studies, and environmental studies) are represented in large numbers, most of these follow a trans- or interdisciplinary conception (Magendane & Kapazoglou, 2021; Warchold et al., 2021). Furthermore, most studies appear to rely on quantitative statistical analyses. A recognisable number of studies with quantitative or mixed methods approaches are also available.

Studies with different methodological approaches allow insights into diverse aspects regarding the SDGs. For example, systemic studies show that the nature and degree of SDG interactions vary by country (Magendane & Kapazoglou, 2021; Scherer et al., 2018; Zhou et al., 2017), whereas non-systemic studies highlight strong bilateral relations between SDGs as these examine SDGs in pairs (Fonseca et al., 2020; Hegre et al., 2020; Magendane & Kapazoglou, 2021). A classification of the main study types based on findings of Magendane & Kapazoglou (2021) is featured in Table 1.

Table 1: Classification of already existing research on SDG trade-offs according to Magendane & Kapazoglou (2021).

Study Type	Characterization and findings	Advantages and drawbacks
Non-systemic quantitative studies	investigate synergies and trade-offs among pairs of SDGs and within single SDGs. There exists a consensus among those studies about the SDGs' synergistic interactions prevailing over their trade-offs (Fonseca et al., 2020; Hegre et al., 2020). Findings show that SDGs 1 (No Poverty), 2 (Zero Hunger) and 3 (Health and Well-Being) have most synergies with other goals.	⊕ robust measurement criteria ⊖ inability to establish causal relations
Systemic quantitative studies	presume an interrelated nature of SDGs and hence are investigated in clusters and pairs. Findings of these typically agree that the nature and degree of SDG interaction vary by country (Scherer et al., 2018; Zhou et al., 2017). Results point to SDG 4 (quality education) as a main driver in achieving all other SDGs. Furthermore, they point to achievement of SDG 17 (partnerships for goals) as being most dependent on the achievement of other goals. SDGs 14 (life below water) and 15 (life on land) are pre-requisite for many SDGs, but their achievement is also highly dependent on other SDGs.	⊕ capture determinants, such as country- and region-specific factors ⊖ inability to establish causal relations
Non-Systemic qualitative studies	investigate SDGs pairwise and tend to make conceptual contributions. A specific qualitative, non-systematic approach often used is the network analysis (Lusseau & Mancini, 2019; Pham-Truffert et al., 2020; Putra et al., 2020).	⊕ in-depth insights to specific goals and areas ⊖ generalisability of findings strongly limited
Systemic mixed-methods studies	use qualitative and quantitative analysis methodologies and investigate the SDGs in clusters (e.g. Zelinka & Amadei, 2019; Zhou et al., 2017).	⊕ useful for the generation of profound insights with regards to very specific goals and question ⊖ possible incompleteness/incorrectness of results

While the academic literature sheds light on different methodologies to examine synergies between and driving powers of certain SDGs, it leaves a **gap in more holistic views on the impact of SDG fulfilment**. This seems to be because many authors see the added value of their studies in providing a starting point or recommendations for the policy-making process of decision-makers. In addition to this underrepresentation of SDG trade-offs, however, the literature review also shows how manifold SDG interactions can be and that they are influenced to a large extent by determinants such as the country-specific context.

Regardless of the study approach, the findings imply that there are **no universal trade-offs between certain SDGs, but that these must be identified on a case-specific basis**. In the next chapter, the role of DFIs in the achievement

of the SDGs is analysed to apply these findings and identify the framework conditions for an SDG-based net-impact assessment.

3.1.2 The role of DFIs in achieving the SDGs

The SDGs promote an integrated approach to economic, social, and environmental development. Furthermore, the SDG framework views the private and public sector complementary to support inclusive and sustainable growth, which emphasizes the role of the private sector in fulfilling the SDGs (Attridge, te Velde, et al., 2019). As private investment and innovation are major drivers for economic growth and are thus crucial for tackling poverty and other challenges, Development Finance Institutions (DFIs) are promising actors in the achievement of the SDGs.

Through the mobilisation of private investment in developing countries via their financing, risk-sharing and supporting activities, DFIs are hoped to have considerable impacts on job creation, energy provision and the combat of climate change in developing countries and with that significantly contribute to the fulfilment of SDG 7 (Affordable and green energy) and also of SDG 13 (Climate action) and SDG 8 (Decent work and economic growth) (Attridge, Calleja, et al., 2019; Attridge, te Velde, et al., 2019). These aspects are also directly reflected in the strategies and development reports of various DFIs, in which they emphasise their contribution in these fields.

As the extensive literature reviews by Attridge, Calleja, et al. (2019) and Attridge & Gouett (2019) show, studies on the impact of development investing indicate that **DFI investments stimulate job growth**. Furthermore, the authors also refer to national-level studies that suggest that **DFI-investment increases direct and indirect employment**. Moreover, studies state energy-sector DFI investments have increased the **supply of energy**, even though there is limited evidence that this has also increased access to electricity for consumers (Attridge, Calleja, et al., 2019). Additionally, a gap of evidence on the "greenness" of this energy supply persists (Attridge & Gouett, 2019b).

Even though DFIs' main impacts appear to be assigned to the fulfilment of specific SDGs, they also affect the fulfilment of other goals, as SDGs are interrelated. Despite the mentions of synergies between the above-stated focused SDGs, there is a **lack of investigation on DFIs' net-impacts on the fulfilment of SDGs**, which also consider the negative effects of their investments (Attridge, Calleja, et al., 2019). Furthermore, impact and development reports on a portfolio-level are criticised for often focusing on positive contributions. On the client level, a good partnership between DFI and client can allow for exceptional depth when conducting net-impact assessments with a focus on learning. Nevertheless, it is also important to acknowledge that the nature of the bank-client confidentiality makes it not impossible, but comparatively harder, for DFIs to publicly communicate negative development impacts for client-focused case studies.

The SDG framework allows for aggregated reporting independent of individual clients. DEG and OeEB both utilise the SDG framework to communicate impacts for core investment areas. According to their impact communication, these are primarily:

- SDG 1 – No poverty
- SDG 7 – Affordable and clean energy (OeEB)
- SDG 8 – Decent work and economic growth
- SDG 9 – Industry, innovation, and infrastructure
- SDG 13 – Climate action
- SDG 17 – Partnerships for the goals

Apart from these, the two DFIs further address several other SDGs either directly or indirectly through their investments and financial service activities, e.g., depending on the products created by the investees or the sector (e.g., Education, Health, ...).

Spotlight I: Criticism of DFIs

Non-governmental and international organisations have criticized DFIs for concentrating on limited numbers of sectors (and countries) that are likely to be financially lucrative, hence for putting their emphasis in the consideration of potential investees on **financial returns instead of development returns** (Kapoor, 2018; Ravenscroft, 2020).

In addition, another aspect often criticized is the **lack of specification in desired development outcomes and suiting monitoring measures** (Perrault et al., 2012). Furthermore, DFIs have also come under increased political scrutiny as sustainability and environmental considerations are becoming more mainstream.

In short, critics do not believe the DFIs are delivering on the SDGs. This criticism – valid or not - highlights the **desideratum for more detail and transparency** when disclosing information on the impact on investments,

Our analysis has shown that contributing to certain SDGs might cause possible adverse effects on other SDGs. To maximise effects on development returns and to address concerns over effectiveness of investments, and in line with the Operating Principles for Impact Management (OPIM), the importance for DFIs to assess, address, monitor, and manage potential negative impacts of each investment becomes apparent (OPIM Principle 5). This means going beyond E&S and risk considerations within individual investments, and instead taking a net perspective to overall development impact not only a firm-level, but also in their wider supply-chain and societal level.

To summarize, DFIs are key actors to facilitate sustainable development. Negative contributions of DFIs' investments are not considered explicitly in impact measurement systems. In the future, however, the assessment of net-impacts is a significant enabler for DFIs to fulfil their role in delivering on the SDGs.

The various trade-offs and complexities that are inherent in investments are shown in the next chapters. The following section introduces possible positive and negative impacts for 26 sectors to highlight impact trade-offs and sector-inherent themes, utilising the SDGs.

3.1.3 Sector impact analysis

For 26 sectors, we have assessed and analysed a total of 131 different SDG impact interactions, both positive and negative. For each sector, we included up to three positive and up to three negative SDG interactions. The detailed methodology can be found in Annex I. For each interaction, we assessed the dimension (economic, social, climate, environmental) and the likelihood (from rarely (context-dependent) to always (inherently featured)) of the impact interaction occurring. Most significantly, we assessed the strength of the potential positive impact and the potential negative impact. This category of "Interaction Strength" for positive and negative impacts is based on Nilsson et al., 2018, who developed a conceptual framework for SDG trade-offs, which we modified and re-applied to investment areas. It ranges from +3 to -3 can be categorised as follows:

- +3 Exceptional Impact – large positive impacts inherent in the sector/investment
- +2 High Impact – strong impacts that can be partly influenced/improved in the investment
- +1 Supporting Impact – smaller positive impacts that can be influenced in investment
- -1 Constraining Impact – smaller negative impacts that can be influenced in investment

- -2 Counteracting Impact – reduces or neutralises positive impact: partly influenceable in investment
- -3 Cancelling Impact – negates positive impact; inherently featured in investment

For negative interactions, mitigation options are presented where possible. These assessments are complemented by an explanatory text with sources for each assessed SDG interaction. The full methodology can be accessed in Annex I.

The analysis was conducted based on literature research on the respective sectors and SDGs via google scholar. The scope of assessed impacts varies depending on the sector. In some sectors, impacts identified in the literature were more present on firm level (such as issues of working conditions in the agricultural industry), whereas in other sectors, we were able to focus on the wider impacts spurred by investments in that sector in general (e.g., impacts of telecommunication technology on societies). The aim of the analysis was to **strengthen OeEB and DEG's knowledge base** by providing an overview of **common impact-related issues within various sectors**, which can serve as a foundation to build upon or as an additional source of information when engaging in certain sectors.

Table 2 shows the list of analysed sectors, as well as which SDGs were incorporated per sector. Please note that these are general assessments of positive and negative development impacts of various economic sectors, independent from OeEB and DEG's individual portfolio and potential investments sectors. In some cases, the same SDG is triggered on both the positive and the negative side because interactions can also occur within SDGs.

Table 2: List of analysed investment sectors with identified positive and negative SDG interactions.

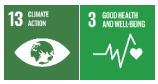
Area	Sector /Scenario	Positive Interaction SDGs	Negative Interaction SDGs
Agriculture	**Cash crops**		
Agriculture	**Forestry & Tree Plantations**		
Agriculture	**International agricultural wholesale**		
Agriculture	**Sugar**		
The area of agriculture highlights that within a sector, the same SDG can be triggered on the positive as well as on the negative side. In this area, the determination for one or the other is heavily dependent on **management practices and certifications**. For forestry, for example, the management practice can directly determine if biodiversity is increased, upheld, or lost. Likewise, the sugar industry can provide good and decent jobs, but is also associated with forced labour and health hazards for workers. Trade and value chains in global agricultural markets are especially relevant when it comes to enforcing good standards for people and environment.			
Energy	**Fossil Gas**		
Energy	**Hydro Power Production**		

Energy	**Solar Power Production**		
Energy	**Wind Power Production**		

Renewable energies yield high benefits in the **fight against climate change at low cost** and provide cheap and decentralised access to electricity. Solar and Wind are becoming increasingly cheaper. With the increased proliferation of renewables, attention must be made towards the associated negative impacts in terms of land use and the material footprint, which can be significant without a circular approach. However, fossil fuel alternatives like gas have no future in a net-zero world and feature the dual burden of significant negative impacts for both the environment and the climate.

Finance	**Insurance**		
Finance	**Leasing**		
Finance	**Microfinance / Local banks**		
Finance	**SME Finance**		
Finance	**Tech (e.g. Fintech)**		

In the area of finance, a challenge lies in the fact that **impacts often realise downstream** on the investee level and cannot always be directly linked to financing activities. SME finance, for example, can have great effects on growth and providing access to finance for firms, but if the activity of the investee firms is not considered, labour standards might not be upheld, or environmentally harmful practices might occur. Another relevant aspect of the finance area is its role to reduce inequalities: on the one hand, providing access to finance to marginalised groups and small firms is a great way to reduce inequalities, on the other hand, there are also many examples showing how various financial instruments benefit mostly those who are already better off.

Infrastructure	**Cement**		
Infrastructure	**Ports**		
Infrastructure	**Telecommunications**		
Infrastructure	**Toll Roads**		
Infrastructure	**Wastewater**		

Infrastructure	**Water Supply**		

Infrastructure provides essential services to fulfil human needs. They do this directly by providing e.g., water supply and electricity, or indirectly by providing the road, rail or port infrastructure that allows essential goods to be transported and traded and allows people to move around and access health and education. What most infrastructure has in common is its **often-negative impact on the environment or the climate**: roads can fragment habitats, ports and ship disturb marine life and cause noise, emissions, and waste. Telecommunications infrastructure has a lower physical footprint, but shows interesting indirect effects on societies and democracy, e.g., allowing better access to education, but also the potential to be abused for surveillance and crime.

Manufacturing	**Garment**		
Manufacturing	**Pharmaceuticals**		

Manufacturing is all about producing products that address human needs, such as pharmaceuticals for healthcare, which has many indirect positive effects. The impacts of manufacturing however can be severe – for example, the global apparel and footwear industry was responsible for 2 to 8% of global greenhouse gas emissions in 2016 and produces massive amounts of wastewater and chemical waste (UNFCCC, 2022), both of which are also issues concerning the pharma sector. At the same time, textile industry provides jobs for many people in developing countries, although there are many cases of labour violations. While there are many approaches, certifications, and standards to avoid negative effects and increase their net-impact, certain business practices and trends might be detrimental to achieving SDGs altogether. Given the **diversity of the manufacturing area**, generalised assessments on their overall impacts are not possible.

Services	**Hospitals**		
Services	**Real Estate**		
Services	**Retail**		
Services	**Software development**		
Services	**Hotels**		

Like manufacturing, the services industry is quite diverse and features a myriad of different sectors, which can directly (healthcare, housing) or indirectly (software development, retail) contribute positively to the SDGs. Unlike manufacturing, the associated environmental impacts are lower, and the **social impacts are also more diverse**, e.g., the consumer risk related to data security (software) or negative impacts on decent work and gender equality (hotels).

While the table above gives a good overview of the various assessed sectors and their SDG interactions, our analysis on the individual sector-level is the foundation of these results and provides more depth and context.

We therefore provide in table Table 3 the complete results in the **wastewater treatment** sector as an example for a complete analysis of the trade-offs within. As mentioned above, the complete methodology can be found in Annex I. Unlike the simplified table above, each SDG interaction is contextualised with a likelihood assessment (from "rarely" to "always"), and an assessment of the strength of the impact on a scale from +3 (exceptional impact) to -3 (cancelling impact).

Table 3: Analysis of the wastewater treatment sector.

Sector Impact Analysis: Wastewater Treatment

Strength of impact (+3 to -3)	Likelihood of impact (from rarely to always)	SDG	Explanation
3 Exceptional impact	Always		**SDG 6 - Clean Water and Sanitation -** Economic and domestic activities consume water. A big part of the water used by households, industry, and business must be treated before it can be released back into the environment, since wastewater includes human and industrial waste like food scraps, oils, soaps, and chemicals. These wastes contain organic matter, nutrients, chlorine compounds, bacteria, viruses, and other pathogens, toxic metals (mercury, lead, cadmium, ...) and residues of pharmaceuticals. These substances can have a negative impact on human health as well as the environment if they are not treated (USGS, o. J.). Therefore, wastewater treatment is a crucial step to achieving SDG 6 by reducing these negative impacts. This can be achieved by combining mechanical (filters and grit chambers), biological (use of bacteria), nature harnessing (constructed wetlands), disinfecting (chlorine) and other more advanced treatments, such as UV lighting or activated carbon. It is important to state that the degree of effectiveness of wastewater treatment facilities varies greatly depending on technology. It must be adapted to the local context and the specifics of the wastewater. The treatment of household wastewater for example is very different from the treatment of industrial discharge.
2 Strong impact	Highly Likely		**SDG 3 – Good Health and Well-Being** – Clean water is essential for human health. Polluted water can have a variety of negative effects on human health and waterborne diseases (e.g., cholera). The effects of bacteria, viruses and pathogens, and toxic metals on humans can be acute as well as chronic. Substances from household wastewater (pharmaceuticals) and industrial wastewater (industrial residues and particulates) can both affect human health (USGS, o. J.). Globally, polluted water poses a significant risk of diarrhoeal diseases, opportunistic infections, and malnutrition. These effects cause 1.7 million deaths annually, with most of them (over 90%) occurring in developing countries and half of them being children. Ingestion of faecal pathogens from humans or animals is the most significant factor leading to these deaths (UNEP, 2019). Waste and drinking water treatment and pollution control are the critical factors to mitigate these devastating effects.
2 Strong impact	Highly Likely		**SDG 15 - Life on Land** – By treating Wastewater the negative impacts of human activities on the environment can be reduced. Untreated water threatens wildlife habitats on land (birds, plants) and in water (fish and other aquatic life). Water bodies enriched by nutrients such as phosphorus and

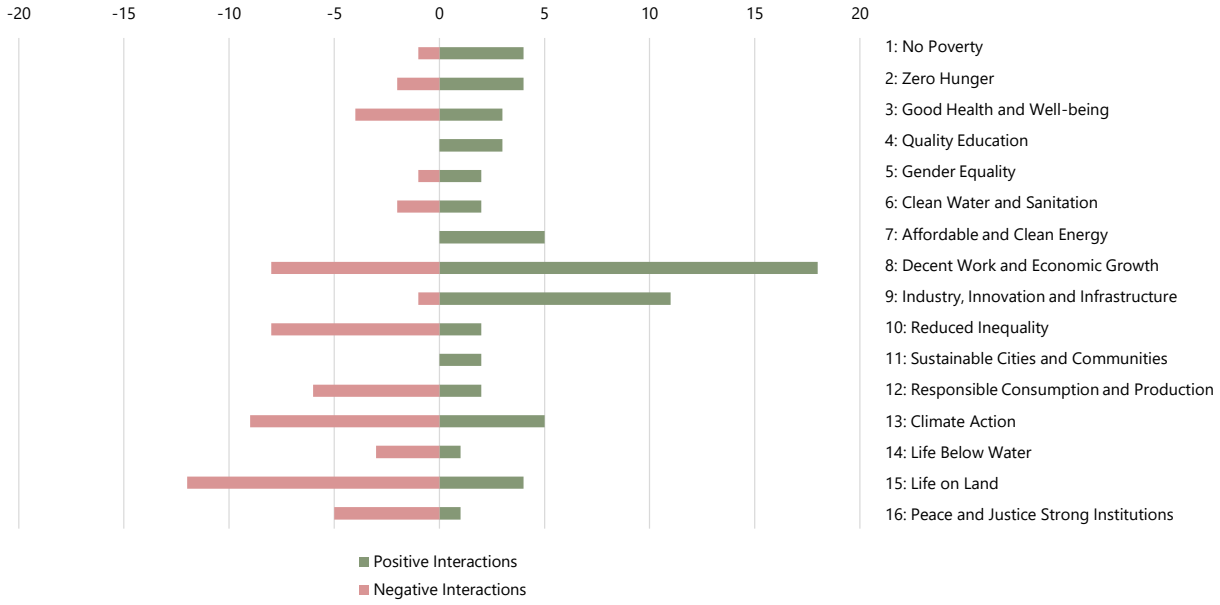
			nitrogen can suffer from eutrophication or over-fertilisation. This can be toxic to aquatic organisms, promote excessive plant growth, reduce oxygen and damage spawning grounds of marine animals. In the worst case it can change the habitat altogether and lead to the decline of certain species (USGS, o. J.). Other substances like chlorine compounds, inorganic chloramines, or heavy metals can have a negative effect on aquatic invertebrates, algae and fish. (Related SDGs: SDG 14 – Life under Water)
-2 Counter-acting impact	Always		**SDG 13 - Climate Action** - Various processes in wastewater treatment cause greenhouse gas emissions. Operating wastewater treatment plants leads to direct greenhouse gas emissions (GHG) like carbon dioxide, methane, and nitrous oxide resulting directly from the biological processes as well as indirect emissions stemming from the energy consumed by the plant (Campos et al., 2016). The direct emissions are the result of chemical reactions and cannot easily be avoided and are often underestimated or not measured. Nitrous oxide for example is a 300 times and methane a 25 times more potent greenhouse gas than carbon dioxide (albeit they stay in the atmosphere for a shorter time). Lowering emission levels of these gases therefore has a big impact in the greenhouse gas balance of wastewater treatment plants. Nitrous oxide (N_2O) emissions from wastewater treatment are estimated to contribute 26% of the total GHG emissions from the entire water supply chain (drinking water production, distribution, wastewater collection and treatment) (Campos et al., 2016).
-2 Counter-acting impact	Likely		**SDG 3 – Good Health and Well-Being** – Current methods of wastewater treatment are unable to completely negate antibiotics and organic toxic pollutants, leading to these substances entering the environment and polluting soil and water. Through the consumption of these substances in food and drinking water, they endanger human health (Wu, 2020). Growing demand for water for food production and industrial production leads to a competition for freshwater resources and an increase in the reuse of wastewater residues. The agricultural sector is responsible for over 70% of global water and wastewater usage (UNEP, 2019). Agricultural workers are especially exposed to the health risks posed from reused wastewater. Through the consumption of food grown on contaminated soils or with contaminated water, all consumers are affected (Wu, 2020).

Note: *Full analyses of further sectors can be requested from OeEB or DEG respectively (see contact details at the end of the report)*

Next to the individual results, we have also analysed the aggregated results across all 26 sectors. They show that some SDGs are most often assigned in the positive or negative categories only, whereas others were impacted both on the positive and the negative side. Due to the scope and selection of the sector analysis and the focus of the literature, some SDGs naturally occurred more often than others. For various sector assessments, we also named "related SDGs" in the explanatory text, which are not included in this analysis.

The following graph shows the amount of positive and negative interactions assessed per SDG for the 26 sectors.

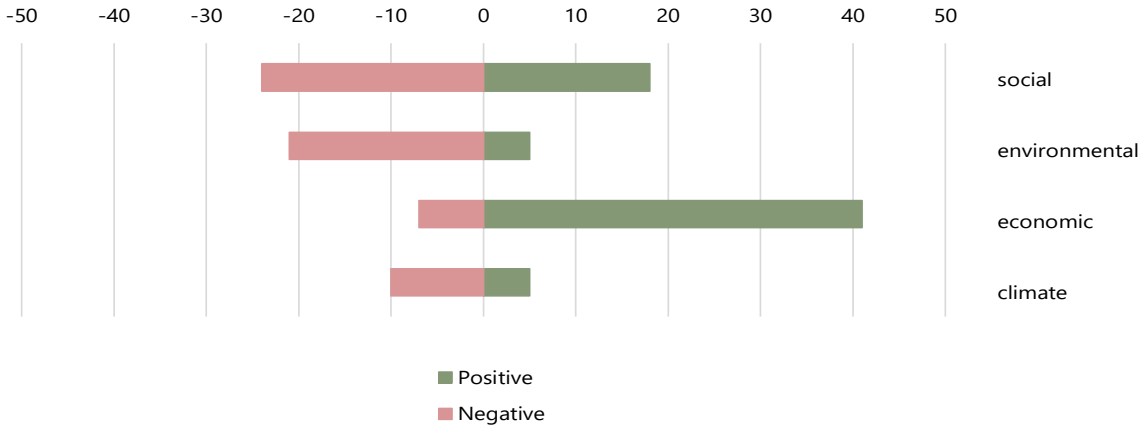
Graph 1: Amount of positive and negative SDG interactions per SDG for 26 analysed sectors.



SDG 8 (Decent Work, Economic Growth) as well as **SDG 9 (Industry, Innovation, Infrastructure)** are the ones most often assessed as positive, whereas the negative impacts are more spread: **SDGs 15 (Life on Land), 13 (Climate Action)** and **12 (Responsible Consumption and Production)** are rated as most negatively affected in the environmental realm, whereas **SDG 10 (Reduced Inequality)** and **SDG 8 (Decent Work, Economic Growth)** are most often rated negative in the social and economic realm respectively.

This is also reflected in the aggregate by the overall sustainability dimensions shown in Graph 2. On the social and the climate dimension, interactions go near evenly in both directions, whereas in the environmental and economic realm there is a clear distinction, with the economic category most positively, and the environmental category most negatively affected.

Graph 2: Interaction of impacts by dimension for 26 sectors (social, environmental, economic, climate).



An explicit matching of SDGs to the four dimensions is not possible due to the nuanced nature of some SDGs and sectors. For example, SDG 8 – Decent Work and Economic Growth can be assigned to the economic dimension

(growth, number of jobs) or the social dimension (labour standards, work quality). However, some SDGs can be directly matched to dimensions, e.g., SDG 13 – Climate Action to the climate dimension, and SDG 14 and 15 (Life on Land, Life below Water) to the environmental dimension. On the social dimension, SDGs 3, 4, 5 (Health, Education, Gender) are all featured there.

This view, of course, only considers the binary distinction between positive and negative impacts. Incorporating the interaction's likelihood and strength adds another layer of differentiation and complexity (cf. Annex I). On the likelihood scale (ranging from rarely – sometimes – likely – highly likely – always), most positive interactions were characterized as "likely" or higher, and often showing an exceptional or high impact (+2, +3). In contrast the negative interactions' likelihood was more diverse, and counteracting (-2) impacts prevail for most of the negative interactions.

In conclusion, the following **three key insights** can be taken away from the sector analysis:

(1) **Level-sensitivity:** First, the level on which we found positive and negative impacts to materialise varies significantly. In some sectors, impacts materialise mostly on the firm and local level, with no clear connection to wider societal impacts, e.g., in some sectors that are at risk for unfair working conditions (decent jobs) like hotels or manufacturing. In others, the local effects are negligible compared to their impact on the wider economy and society (for example in tech and telecommunications). These results might also be skewed by the available literature. For several sectors, wider societal impacts are not directly relating to the sector in the literature, whereas firm-level issues are directly attributed. One example is land-use change and sealing land. Almost all new industrial activity leads to sealing of areas and removal of natural land, which on the firm-level might seem unsignificant and is not related to a specific sector, but globally is a key contributor to environmentally harming land-use-change and urban sprawl.

(2) **SDG-interrelations**: For a significant number of SDG interactions, we found various other SDGs closely related. For example, SDG-3 Health (Humans), SDG-14 Life under Water and SDG-15 Life on Land (Animals) are both negatively affected by toxic emissions of port operations. On the positive side, various social SDGs are often interrelated, such as Gender and Education, as is the case in the benefits of telecommunications access. For closely related SDGs, we have utilised only one SDG-interaction and mentioned the other affected SDGs as interrelated. On an aggregate level, the trade-off between economic aspects (positive) and environmental aspects (negative) becomes quite clear, whereas social impacts are kept roughly in balance between positive and negative.

(3) **Context:** For most sectors, context matters to a large extent and results cannot simply be generalised for the sector. The forestry sector shows that negative and positive impacts heavily depend on the applied management practices, which can turn the balance into one or the other direction. However, there are also sectors with sector-inherent trade-offs for which we can make a blanket "positive" or "negative" assessment. One example are the significant benefits of solar and wind compared to the sector-inherent GHG-emissions of the oil and gas sector. In general, our analysis tries to highlight potential issues and common themes within sectors to provide a quick overview on which impact-issues might arise beyond already prevalent risk and ESG considerations.

3.2 Impact trade-offs and DFIs

What are influencing factors of SDG interrelations and common trade-offs within SDGs?

In this chapter, we highlight the importance of taking a net perspective when it comes to development impact. Our introduction shows the large number of complex interrelations between SDGs and within individual sectors. The question now is what aspects need to be considered when applying a net-impact lens.

To answer this, we first need to be aware that SDGs and their interrelations cannot be considered as isolated from each other and from the field of action in which they are applied. As we have shown with the exemplary sector impact analysis in the previous chapter 3.1.3, these are highly context-dependent, meaning the nature and strength of interactions are influenced by certain factors. Thus, in the first part of this chapter (3.2.1), the **five main influencing factors of SDG interactions** identified in the literature are presented and linked to individual investment sectors. Moreover, their implications for DFI investments and operations are described. For example, we show how the governance context within a country affects SDG interrelations and use sector examples that highlight this aspect.

The second part of this chapter – subchapter 3.2.2 – then goes beyond those influencing factors and introduces clusters of interrelated SDGs ("Nexus") to **highlight the complexity of interactions and trade-offs.** The two presented clusters are the Water-Energy-Food Nexus and the Nexus between energy, material consumption, and economic growth. They are featured prominently in the literature and are also the most significant for DFIs.

3.2.1 Influencing factors of SDG interactions

In unravelling the contextual determinants shaping interactions between SDGs, the literature points to the following five key factors: the **prioritisation of SDGs and targets,** the **governance context,** the **geographical context,** the **time horizon**, and **technology.** In this subchapter, each factor is introduced. We then utilise sectors examples or spotlights to show how the factors unfold in concrete contexts. After that, implications for the work of DFIs are derived for each influencing factor.

1. Prioritization of SDGs and targets. When it comes to implementation of the 2030 Agenda for Sustainable Development, different countries are likely to prioritise certain SDGs, targets and indicators over others due to their budgetary, political, and resource constraints. The prioritisation of selected goals is likely leading to trade-offs with the non-prioritised goals, in turn leading to a weaker fulfilment of the non-prioritised ones (ICSU, 2016, 2017; Nilsson et al., 2018). An example for the negative effects of prioritisation can be a country's prioritisation of SDG 2 (Zero Hunger): If areas of the rainforest are converted to agricultural land to plant crops, this unsustainable development is very likely to have negative effects on several targets of SDG 15 (life on land), which will ultimately threaten food security again in the long term.

In addition to creating trade-offs, prioritising individual SDGs can also be positive (Magendane & Kapazoglou, 2021). This case occurs when the fulfilment of certain SDGs is a prerequisite for the fulfilment of another (Kumar et al., 2018). An example of the positive effects of prioritisation are "driving powers" of certain SDGs: Other studies show that SDG 4 (Quality Education) and SDG 1 (No Poverty) are key pre-requisites and drivers for achieving all other SDGs (Scherer et al., 2018; Zhou et al., 2017). They therefore have a great "driving power" for the fulfilment of other goals and targets (Hegre et al., 2020; Pradhan et al., 2017).

The prioritisation of SDGs and their targets is dynamic and subject to changing contextual conditions. A key example for rapidly shifting of priorities is provided by the emergence of the Covid-19 pandemic.

Spotlight II: The Covid-19 pandemic and development

Since the onset of the global SARS-CoV-2 pandemic in 2019, much debate has revolved around the setbacks to development incurred by the pandemic situation. With economies coming to a near standstill, global trade severely disrupted, factories and services in lockdown, closed schools and overburdened hospitals and health systems, the impacts on well-being and sustainable development worldwide are profound and disproportionately affect the poor and the marginalised, further widening global and national inequalities. The pandemic immediately led to a **renewed focus on global health** (SDG 3), with billions of dollars spent to address the pandemic and work to prevent further outbreaks. However, the covid pandemic has also spurred dynamics to change other aspects of the global economy.

In the context of recovery, involving billion-dollar stimulus programmes, the intention to "Build Back Better" has gained traction. Spearheaded by the World Economic Forum and other experts and institutions, the argument is that there now is a "unique window of opportunity" to shape the recovery in a way that supports resilient economies and services, kick-starts decarbonisation, and makes capitalism future-proof (World Economic Forum, 2020):

"The pandemic has brought into focus many of the vulnerabilities in our systems and institutions. But it also offers us a chance to shape a more resilient and sustainable world. (...) An inclusive and green recovery is vital if we are to create more resilient economies and a world in which business can thrive, not just now but long into the future. There are positive signs that, in some countries, bailouts and stimulus packages have been designed with these criteria in mind, but this is by no means universal. It seems inevitable that some governments will repeat the mistakes made in the aftermath of the 2007-8 financial crisis when, in many cases, the policies adopted post-crisis exacerbated inequality and locked in unsustainable outcomes."
(World Economic Forum)

The terms and concepts around the green and inclusive recovery have been picked up by many, and feed into the wider debates revolving around the role of businesses in achieving the SDGs. This shows how a rapid change regarding one SDG can have massive implications for others as well. For example, the pandemic-induced shift to digital and remote work has reduced polluting international travel significantly and is likely to persist also beyond the pandemic.

The Covid-19 pandemic has shown how political and societal priorities can shift rapidly. DFIs are often owned or overseen by their governments and are thus subject to answer quickly to emerging priorities. The consensus is that such disruptions will increase in the future, e.g., in the context of the climate crisis or the emergence of new disruptive technologies.

Moreover, development Finance Institutions are at the forefront in delivering results under the "build back better" agenda and proving the positive role of the private sector in sustainable development. The private sector of the future will need to ensure that financial, environmental and social risks and impacts are properly "understood, priced and mitigated" (World Economic Forum, 2020). As such, DFIs have become both more prominent and more scrutinised in the past years.

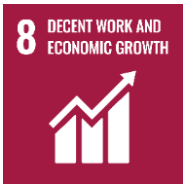
> **Implications of SDG prioritisation for DFIs.** DFIs themselves also prioritise certain SDGs and have always answered to shifting trends. For example, the initial focus on economic growth and poverty reduction is increasingly accompanied by a focus on environmental and climate concerns in investments. Foreseeing, monitoring, and answering to emerging trends is thus important for DFI's business and market positioning vis-à-vis their peers. Taking a net-impact perspective means an **increased scrutiny on developmental effects and the ability to foresee and respond to emerging issues** that threaten the business model in certain sectors.

2. Governance context. The nature and strength of potential SDG-interactions depends on the strength and willingness of existing administrative and political systems, institutions, partnerships, as well as intellectual and financial resources on the ground (Nilsson et al., 2018). These aspects determine which policy options and strategies are used to address the fulfilment of the SDGs (Mainali et al., 2018) and which capacities exists to address them.

If appropriate policies to achieve a certain SDG are not chosen, if there are no sufficient monitoring processes in place, or if enforcement is lacking, potentially positive interactions between SDGs can be weakened or even reversed.

The following examples in telecommunications and software development highlight the positive and negative impact that the governance context can have. We show how a weak governance context can have detrimental effects, e.g., a lack of privacy and data rights violations in the context of SDG 16 (peace, justice and strong institutions), and how a good governance context is key for the emergence of a digital economy and digital skill building in relation to SDG 8 (decent work and economic growth).

Table 4: Application of the factor *governance context* on exemplary investment sectors and its implications for DFIs.

Sector Example I: Telecommunications & Software Development	 Private data is constantly transmitted via telecommunications media, especially the internet. This data can be misused by companies, authorities, and public institutions to monitor citizens (Hintz, 2014). This misuse strongly depends on the respective country and governance context. Technology and particularly software are not "neutral". They have inherent characteristics that can be harnessed for positive and negative impacts. The rapid deployment of (digital) technology is often seen as the answer to achieving all 17 Sustainable Development Goals. However, without **appropriate conditions, standards and regulations, software can pose significant risks and may not adequately protect citizens from misuse, manipulation or misapplication** (Michael et al., 2019) (by the software company itself, the company or government using the software, or by other users of the software). The essential building blocks to avoid such negative consequences are threefold: (1) **Privacy** - the right to privacy is part of the Universal Declaration of Human Rights. Data about race, religion, sexual orientation, mental health, and more are protected by the right to privacy. (2) **Data rights** are about who has and therefore controls certain types of information. Data rights are a hotly contested area between consumers and large internet companies that have been shown to share information with third parties. There are also many other cases where data rights are crucial, such as services that analyse customers' DNA for genealogy. The European General Data Protection Regulation (GDPR) has set a consumer-friendly standard with global reach that includes several additional rights, such as the right to information, the right to erasure, restriction of processing and more. Finally, (3) **cybersecurity** is crucial to protect data and users, which is becoming increasingly important in the face of rising cybercrime and possible government surveillance (Michael et al., 2019).
Sector Example II: Software Development	 The digital economy is emerging as one of the key drivers of economic development, and software development is at its heart. At the same time, it needs a certain physical infrastructure and regulatory environment to develop - in **Kenya**, for example, improved telecommunications, internet access and submarine cable infrastructures, as well as lower equipment costs, have been **key to launching the digital economy**, which is one of the most innovative technology markets in Africa, especially in terms of mobile banking and transactions (Vital Wave / Caribou Digital, 2014). Software companies employ software engineers, product managers, testers and more - all with highly technical skills that require **strong educational institutions**. Often, the software itself also contributes to the creation of more jobs through various mechanisms, such as

	increased market penetration, customer support or economic opportunities enabled by the software (e.g., for mobile payment technology).

Implications of the SDGs' governance context for DFIs. The implications from the governance context for DFIs are twofold. Firstly – by definition of their mandate – DFIs often operate in environments with a weaker regulatory and governance context, meaning investee companies are at a higher risk of failing to comply with certain (international) standards that aim at reducing or eliminating negative impacts. There are mechanisms in place to measure ESG performance and monitor compliance with action plans. In the dynamic digital market, it is a challenge for regulation and standards to keep track of latest developments as these emerge very dynamically, leaving regulators lagging in setting standards. The second issue is **that impacts can realise positively or negatively depending on the governance context**. When DFI investments lead to the provision of certain infrastructure, the utilisation of this infrastructure is impact relevant. The telecommunications example shows how investments in telecommunications infrastructure can later be abused for surveillance and crackdowns. It is thus important to consider the governance context and potentials for abuse when investing in sensitive infrastructure. Similarly, when an investment does not meet a fitting environment, it might not unfold its impacts ("Internet start-up, but no free internet access"). The same holds true in the opposite direction: When the context is right, the positive impacts can be much stronger than anticipated.

3. Geographical context. Some SDG interactions are similar across borders, regions, and continents while others are bound to location. The geographical place and the available resources on the ground, such as free and fertile land for agricultural purposes or the presence of valuable raw materials is a factor shaping SDG interactions (Nilsson et al., 2018; Vehmas et al., 2007). For example, the agricultural sector of countries in arid zones differs vastly from the agricultural sector in the tropics, e.g., when it comes to sustainable use of water in the context of SDG 15. This shows the importance of the geographical context for assessing SDGs and sectors.

On the other hand, globally unfolding impacts are independent from geographical context. Reducing GHG emissions is important everywhere since climate change is global and GHG accumulate in the atmosphere. Of course, there are social aspects and the need to reduce emissions based on responsibility for historic emissions and level of development, but in principle, GHG reductions are relevant independent from location. Likewise, actions to promote renewables and boost energy efficiency in one part of the world are just as important as in any other (ICSU, 2017). Here again, we enter the territory of geographical dependency, which make certain types of renewable energy more viable in some areas than others, e.g., when hydro power is not applicable due to lack of water.

Thus, in the following Table 5 we describe the geographically-dependency of solar power production's positive effects on SDG 7 (affordable and clean energy) and on the other hand illustrate the geo-independent negative effects of fossil gas on SDG 13 (climate action).

Table 5: Application of the factor *geographical context* on exemplary investment sectors and its implications for DFIs.

Sector Example I: Solar Power Production (geo-dependent)	 Solar power is a leading technology in the shift away from fossil fuels: solar energy can be used for heating, cooling, providing natural light and fuels, and electricity, with much lower life-cycle greenhouse gas emissions than fossil fuels (Edenhofer et al., 2011). Moreover, quantification of external costs also yields more favourable levels than fossil fuel energy (Ibid.). In many countries, solar energy is already cheaper than gas or coal. Furthermore, a significant social benefit of solar technologies is their potential to close the availability gap of modern energy services

	for the approximately 1.4 billion people who lack access to electricity and the 2.7 billion people who rely on traditional biomass for cooking and heating (Caldés & Rodriguez-Serrano, 2018; Edenhofer et al., 2011). Whether a site is suitable for solar energy generation depends heavily on location factors, such as available solar radiation and space for deployment. Depending on the location, there may be issues regarding land consumption and habitat loss (Tawalbeh et al., 2021). Particularly in terms of installation area, land consumption by solar arrays can be high. In contrast to wind energy, there are fewer opportunities for solar projects to share land with agricultural use (Edenhofer et al., 2011; Turney & Fthenakis, 2011), although there are promising pilot projects ("agrivoltaics"). For countries with a higher number of sunshine hours, as well as more intense solar radiation and available land area, solar technologies are highly efficient and have the potential to boost economic development, increase access to energy and replace energy from fossil fuels. Another aspect that should be considered in the context of solar energy are supply chains and manufacturing processes of photovoltaic cells: For example, land use is also negatively impacted by solar technologies in the geographic areas used for mining and production of materials needed to manufacture photovoltaics. In addition, the production of photovoltaic cells requires a significant amount of energy during the processes of mining quartz, copper and aluminium, manufacturing, and transporting the finished cells (Beloin-Saint-Pierre et al., 2009). Furthermore the compliance to decent working conditions and human right in the supply chain of PV cells are often criticized as questionable.
Sector Example II: Fossil Gas (geo-independent)	 Natural gas is often argued to be a transition technology for many countries, bridging the period until the introduction of zero-emission energy systems (Zhang et al., 2016). However, understanding natural gas as a "bridge fuel" risks delaying the deployment of renewable energy systems ("lock-in effect"), negating any potential benefit of replacing coal with gas. Moreover, as a bridge fuel for ambitious temperature stabilisation targets, natural gas has limited direct emissions-reducing value and is not cost-effective because of the short time period over which it would be used (Ibid.). In addition, natural gas is associated with varying levels of methane emissions, which contribute much more to the greenhouse effect in the short term. Thus, while gas could reduce total CO_2 emissions in some cases, it would still result in additional short-term warming due to significant methane leakage (Hmiel et al., 2020; Zhang et al., 2016). Emissions resulting from the extraction and processing, as well as the transportation and combustion, of natural gas have enormous impacts on the environment and the global climate and run counter to global ambitions and policies to achieve global warming of well below 2°C (IEA, 2021; IPCC, 2014).

Implications of the SDGs' geographical context for DFIs. As the examples show, investments can lead to impacts both at the local as well as on the global level. The example of renewable energy highlights the need to adapt to local environments, since **hydro, wind and solar power all rely on certain geographical features** which are a pre-requisite to create local (access to energy, income, reduced pollution) and global impacts (contribution to climate change mitigation). Likewise, GHG emissions locally directly contribute to negative impacts elsewhere, with global warming already showing devastating impacts around the world. The geographical lens also helps DFIs take a wider perspective when it comes to considering **impacts along their client's supply chains**. Global supply chains are complex and feature certain impact-risks that realise in other places than the site of investment. For example, the meat and dairy supply chain (beef/soya) is often criticised for their involvement in rainforest destruction. Similarly, fashion retailer investments have implications for the global fashion supply chain, which is associated with significant risks regarding working conditions and environmental pressures. These examples show that taking a wider approach to impacts helps to incorporate various levels at which impacts materialise and can help DFIs to incorporate the complex impacts of various investments.

4. Time horizon. Possible SDG interactions must also be considered in different time frames. Some interactions develop in real time and potential synergies and trade-offs become apparent immediately or shortly after an intervention (Nilsson, 2017). Other interactions may only emerge with a time lag. An example of this is the use of chemical fertilizers: fertiliser-use is essential to agricultural productivity and thus increases food availability. In this manner, it can make a positive contribution to achieving SDG 2 (zero hunger) and SDG 1 (end poverty). On the other hand, the over-use of fertilizers in intensive agriculture can show high initial yields, but negative long-term effects on life on land (SDG 15) and below water (SDG 14) – which ultimately means reversing the positive effects on the SDGs that initially benefited. Furthermore**, SDG interactions may not only evolve and change over different time periods, but may also persist or dissolve** (Nilsson, 2017). There are interactions that only take place during the period of intervention, but also those that are irreversible (species extinction) or take an immensely long time to dissipate (atmospheric CO_2).

Table 6 highlights the time horizon for two sector examples: We illustrate how cash crops are likely to have a negative long-term impact on SDG 15 (life on land) through the usage of fertilizer. Additionally, the second sector example of Offshore Wind demonstrates how short-term negative effects could be outweighed by positive effects in the long run.

Table 6: Application of the factor *time horizon* on exemplary investment sectors and its implications for DFIs.

Sector Example 1: Cash Crops	 Crop specialisation increases vulnerability to ecological risks, mainly due to monocultures. Large-scale agriculture often neglects a **long-term vision for soil and environmental impacts to maximise yield in the short term**. Without sustainable management practices, monocultures lead to soil degradation, impairment of hydrological functions, a reduction in agrobiodiversity and an increase in greenhouse gas emissions. These conditions are associated with lower yields and lower productivity, an increase in pests and diseases, lower incomes for farmers, greater dependence on chemicals and higher cultivation costs. The practice of e.g. sugarcane monoculture also increases the risk of fires in plantations, especially during dry seasons or when residues are dry (Putra et al., 2020). In the long term, sugarcane monocultures can, for example, lead to a deterioration of ecological conditions and lower agrobiodiversity (Altieri et al., 2015).
Sector Example 2: Offshore Wind	 The main potential negative impact of offshore wind farms relates to **short-term underwater noise and disturbance generated during the construction**. In particular, the noise generated during pile driving has sound pressure levels high enough to affect the hearing of marine mammals close to the source and disturb their behaviour at a considerable distance from the construction site. In addition, animals could be displaced from the wind energy area, either by the noise of construction or operation, by the presence of wind towers, or by the boats and noise associated with regular maintenance activities in the wind farm area. In addition, animal behaviour (e.g., calling behaviour, feeding, breathing, movements) may change in a way that reduces the ability to forage for food or mates (affecting fertility and/or animal health), or may lead to increased chronic stress levels that affect animal health. Wind farms may also alter the physical habitat in a way that disrupts the occurrence and/or aggregation of prey for the affected cetaceans or sea turtles (Kraus et al., 2019). However, short-term impacts of offshore wind are generally much more disturbing than the long-term impacts. The placement of offshore wind turbines also has the potential to create new marine habitats. Research shows that the net amount of **habitat** created by the most common form of offshore wind turbine, the monopile, can be **equal to or greater than the area lost through placement**. Thus, offshore wind may actually result in a net gain in habitat, although the habitat gained may be of a different character than that lost (Wilson & Elliott, 2009). To illustrate, offshore wind farms have the potential to serve as indirect refugia for several species. For example, the bluefin tuna has been shown to tend to congregate near offshore turbines in the Adriatic Sea.

	This suggests that turbines may act as 'fish aggregators' in a similar way to oil platforms, which have a higher density of juvenile fish than surrounding areas, as well as a higher abundance of larger individual fish (Ibid.).

Implications of the time horizon for DFIs. The question of the time horizon is tricky because it is concerned with the fundamental question of the scope of impact. Long-term developments are often dependent on a wide range of context-specific local factors and will always be hard to attribute to investments, whereas others can be determined more clearly for the long-term, such as the effect of GHG emissions. When making impact assessments that incorporate the time horizon, the severity of short-term vis-à-vis the long-term effects must be considered. A short-term negative impact might be justified sometimes (e.g., construction disturbance) because it yields clear long-term benefits such as access to health services or trade opportunities. The question becomes trickier, when a short-term positive impact (e.g., company output, agricultural yield, jobs) stands against more long-term negative impacts, such as contributions to climate change and biodiversity loss. As a guiding question, investment managers and impact specialists can ask: **Do aggregated negative impacts in the future threaten the sustainability of the realised positive impacts today?** If the long-term negative impacts directly relate to the short-term positive impacts, they cannot possibly be seen as sustainable under a net-impact perspective and appropriate measures should be taken.

5. Technology. By using certain (new) technologies, strong SDG trade-offs can be significantly mitigated or even eliminated altogether (ICSU, 2016). Technology dependency can be observed especially in relation to the water sector, energy supply (switch to renewables), food production (e.g., agricultural production) and transport in the cities. The consideration of different kinds of technologies is also significant for mitigation options of possible trade-offs.

In the following two sector examples, we show how the use of innovative dying and textile finishing processes can mitigate negative effects of the garment sector on SDG 6 (clean water and sanitation) and describe how the application of new configurations and processes in the wastewater treatment sector reduce negative impacts on SDG 13 (climate action).

Table 7: Application of the factor *technology* on exemplary investment sectors and its implications for DFIs.

Sector Example 1: Garment	 The fashion and textile industry is a major polluter of water at all stages of the value chain: wastewater is the largest waste stream in the textile industry. It can contain a mixture of substances such as dyes, salts, acids, alkalis, oils, and fats as well as (chlorinated) solvents, and thus contributes heavily to environmental pollution (Gardetti & Muthu, 2020; International Finance Cooperation (IFC), 2005). Spills in production, leaks in tanks or pipes, and the disposal of liquid waste can contaminate buildings and the soil (International Finance Cooperation (IFC), 2005). This can pose a risk to groundwater resources or human health. Innovative dying and textile finishing processes offer solutions to minimize such water pollution and overall water usage (Gardetti & Muthu, 2020). Furthermore, the development of sustainable alternatives to synthetic fibres contributes to enhancing possibilities to recycle garment waste during production and discarded clothing (International Finance Cooperation (IFC), 2005; KPMG, 2018).

Sector Example 2: Wastewater Treatment	 Various processes in wastewater treatment cause GHG emissions. The operation of wastewater treatment plants leads to direct emissions of GHG such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) from the biological processes, as well as indirect emissions resulting from energy consumption for the operation of the plant (Campos et al., 2016). The amount of greenhouse gas emissions from wastewater treatment plants is often underestimated. Due to the physical and chemical reactions involving carbon and nitrogen in standard wastewater treatment, CH_4 and N_2O are an unavoidable by-product. N_2O is a 300 times more potent greenhouse gas compared to carbon dioxide (CO_2), so even low emission levels contribute significantly to the greenhouse gas balance of a wastewater treatment plant. Similarly, methane is 25 times more potent than CO_2. N_2O emissions from wastewater treatment are estimated to contribute 26% of the total GHG emissions from the entire water supply chain. However, both methane and nitrous oxide remain in the atmosphere for a shorter time compared to carbon dioxide. Mitigation of emissions can be undertaken by (1) the minimization through the change of operational conditions, (2) treatment of the gaseous streams, and (3) prevention by applying new configurations and processes to remove both organic matter and pollutants (Global Infrastructure Hub, 2020; UNEP, 2019). Pre-requisite for reducing emissions is monitoring technology to better quantify emissions and implement appropriate treatment alterations and optimizing existing systems (UNEP, 2019). Emissions of energy use from operations can be mitigated completely by switching to new renewable energy technology.

Implications of the factor technology for DFIs. Technology can – in the positive and the negative sense – (1) deepen existing impacts (2) reverse existing impacts or (3) completely transform a sector's impact pathway. The transformative impacts of technology thus pose both a risk and a huge opportunity. Considering innovative technological developments and solutions as opportunities, they can significantly **expand the solutional space to address negative trade-offs**. For DFIs, this implies that they can perform a more accurate impact assessment when incorporating information on the technologies used by the investee. The client can be linked to new technology to address challenges (e.g., smart meters to reduce energy use). Furthermore, DFIs have a special role to play in the context of technological considerations, as they know their markets better than others. Thus, they can promote technology adapted and suited to the local contexts through their investments.

As these examples have shown, SDGs and sector-impacts are closely related with each other, but also depend heavily on various influencing factors. The wider political and governance context as well as geography provide context to investments today, whereas technology options and the aspects of impacts over time focus on the fluid and transformative nature of development impact.

Beyond these contextual factors, there are also fixed linkages and clusters, so-called nexuses, between specific SDGs. A change in one SDG causes a direct impact on other SDGs in the nexus. Two of the most relevant nexuses identified in the literature - the water-energy-food nexus and the nexus between energy, material consumption, and economic growth - are discussed in the following sub-chapter 3.2.2. These two nexuses are of particular importance for DFIs, including DEG and OeEB, as they also include the interrelations between SDGs 7 (Energy) and SDG 8 (Growth), which are featured prominently in the DFI's portfolios in terms of their impact.

3.2.2 SDG Nexuses

Conceptually, a nexus describes the "interconnection of many resource-consuming practices" and is used to understand interactions between these practices (Schneider et al., 2018). Under a nexus approach, the individual SDGs and their targets are not viewed as isolated from each other, but are seen as interconnected (van Zanten &

van Tulder, 2021; Weitz et al., 2014). Possible positive and negative interactions between the SDGs are considered from the outset and analysed on a sector-specific basis (Hülsmann & Ardakanian, 2018; Liu et al., 2018).

The main premise of the nexus approach is to establish an understanding of the SDGs, which implies that arising **challenges can only be solved effectively if the SDGs in the nexus are seen as wholly interconnected and interdependent** (Boas et al., 2016). However, this approach does not stop the interrelationships and interdependencies from appearing in different forms and strengths. So far, the main application of this approach has been in consideration of possible interventions in the public sector to achieve the SDGs, as well as scientific studies and considerations of these. Nevertheless, the nexus lens is also essential for DFIs and private sector investment, because it highlights trade-offs of an investment.

Two nexuses are of particular interest to DFIs and play a central role in the literature: the **water-energy-food nexus** (nexus between *SDG 7 – affordable and clean energy*, *SDG 6 – clean water and sanitation* and *SDG 2 – zero hunger*) and the nexus between **energy and material consumption and economic growth** (nexus between *SDG 7- affordable and clean energy*, *SDG 8 – economic growth* as well as *SDG 12 – responsible consumption and production*). In the context of the portfolios of OeEB and DEG, the achievement of SDGs 7 and 8 plays a central role, which is why these two nexuses are examined in more detail below and their implications for development investing in sectors that relate to these SDGs are highlighted.

3.2.2.1 The water-energy-food (WEF) nexus

Due to the **strong inherent interconnections between the water, food, and energy sectors, impacts in one of the sectors will also have significant effects on the others.** The key connections between these three areas are as follows (Bizikova et al., 2014; GWP, 2020): Firstly, water is an essential part of food production in rain-fed and irrigated agriculture, as it is a keystone of the whole agro-food supply chain. Conversely, the intensification of agricultural processes affects the water quality strongly. Secondly, water also plays a major role in the production of energy, for example in the hydropower sector, in growing plants for biofuels, in the production of other renewable energies but also for cooling thermal plants of fossil fuels or nuclear power plants. In turn, energy is essential for desalination, water and wastewater treatment, water supply and irrigation. Energy is also required for food production, including harvesting, transportation, processing, storage, packaging, and marketing. Hence, energy too is an essential input throughout the entire agro-food supply chain. In reverse, conflicts around land use may arise in the competition between agricultural land and land for energy such as biofuel crops, barrier dams for hydro power or extended solar installations or wind parks.

The core problem underlying the set of interactions between SDG 6, SDG 7, and SDG 2 is the scarcity of resources (Hoff, 2011; Leck et al., 2015). The growing demand for food, affordable energy, and water is increasing the pressure on natural resources through consumption and pollution (Bizikova et al., 2014; Schneider et al., 2018). The consequences for the environment, ecosystem services, soil, biodiversity and thus for the living foundation of the population are far-reaching. The impacts of climate change exacerbate these negative interactions and uncertainties. For this reason, considerations of the WEF-nexus also include the **ecosystem as an essential framework condition** closely linked to these three aspects (GWP, 2020; Schneider et al., 2018). This is because healthy ecosystems are an essential prerequisite for the sustainable use of these scarce resources and are negatively impacted by their unsustainable use.

The following table highlights the interconnected nature of the nexus, using the water supply sector and the sugar industry as examples for concrete effects and interrelations in the WEF-nexus.

Table 8: Application of the *water-energy-food nexus* on exemplary investment sectors and its implications for DFIs.

Sector Example I: Water Supply	 **Water is essential for all stages of energy production**, from fossil fuels to biofuels and hydropower (IEA/OECD, 2016). Therefore, water supply must be secured to achieve SDG 7.  In addition, **energy use is critical for a range of water processes, including water distribution, wastewater treatment, and desalination** (Ibid.). Switching the energy source from fossil-based to renewable energy significantly lowers the environmental impact of the water supply industry. Water supply, particularly for agriculture and energy (especially hydro and nuclear) is subject to significant climate risk, both from extended droughts and sinking groundwater levels, as well as from excessive rainfall and floods which often contaminate water sources. **Globally, three out of four jobs depend on water**, and half of the world's labour force is employed in eight highly water-dependent sectors: Agriculture, forestry, fisheries, energy, manufacturing, recycling, construction and transport (UNESCO, 2016). Many of the jobs in these sectors are in rural areas and depend on the effective management and sustainable condition of the environment (ILO, 2019).
Sector Example II: Sugar Cane	 Sugarcane is a **water-intensive crop**. The water footprint of refined cane sugar is about 1780 litres/kg. Compared to other crops, sugarcane requires a high level of irrigation (El Chami et al., 2020; Mekonnen & Hoekstra, 2011). In South Africa, water withdrawal for sugarcane production is 9.8% of total irrigation withdrawal. Another problem is land-use change, which negatively impacts biodiversity and endemic species (El Chami et al., 2020): sugarcane cultivation has driven **deforestation in some of the world's most threatened ecosystems**, particularly in the Amazon (El Chami et al., 2020; WWF, o. J.). Soil acidification is widespread due to the use of nitrogen fertilisers (El Chami et al., 2020; WWF, 2005), and conventional plantations put a very high pressure on soil resources and alter the physical, chemical and biological properties of the soil (El Chami et al., 2020).   There is a growing **competition for land between crops for bioenergy and food crops**, threatening global food production, which is already facing the challenge of feeding nine billion people by 2030. The impact of this competition is described as devastating for food security (Ibid.). The growing and changing demand for food, combined with the increasing global demand for energy for transport (biofuels), is creating competition for land under conditions of declining petrochemical resources and the urgent need to reduce greenhouse gas emissions (Harvey & Pilgrim, 2011). Sugarcane is mostly grown for its sugar content, but the recent growth in demand is due to the increasing need for biofuels, for which sugarcane can also be used. When only by-products of pre-existing sugar production are used to distil biofuels, they can **provide energy and replace fossil alternatives** without the associated negative impacts and competition for land.

Implications of the WEF-nexus for DFIs. Concerning investments in the energy sector, or the foreseeable (positive or negative) impact an investment will have on SDG 7, it must be assumed that it will also have an impact on water and food management, as well as ecosystems, and thus also on the achievement of SDGs 6 (Water), 2 (Hunger) and 15 (Life on Land). Accordingly, it is also important to assess potential risks in these areas, even if they do not appear relevant or influenceable at first glance. In addition, a breakdown of potential impacts by time dimension is essential, particularly regarding the WEF nexus, as trade-offs with ecosystems (SDGs 14 and 15) and climate (SDG 13) mostly unfold in the medium or long term. Another factor to consider is the **effect of technology in the nexus**. For example, the introduction of drip water irrigation systems can reduce water use and increase resilience to water shocks, whereas the use of energy that does not require water also changes the dynamics in the nexus (e.g., wind and solar). Considering the ongoing transition towards carbon-neutral economies, concepts aiming at **reconciling certain trade-offs within the nexus are gaining traction**, for example agrivoltaics, combining agricultural land use (animals or plants) with solar panels above, which provide additional income to farmers (energy) and can also help reduce heat pressure on the crops below.

3.2.2.2 The energy, material consumption, and economic growth nexus

This nexus deals with the fundamental inputs that foster economic activity. In our industrialised world, economic growth was historically driven by, and is dependent on, energy and material consumption (Eisenmenger et al., 2020; Kasperowicz et al., 2020). Eisenmenger et al. (2020) conducted an extensive historical-economic analysis of the industrialisation processes between 1830 and 2000. They showed that industrialisation led to a strong increase in the use of fossil energies and thus in CO_2 emissions, and a similarly large increase in material consumption.

With the rise of renewable energies, the **nexus between energy consumption and economic growth will shift significantly** by the phase-out of fossil fuels. This influences the interconnections between SDG 8 and SDG 7. Generally, there is no consensus in the literature on the nature of the relationship between renewables and economic growth (Kasperowicz et al., 2020). Where the literature agrees however, is in the **bidirectionality and time-dependency of the relationship between SDG 8 (Economic Growth) and SDG 7 (Energy)**. Bidirectionality of the relationship here refers to the achievement of each goal affecting the achievement of the other goal (ICSU, 2016, 2017; Lapinskienė et al., 2017). For example, the expansion of renewable energies can help spur innovation and impact local, regional, and national employment (SDG 7 affects SDG 8) (ICSU, 2017).

Material consumption on the other hand primarily concerns SDG 12 – Sustainable consumption and production. It relates to energy (SDG 7) as it provides all raw materials for construction and fuel (in case of fossil and nuclear energy) in energy infrastructure. It also relates to economic growth (SDG 8) by providing raw materials for all products, industries, infrastructure and much more. Both material consumption and energy use have been growing alongside economic growth and are closely interwoven.

However, like with the WEF-Nexus, there are planetary limitations threatening this upwards dynamic. Many of today's most pressing **environmental problems** such as climate change, biodiversity loss or water scarcity are **directly linked to the scale of material throughput**. The unprecedented industrialisation and development in the past two hundred years has already led to a critical overshoot in various planetary systems, such as greenhouse gases, species extinction rate, anthropogenic nitrogen, and deforestation (Steffen et al., 2015). Due to the associated consumption of non-renewable resources and the destruction of ecosystems, ever-increasing economic development is often seen as incompatible with climate change mitigation (Hickel & Kallis, 2020; IPCC, 2007; van Zanten & van Tulder, 2021). Nevertheless, economic growth and drivers of industrialisation are still indispensable for development and are essential for lifting people out of poverty in developing and emerging economies.

The SDG framework acknowledges the growth-related pressures on the ecosystems and several SDGs related to them, most notably SDG 13 – Climate Action, SDG 14 – Life under Water, and SDG 15 – Life on Land. The most prominent concept to harmonise economic and environmental goals is to **decrease the requirement of natural resources for ongoing economic performance**. This concept of **decoupling** is differentiated into breaking the link between economic growth and resource use (resource decoupling), and the link between economic growth and environmental pressure (environmental decoupling) (Lutter, Giljum, Gözet, 2018). Two types of decoupling can be distinguished: *relative decoupling* is achieved when economic growth is exceeding growth in material use. In contrast, achieving economic growth while at the same time decreasing overall material use is called *absolute decoupling*. While both cases entail an increase in efficiency in raw material use, only absolute decoupling would allow economic prosperity while reducing environmental pressures and impacts and, furthermore, would enable human development in accordance with planetary restrictions (Ibid.). Only if such absolute decoupling is achieved, GDP growth is a sustainable societal goal (Ward et al., 2016).

Economic growth itself has led to new technologies and innovations that can be utilised to **reduce the mutual independencies between growth, energy, and material consumption**. One example are renewable energies, which still require significant material input for construction, but which are no longer dependent on continued material input during their operations because, unlike fossil energy, they utilise natural processes (sun, wind, water, geothermal power). At the same time, there is an increased drive for more and more energy-efficient appliances and tech. The second example, which focusses on material consumption, are policies, innovations, and technologies in the realm of the **circular economy**: namely the reuse and recycling of waste, products and materials which can decouple the material footprint of products, as well as the increased use of renewable building materials.

Economic growth is a **key element of the SDG framework** and is seen as essential for achieving other SDGs. However, for economic growth to be sustained and sustainable, it must adapt to stay within planetary boundaries - by decoupling from fossil fuel energy and shifting to renewables, and by moving towards a circular economy (Lonca et al., 2019), which is reflected in a set of corresponding SDGs.

The following table emphasises the interconnected nature of the nexus, using the forestry and retail, as well as the telecommunications and garment sectors to give examples for concrete effects and interrelations in the nexus between energy, material consumption, and economic growth.

Table 9: Application of *nexus between energy, material consumption and economic growth* on exemplary investment sectors and its implications for DFIs.

Sector Example I: Forestry & Retail	 The production and use of renewable and sustainable **wood fibre products** is key to achieving SDG 12 on the sustainable use and management of natural resources, to which a circular forest bioeconomy contributes (WBCSD Forest Solutions Group, 2019). The forest sector is well positioned to break the prevailing linear 'take-make-dispose' model and drive the transition to a low-carbon and circular economy, as wood fibre is renewable, biodegradable and provides renewable, durable, and recyclable products (Ibid.). As a substitute for steel, cement and other products with high fossil fuel consumption, the impact on the climate is reduced (Waring et al., 2020). However careful consideration to sustainable management of forest resources must be maintained. Increasing concentration in the retail sector and the emergence of preferred supplier systems have made the retail sector a more powerful player in the value chain (Swinnen, 2020). Retailers, under pressure from changing consumption patterns and trends, have an interest in promoting sustainable value chains, upholding human rights and fair labour standards, and reducing pressures on the environment, e.g., by participating in various initiatives and implementing sustainability practices. The

	food and beverage retail industry also has great potential to reduce food and packaging waste through circular and innovative solutions (Jones & Comfort, 2020).
Sector Example II: Telecommunications & Garment	 The material footprint of the **electronic device industry** in terms of rare metals and materials is very high, and waste from electronic devices is a rapidly escalating problem. Many countries face significant environmental and human health risks from inadequately disposed electrical equipment (Forti et al., 2020). Recycling rates are very low in most economies (0.9% in Africa, 9% in the Americas, 11% in Asia). In middle and low-income countries, e-waste management infrastructure is not fully developed and is therefore taken over by the informal sector, with significant negative health and environmental impacts. (Ibid.). **The global apparel and footwear industry** was responsible for an estimated 8% of global greenhouse gas emissions in 2016, and its climate impact is projected to increase significantly if current trends continue (Niinimäki et al., 2020; PACE & accenture, 2020; UNFCCC, 2022). The most basic link between waste and the textile industry is in garment cuttings or garments disposed of after use; however, pollution is present in every link of the production chain. Waste can be divided into three subcategories (Gardetti & Muthu, 2020): pre-consumer waste (cutting and raw material residues), post-consumer waste (garments disposed of after use) and post-industrial waste, i.e. waste related to dyes, finishing processes, chemical waste and environmental pollution, e.g. from transport (Muthu, 2019). If current practices continue, annual production and disposal of waste will increase by 60% by 2030 (Gardetti & Muthu, 2020). Only 20% of end-of-life garments are recycled, and most of these garments lose value due to inappropriate processing technologies (Ibid.).

Implications of the nexus between energy, material consumption, and economic growth for DFIs. DFIs invest in the private sector for economic growth and financial returns. The markets that DFIs operate in are the ones most disproportionately affected by the negative impacts of climate change and material consumption. As financiers of the private sector, from both a risk and an impact-perspective, DFIs should **consider and pursue absolute decoupling** in both resource use and environmental pressures when investing to not further jeopardize future economic development, which is increasingly threatened. From a comprehensive long-term perspective, sustainable economic growth is not achieved by measuring, managing, and reducing emissions and resource use, it is only achieved by absolute or near-absolute decoupling. However, the urgency of meeting crucial infrastructure needs (water, renewable energy) in developing markets will likely take precedent over concerns of material consumption and can be seen as a **pre-requisite to achieve absolute decoupling in other economic sectors** (for example, recycling processes often require water and energy as inputs, as well as an appropriate policy environment and professional private sector). There are also ample opportunities for technical assistance, for example by reducing emission intensity along domestic and import supply chains (Hubacek et al., 2021).

As can already be seen from the above, both nexuses are closely related to anthropogenic climate change, which is therefore the topic for the third spotlight in this report.

Spotlight III: The climate crisis and private sector investing/DFIs

1. Climate Risk

Human-induced climate change today is affecting many weather and climate extremes in every region across the globe, including every inhabited region (IPCC, 2021). As summed up by the **2021 Chatham House Climate Risk Assessment**, the failure to achieve the Paris Agreement's targets will have far-reaching initial physical and socio-economic consequences:

"If emissions do not come down drastically before 2030, then by 2040 some 3.9 billion people are likely to experience major heatwaves, 12 times more than the historic average. By the 2030s, 400 million people globally each year are likely to be exposed

to temperatures exceeding the workability threshold. Also, by the 2030s, the number of people on the planet exposed to heat stress exceeding the survivability threshold is likely to surpass 10 million a year. To meet global demand, agriculture will need to produce almost 50 per cent more food by 2050. However, yields could decline by 30 per cent in the absence of dramatic emissions reductions. By 2040, the average proportion of global cropland affected by severe drought will likely rise to 32 per cent a year, more than three times the historic average." (p. 2-3)

Moreover, these physical and socio-economic consequences lead to **systemic risks** that send compounding impacts throughout systems, meaning people, infrastructure, economy, society, and ecosystems (Quiggin, Daniel et al., 2021). The 2021 Chatham house climate risk assessment traces interactions and risk cascades in six areas, one of which is economic and trade disruption (Ibid.). The drastic emergence of heat waves, wildfires, floods, and droughts threaten food security, as well as energy and water infrastructures. These extremes also cause business failures and a sharp drop in consumer spending to such an extent that they can no longer be absorbed by the insurance industry. In addition, equity markets are expected to also experience negative consequences from the indirect impacts of climate hazards on businesses, infrastructure, and the wider economy. All these cascading effects and impacts could therefore lead to far-reaching macroeconomic consequences in terms of inflation rates, asset prices, jobs, and livelihoods.

2. Climate Action

Temperature increases from anthropogenic climate change are caused by *cumulative* greenhouse gases in the atmosphere. This means a slow path to zero by 2040 or by 2050 does much more absolute harm than a very fast one. The ongoing delays in emissions reductions come with the dual burden of needing to do more to slow global warming and to do it faster (IPCC, 2014, 2021). For this purpose, **steep short-term reductions in the decade until 2030** must be prioritised. Further investments in fossil fuels are incompatible with sustainable emission reduction pathways (IEA 2021). Global fossil fuel production must also start to decline immediately and steeply to be consistent with limiting long-term warming to 1.5°C (SEI, IISD, ODI, E3G, and UNEP, 2021).

After the world decided to combat climate change in 1992, global greenhouse gas emissions have continued to rise. The Paris conference of 2015 (COP21) for the first time brought a broad consensus among countries to consistently limit global warming to at best 1,5° or to well below 2° Celsius. The COP26 in Glasgow aimed to mark a turning point in global climate action (bpb, 2021), as many countries submitted updated nationally determined contributions (NDCs) to emission reductions.

The final declaration of the conference, supported by some 200 countries, underscores the IPCC's finding that the impact of climate change will be much smaller at 1.5° Celsius than at 2° Celsius. It is also the first time a link has been made between long-term and short-term goals. In addition, the final document recognises that achieving the 1.5° Celsius target will globally require a **45 percent reduction in global CO_2-emissions below 2010 levels by 2030** and to reach net-zero by 2050 (UN, 2021). The "Glasgow Climate Pact" also calls on countries to make improvements to their 2030 climate targets. According to the pact, the decisions taken at national level (NDCs) have so far been insufficient to achieve the 1.5-degree target. The national climate targets are to be reviewed by the end of 2022, three years earlier than previously planned (UN, 2021). In addition, the industrialised countries responsible for the largest share of historical emissions are called upon to provide most affected countries with USD 100 billion a year for climate protection and adaptation to the consequences of global warming.

3. Climate Finance & DFIs

What is true for the global and national level also holds at the level of the private sector. Various DFIs have therefore set targets to reduce portfolio-level emissions over time and achieve net-zero at various dates. Many DFIs have been frontrunners in financing renewable energies in developing economies and have gained a lot of expertise, which puts them in a **favourable business position going forward**. The investment paradigm

globally is changing, meaning climate action and economic development are not seen as contradictory, but viewed as interrelated and interdependent (van Zanten & van Tulder, 2021). The World Energy Agency Net-Zero Scenario estimates an annual market opportunity that rises well above USD 1 trillion by 2050 for manufacturers of wind turbines, solar panels, lithium-ion batteries, electrolysers, and fuel cells. This is comparable in size to the current global oil market (IEA, 2021).

Until then, DFIs as impact investors are in a good position to ensure that they only invest in those emitting industries featuring indispensable development effects and no availability for alternative processes (e.g., wastewater treatment) and likewise avoid to lock-in unsustainable practices with their investments (e.g. fossil fuel infrastructure). Furthermore, it is of particular importance for DFIs to ensure that **financial intermediary financing** is aligned with SDG 13 and the Paris Agreement (Fuchs et al., 2021).

In conclusion, most DFIs are in a business and market position where it makes sense to take aggressive action to realign financial flows, engage with clients to reduce emissions and contribute significantly to support transformation and enable leapfrogging in their markets. This also implies **phasing out all fossil fuel investments** as to avoid lock-in effects, sunken costs, and negative impacts. Another major investment opportunity is **financing for adaptation**, i.e., helping clients develop resilient business models and infrastructure considering climate hazards, especially in the agricultural sector, but also along global supply chains.

3.3 Intermediate conclusion

This chapter aimed to lay the foundation for the net-impact perspective using an SDG framework. To this end, we conducted a SDG literature review and an analysis of the positive and negative impacts of selected investment sectors in the first part of the chapter (3.1). In doing so, we showed that a variety of complex interrelationships between SDGs and within individual investment sectors exist. In the second part of the chapter (3.2), we connected findings and examples from SDGs and investment sector analyses to DFI activity. Here, we went into more detail about the role of DFIs in achieving SDGs and explored influencing factors of SDG interactions, as well as their implications for investment sectors and thus DFI operations. In addition to contextual factors, we examined two of the most relevant fixed linkages and clusters for DFIs - the water-energy-food nexus and the nexus between energy, material consumption, and economic growth.

Based on these steps, we have arrived at the following **four key takeaways**:

(1) **Complexity is key**: Impacts are interrelated, realised on different scales and time-horizons and are highly context dependent. Technology can play an important role for mitigating negative impacts and trade-offs.
(2) **Firm level observations fall short** to grasp important impacts and impact interactions, as these are often realised at wider levels, or only by aggregate. This emphasises that the sectoral impact level of a firm is important for a holistic net-impact assessment.
(3) **Delivering on sustainability is a challenge**: Almost all economic activity today features certain inherent trade-offs that often exacerbate long-term negative consequences, especially in the relationship between economy and environment. Becoming aware and transparent about these trade-offs is central in finding the most appropriate private sector solutions to address global challenges.
(4) **Implications for DFIs are wide ranging**: DFIs are challenged at all levels of the investment cycle if they wish to incorporate a net-impact perspective. Questions of selection and exclusion, due-diligence, portfolio management, and long-term considerations are influenced by the application of a net-impact lens.

4 Implications for integrating a net-impact perspective

How can DFIs incorporate a net-impact perspective in their operations and rating systems?

Based on the implications of the analysis above, workshops with OeEB and DEG, and interviews we have conducted with several DFIs and other experts, this chapter establishes key considerations for integrating a net-impact approach.

We derive our implications on two levels. If DFIs wish to incorporate a net-impact approach, their overall **impact management** is affected, meaning the overall approach towards impact in the investment process and systems in the DFI - from acquisition to exit. This also includes related topics such as thematic expertise of staff, overall management priorities and strategies, and of course considerations on financial returns. We discuss implications on these topics in chapter 4.1.

A key pre-requisite for incorporating net-impacts is the concrete **impact measurement** approach, meaning those rating systems, data requirements, and tools that are used to measure and rate impacts for individual investments. The opportunities and challenges for a net-impact measurement are discussed in chapter 4.2, in which we also introduce key considerations for the configuration of such a net-impact rating system.

4.1 Implications for Impact Management in the Investment Lifecycle and beyond

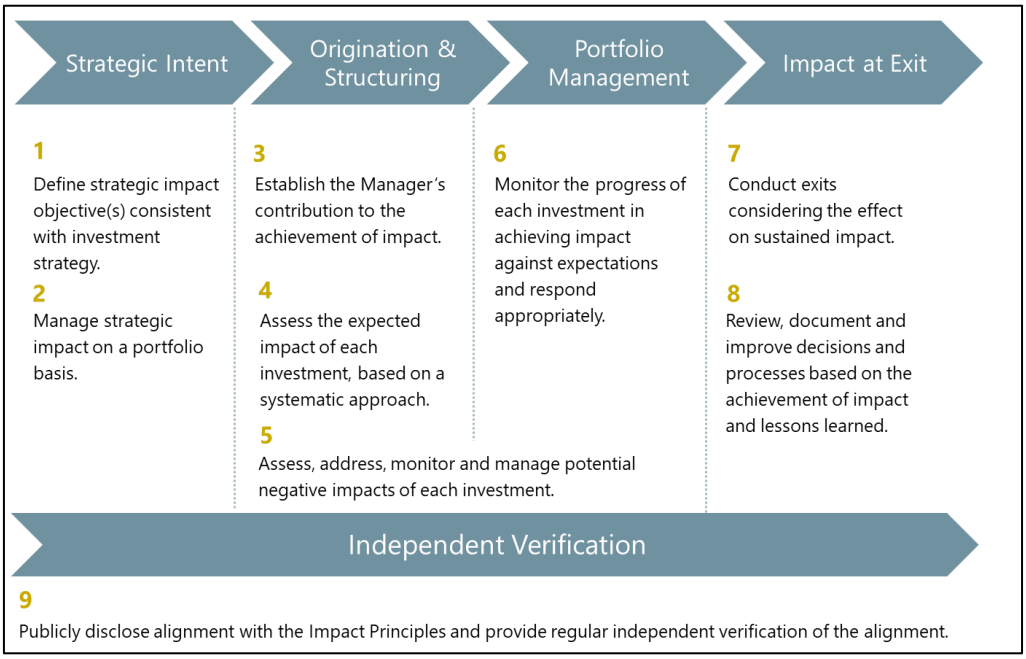
Incorporating a net-impact approach means that impact management needs to reflect the integration of both positive and negative impacts throughout the investment cycle, including measures to ensure as high of a net-positive impact as possible. The Operating Principles for Impact Management are a useful guide to assess which measures for a positive net-impact DFIs are already incorporating. Most DFIs are among the signatories for the Operating Principles for Impact Management (OPIM, 2019), with OeEB and DEG being amongst the first.

The principles provide a framework for investors to ensure that impact considerations are integrated throughout the investment lifecycle. It prescribes nine principles that should guide the signatories' approach towards impact. Next to defining strategic objectives (Principle 1) and managing impact strategically on the portfolio level (Principle 2), the principles call for the assessment of impacts based on a systematic approach (Principle 4) as well as to "assess, address, monitor and manage potential negative impacts of each investment" (Principle 5), which mostly relates to ESG risks that need to be identified and then avoided or mitigated.

The role of the investor for achieving impacts is a key part of the principles –a credible narrative of the contribution of the investment towards impact should be created (Principle 3), the progress of which is then monitored continuously and – if necessary – leads to appropriate measures to ensure impact (Principle 6) and a sustainable exit (principle 7). In the spirit of continuous improvement, principle 8, considers continuously incorporating learnings from the investments and their impacts into operational and strategic decisions.

Finally, principle 9 prescribes the public disclosure of the impact management process and independent verification. Figure 4 shows the logic of the impact principles below.

Figure 4: The Operating Principles for Impact Management (OPIM, 2019) .



Having a closer look at the investment process reveals that DFIs already have several measures in place that could be described as an incorporation of net-impact. These are introduced in the following:

- **Investing for positive impact** is usually part of the **mission statement** and strategic objectives (principle 1) and thus deeply embedded in DFIs' strategies. By their mandate, DFIs have an inherent focus on using their resources to achieve outcomes that are also relevant for society. The British DFI *CDC's* mission, for example, is to support the growth of businesses and job creation across Africa and South Asia. French *Proparco's* mandate is to foster private investment in emerging and developing economies with the aim of supporting growth and sustainability. The Dutch *FMO's* mission is to empower entrepreneurs to build a better world, *DEG's* mission is to promote private-sector enterprises operating in developing and emerging-market countries, in order to generating local added value and qualified jobs, and the *OeEB* is mandated by the federal government to support commercially self-sustaining projects in the private sector of developing countries and is obligated in this regard to support the overall mission of Austrian Development Cooperation (EDFI, 2021).
- **Exclusion Lists**: DFIs have established exclusion lists which minimise negative impacts. Exclusion lists prevent DFIs to venture into investment projects that are illegal or deemed unethical, harmful or hazardous for positive development impact, such as the arms industry, tobacco, gambling, and alcohol. This is in line with principle five and serves to **outright avoid negative impacts**.
- **Due Diligence**: DFIs seek to uncover hidden risks with a sound due diligence (DD) process (Principle 5). These hidden risks can be related to business, society or environmental issues that might arise from the activities of the firms they invest in. ESG experts particularly help DFIs in preventing the emergence of adverse impacts at firm level by vetting possible investees on their governmental, social, and environmental aspects. DD is also a core aspect to identify improvement potentials, especially for already-established companies in which the DFI invests in.
- **Action Plans**: For most investment projects, DFI and investee contractually agree on action plans, in which certain firm level improvement parameters are defined. If certain minimum standards are not fulfilled, the

DFI can obligate the investee to fulfil certain conditions before the disbursement is started. These action plans might relate to the implementation of international work standards, greenhouse gas mitigating measures, wastewater and waste treatment measures, or companywide management policies. With these action plans DFIs thus aim to mitigate negative aspects while improving investees' impact on their respective environments throughout the investment phase (Principle 5/6).

- **Technical Advisory:** At the same time, technical advisory services are often offered to investees by DFIs. Technical advisory and support services might consider the implementation of the action plans or other managerial improvements a firm wishes to implement or is required to perform. Like action plans, technical advisory services aim to improve the impact of investees or curb negative effects (Principle 5/6).
- **Impact Studies and Evaluations**: Those are conducted or commissioned by DFIs to better comprehend the institutions' investment effects and outcomes. These impact studies and evaluations are generally of an ex-post nature and provide detailed information on the positive and negative outcomes and impacts of certain investment projects subject to the studies. In general, impact studies and evaluations provide DFIs accountability and organisational development and learning (Principle 8).

As these examples show, DFIs impact management already displays several features to ensure a high net-positive impact of their investments – ranging from general measures like exclusion lists to mitigating ESG risks and improving impact performance of individual investees over time.

At the same time, current impact management systems **fall short of a comprehensive incorporation of net-impacts** and the ability to assess them. While negative impacts are often explicitly addressed, they are only implicitly included in overall impact management. The following points illustrate some of the gaps and challenges that remain.

- **ESG risk vs. impact** – as prescribed in principle 5, the management of negative impacts is considered mostly under an ESG risk lens, potentially leaving wider impact considerations out of scope. This especially relates to impacts that realise on a wider and more indirect level. The focus on investee-level performance and management system makes sense, but often lacks perspective into the wider societal or global context. Many of the current global crises are not significantly driven by individual investments, but by their aggregate total. In the case of climate change, individual attribution to the global level is increasingly incorporated in ESG considerations, because greenhouse gas emissions provide a simple link from firm to impact. This becomes much harder for confounding issues such as biodiversity loss, which is driven by a myriad of factors, not to mention possible negative societal effects of investments (e.g., contributing to increased inequality). In short: A near-exclusive focus on the ESG risk at firm level risks omitting the wider context of an investment and leaves potential negative impacts unconsidered. A good ESG performance (appropriate management systems and standards are in place) can also be seen as a pre-requisite for achieving wider impacts.
- **Impact-positivism** is another potential issue – as impact investors, DFIs naturally focus on those impact categories that are most positively affected by their investments, which is also illustrated by the DFI examples above ("growth of businesses and job creation", "foster private investment for growth and sustainability", "empower entrepreneurs to build a better world"). Likewise, the corresponding SDG contributions in the focus areas are especially targeted. There is a risk of leaving out of scope and attention the negative impacts associated with the investments. Positive impacts are measured and rated in the impact rating systems (see following sub-chapter 4.2), whereas negative impacts are often only included in ESG considerations, thereby creating an imbalance when it comes to impact measurement. This aspect becomes even more relevant when the ESG and impact teams are separate entities in the organisation. An overall net-impact assessment is then not possible because only the positive impacts are measured in the impact measurement. Another risk here is that impact-positivism could lead to staff bias when making investment decisions, leaving discussions on wider impact trade-offs aside.

- **Data, Reporting and Disclosure Gaps**: Closely related to the previous point, there are also data, reporting and disclosure gaps on three levels: the amount and depth of **data** that DFIs can obtain from their clients is limited. For wider impacts beyond the firm level, clients are unlikely to gather data. This creates a data gap on the DFI level. DFIs obtain data in different phases of the investment, most notably during DD and then in the form of annual reporting. This client data is transformed for internal **reporting**, with positive impact data mostly used for impact measurement. However, negative data is missing for the impact measurement, because negative data points are not measured on the impact level, and because the existing negative data is used mostly in the context of DD and ESG risk mitigation, as explained in the previous point. When it comes to public **disclosure**, the bank-client privilege means that banks might not to be able to disclose negative individual client data. Published impact studies focussing on individual clients and cases are thus (with notable exceptions) often structured in a more promotional way because the relationship between bank and client differs significantly from conventional bilateral development interventions and programming. However, in their aggregated impact reporting on portfolio level, most DFIs do not report on negative aspects either, such as their attributed GHG-emissions or measured negative contributions to SDGs. In the long term, only selectively measuring and disclosing positive impacts without contrasting them to the associated negative ones can be considered a practice of greenwashing and risks subjecting DFIs to outside criticism.

Adapting a full net-impact perspective would allow DFIs to take more informed decisions on maximising their actual impacts of their investments, providing more credibility in reporting and disclosure, and avoiding long-term risks for their businesses and their social license to operate. At the same time, the previous chapters have also shown the financial opportunities of investing into achieving the SDGs, be it through investment in high-impact firms or innovative products, or by supporting the economic transformation.

There are a wide range of opportunities and options to strengthen net-impact in impact management in the investment cycle and beyond. We argue that the following points are important to anchor a net-impact perspective in the organisation.

(1) **Management buy-in:** DFIs invest for impact. For a sustainable implementation of a net perspective, top management needs to commit to make the according changes, including the assignment of resources.
(2) **Strategic bank steering:** Taking an overall net perspective should lead to a re-assessment of current business priorities when it comes to certain sectors and business opportunities. How can scarce resources (capital and time) be best employed to maximise net-impact while realising financial returns?
(3) **Impact Due-Diligence:** Due-Diligence can be expanded to assess wider impacts as well and feed into impact assessments for the investment decision.
(4) **Trade-Off transparency:** Making trade-offs transparent and discussing them allows conscious and honest decisions about which benefits are deemed by the DFI to outweigh which negative impacts.
(5) **Build expertise:** Knowledge on common trade-offs in key portfolio sectors should be built up to reduce the resources required to investigate those cases and provide a better service for clients. For other more marginal sectors, outside expertise could be commissioned. Expertise is also required in market departments, not least to secure a high impact potential already in the acquisition process.
(6) **Business, ESG & impact-integration:** Impacts can be realised at various levels, and clients can be approached more holistically by seeing business, ESG and impact as interwoven issues. This also means that impact is not merely a topic for the impact-units in DFIs, but a crosscutting theme especially for investment managers.

However, a key aspect of incorporating "net-impact" is how it is reflected in the corresponding impact measurement and rating systems, which is discussed in the following chapter.

4.2 Implications for Impact Measurement

As we have shown in chapter 3, the complexity at which positive and negative impacts unfold is immense. Impact measurement systems are an instrument to simplify reality as best as possible to create an accurate reflection of the real impacts. This highlights the importance of incorporating net-impact into wider impact management systems at the bank. Any measuring tool needs to be embedded into corresponding organisational processes, strategies, and priorities to be successful.

Several challenges highlight the complexity of the task:

Trade-offs that are inherent to certain sectors make it enormously challenging to be judged. A guiding question for trade-offs is often "**How much negative X is positive Y worth?"**. However, impacts of different kinds are only rudimentarily comparable. Consider the following dilemma: if a certain sector contributes strongly to job creation and thus to the economic growth of a region but also significantly drives biodiversity loss, how should this trade-off be weighed and quantified? There is no universal answer to these questions, so they require careful deliberation and transparency about trade-off decisions.

Moreover, the **availability or lack of data** needed to adequately judge possible trade-offs can cause challenges. Firm level data usually provides quite clear information about certain variables and parameters. Yet, higher level impact data is hard to get by or not available at all. Therefore, when trying to judge certain higher impact level parameters, DFIs can only rely on approximations. Moreover, higher impact level data is usually subject to complex chains of causality as well as diffusion of attribution - it is often not clear what is responsible for observed alterations in data. Even the impact measurement systems in place today are not able to accurately reflect only the positive impacts. Because the firm is the level at which DFIs can measure and improve performance and enforce compliance with international standards, DFIs naturally focus on firm-level issues, such as job decency, waste treatment, firm governance aspects and the like. Impact information on the local or the global/societal level mostly remains unassessed. To reflect indirect societal impacts of their investments, DFIs often work with simplified approximations such as country and sector scores that define high-impact sectors.

The outlined challenges in measuring higher level impact parameters also cause them to be **costly in terms of needed resources**. While secondary impact data might be available for certain areas and parameters, some of these might require primary data gathering or additional adjustment work (e.g., analysing impacts based on household survey data or analysis of satellite imagery to gather information on natural habitats or forests health). Similarly, there are also limitations to the firm-level data that can be measured and obtained. DFIs that seek to include more in-depth parameters in their monitoring or results measurement system will have to make decisions regarding the resources they are willing to invest to appropriately gather or approximate the needed impact data.

Finally, **investments through financial intermediaries**, such as financial service providers, banks, or funds, are adding a further layer of complexity. A central financial vehicle of DFIs is the investment in financial intermediaries, which in turn provide financial resources to SMEs or certain types of corporations and firms. The ability of DFIs to gather firm level data becomes more challenging in these contexts and depends strongly on the willingness and resources of the financial intermediary to gather and/or supply the requested firm-level data. In addition, these financial service providers, banks, and funds will have their individual impact footprints, which might further alter DFIs' ability to measure theirs.

Coming from these challenges, the following sub-chapter describes fundamental configurations of net-impact measurement systems and key considerations for their development.

4.2.1 Fundamental configurations of Net-Impact Measurement Systems

To introduce a net-impact perspective in DFIs' impact measurement and rating systems, several elements and options can be considered. Generally, the design and configuration of a net-impact perspective heavily depends on available resources and commitments from DFIs. The following points illustrate this further:

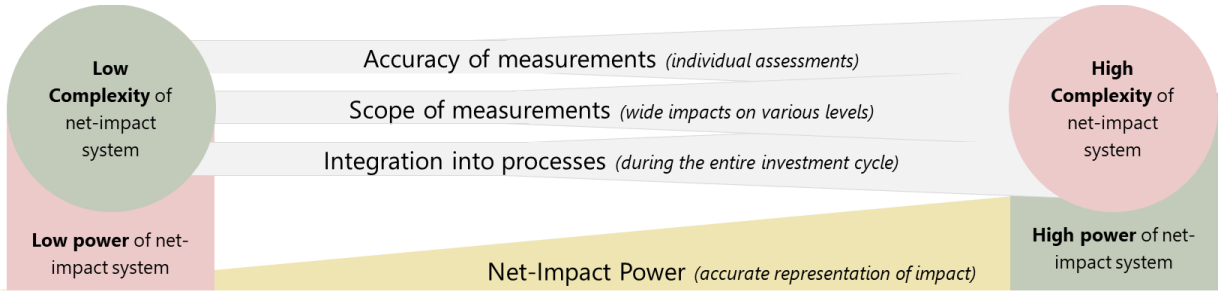
- First, the **more accurate** the measurement, the **more complex** the system becomes. A more exact measurement refers in this regard to an individual client-level perspective instead of a blanket sector level judgment of impacts.

- Second, the **more in-depth** the analysis of impacts, the **more complex** the system and the less standardised any impact measurement and rating system will be. A wide scope in this assessment would fully incorporate not only the firm-level, but also wider regional national and indirect impacts.

- Third, the **more integrated** into the investment lifecycle the measurement system is, the **more complex** the system will become. Data points would not only need to be gathered at one point and one level of depth, but throughout the investment lifecycle all the way to the exit.

At the same time this means that the **more complex** the impact measurement and rating system is, **the better it will be able to reflect the actual net-impact** of DFIs' investment activities, as the following figure illustrates:

Figure 5: Demand profile for a DFIs' new net-impact rating system.



Consequently, the challenge is to find the fitting elements in the three categories to incorporate net-impact within the available resources to get as close an approximation as possible to the actual net-impact.

4.2.2 Key considerations for building net-impact rating systems

Regarding the rating systems themselves, there are various elements to consider. Each of them heavily depends on **available resources and priorities**. They must also reflect the **diversity of the implementing DFIs** concerning size and portfolio priorities (sectors, regions, desired impacts): Some DFIs have large teams that conduct detailed impact assessments for each individual investment, whereas others have between two and ten people responsible for impact measurement. DFIs with a **regional or sector focus** can spend more resources for in-depth analyses of impact pathways in their region or sector and reflect this in their rating systems, whereas others have a broader approach and global operations, needing to combine more diverse sectors and regions in one rating system.

In the following, we present key considerations for building net-impact rating systems. We start from the assumption that an existing impact measurement system is in place and should be adapted to reflect negative impacts as well.

Consideration 1: Deductions

A fundamental aspect of a net-impact calculation is that the negative is deducted from the positive to generate a "net-impact" understanding. One core element of net-impact ratings is thus the element of deduction, which introduces penalties for negative impacts. Deductions can be integrated in various forms. The following examples can be applied individually or combined.

- **Ex-ante deduction or bonus by sector:** A simple approach introducing deductions (and bonuses if desired) adds a certain penalty or reward determined by the sector of investment. This approach creates a steering effect on portfolio and selection level and can create an effect where DFI resources are channelled into more high-impact sectors, whereas business in those with more significant trade-offs are penalised. This model does not incorporate firm-level aspects.
- **Deduction based on ESG compliance and performance:** At the beginning of the investment, the client's ESG performance and compliance with international standards (e.g., ILO core labour standards) is assessed overall and a penalty in the rating is instituted if the client is still non-compliant. The implementation of action plans and the provision of technical advisory services leading to improvements in this regard mean that the deduction is reduced. This creates incentives to work with the client to improve certain metrics. The contribution of the bank's advisory services and required action plans can be measured by the improvement. However, this model lacks a consideration for wider impacts beyond firm-level issues. It allows to track performance throughout the investment.
- **Deduction based on defined project impacts:** During an extended impact-due-diligence, the client's positive and negative impacts can be assessed. These go beyond the firm level (e.g., effects on supply chain). This approach requires a close monitoring and can also be mitigated (with a link to action plans or technical advisory), which allows the DFI to track their contribution to improve impacts. It requires a more detailed approach, more data, and allows to track performance throughout the investment.
- **Monetarisation/Cost-Benefit Analysis:** Several DFIs also rely on comprehensive economic analyses for their impact assessments, in the scope of which they aim to quantify both negative and positive economic, social, and environmental effects as detailed as possible. With detailed operationalisations in place, this allows to monetarise the (expected) positive and negative effects and conduct a net-impact calculation. These ex-ante systems are often also accompanied by a qualitative assessment of the individual case that is presented to the investment committee deciding on the investment. This approach is the most direct implementation of trade-off questions such as "how much X is worth Y", at the cost of high complexity and context-specificity.

Consideration 2: The localisation of negative indicators

Indicators form the backbone of any net-impact rating system, because only they allow standardised ratings and comparability across clients, sectors, and regions. Indicators need to be carefully selected and defined to truly yield what they are intended to measure. When building a net-impact system, the localisation of the negative indicators in relation to the positive ones becomes relevant.

- **Negative indicators within pre-existing impact categories**: Most rating systems focus on certain impact categories, such as jobs, inclusion, environmental benefits, growth, etc. Within those categories,

existing or additional indicators can be utilised to reflect negative impacts as well. Some indicators can be utilised for both positive and negatives: a low or negative value for the indicator would correspond to a deduction in the rating, whereas a higher value would mean a better rating. Next to this, there can be indicators dedicated solely to grasp negative issues, with the value determining the severity of deduction. This approach anchors negative impacts at the heart of rating systems but is constrained to the pre-defined categories. There is also a risk of negative impacts becoming "invisible" when only looking at aggregate scores.

- **Negative indicators outside pre-existing impact categories:** Like the previous example, indicators are included directly in the rating system, however they are implemented across or beyond the existing categories, or within entirely new "negative-only" categories. This allows for a wider consideration and better visibility of negative impacts. Associated positive and negative impacts can be displayed easily. This approach allows to focus not only on the firm level, but also gives room for wider indicators.

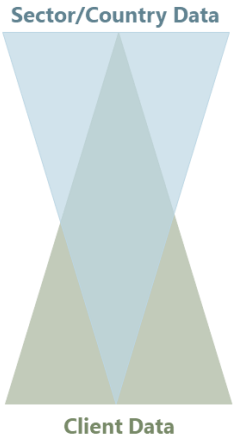
Consideration 3: Assessment type – blanket vs. individual

The fundamental challenge of data availability and the complexity of measuring individual data points on investee level poses a significant problem for impact investors who want to assess impacts in detail.

A key consideration in establishing net-impact rating systems is the source of data. On the one hand, sources can be individual client data, which allows a nuanced firm-level perspective. However, it can become reporting-intensive for the client and misses out on wider level impacts beyond the firm. Contrary to firm-level observations, blanket country/sector assessments allow to look at wider impacts without requiring detailed data from the client, which comes at the expense of nuance for a specific firm-level context.

Finally, a mix of both approaches can be applied, in which limited data points from either level are used to model data on various impact metrics.

Figure 6: Data Sources



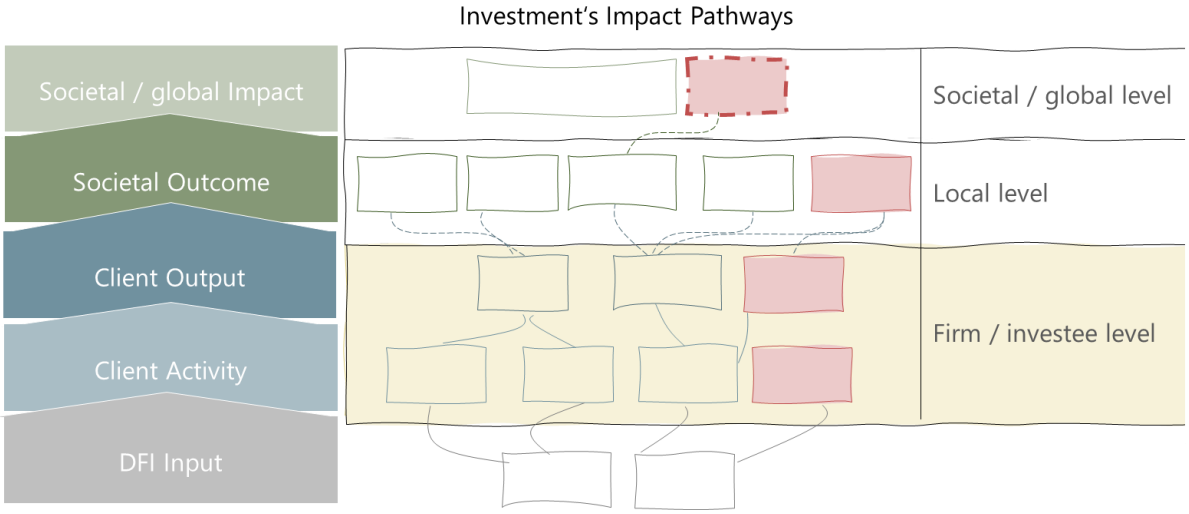
- **Individual assessment:** Defining indicators that are provided for each individual client allows for a very in-depth look at impacts but comes at the price of increased reporting requirements for the client and higher monitoring efforts for the DFI. Individual assessments with client data correspond well with tracking ESG compliance, but risk leaving out wider impacts.
- **Blanket assessment:** Defining a larger number of blanket assessments reduces data complexity significantly and means a less severe data demand on the client-level. Blanket assessments need careful preparation, as they will inevitably lead to inaccuracies. They can include internationally available indicators, e.g., from the World Bank, or be derived from own experiences within DFIs. The most common model is to approach "addressing development gaps" with blanket assessments based on sector and country. Blanket assessments work well with deductions and bonuses for sector-level effects (see element 1). However, they risk neglecting nuance and context on the firm-level.
- **Modelled data** requires complex operationalisations and logic chains but allows to derive assessments on higher-level impacts such as GHG emissions or indirectly created jobs by measuring limited data points on, for example, the firm level or by including a sector benchmark. Like the blanket assessment, this is an inaccurate method that is highly dependent on a sound methodology. Because the

development and maintenance are complex, DFIs rely on third-party models. An example of such model is the "Joint Impact Model".

Consideration 4: Scope-sensitivity

To contextualise individual investees with wider impacts and regional conditions, impact rating systems can measure effects on various levels, or scopes. Indicators and data are most often measured at the firm-level, whereas the local and global level are generally approached via proxies (e.g., via blanket assessments or models as mentioned above). For an impact assessment to have high scope-sensitivity, it requires data on all three levels, allowing for a fuller view of the context in which a firm operates and the wider impact it creates, as shown in figure 7.

Figure 7: Levels of scope-sensitive net-impact rating systems.



- **Firm/Investee level:** The firm-level relates to clients' activities and outputs. This is the sphere in which clients provide various data to DFIs, e.g., during due diligence, for the annual environmental and social monitoring assessments, and to track compliance with standards. Many of these are impact-relevant, such as job decency. Often, firm-level data also serves as proxy to measure wider impacts. For example, when compliance with environmental standards is rated as a positive for the local level.
- **Local level:** The local level relates to effects on surrounding communities and value chains. It also relates to the firm's social license to operate. Local level effects are already harder to measure, especially when it comes to more indirect effects in the social realm.
- **Wider societal and global level:** This sphere is about the wider societal and global impacts and thereby the overall SDG contributions (and trade-offs) of the investment. Because of the more aggregated and interwoven impact pathways, it is much harder measure and attribute those effects. They are often approximated by blanket assessments (see previous element) and can sometimes be derived from the firm as well, e.g., GHG emissions can be directly tied to climate impacts.

We have now presented four key considerations for building net-impact rating systems. One remaining question is

how to decide which deduction to pick, how to place indicators, and which type of assessment and scopes should be included. A key aspect here is to be aware that some elements naturally combine. For example, sector-inherent deductions work well with blanket-assessment indicators on the wider societal level.

For the development of net-impact systems and choosing different elements, DFIs need to carefully weigh their requirements, systems, capacities, and impact priorities. Any approach will remain an **approximation and a compromise between data availability, resource intensity, and the explanatory power of the impact rating tool**.

The following chapter now provides our overall conclusions and recommendations of this study.

5 Conclusions & Recommendations

In this study, we have approached the topic of net-impact by exploring impact trade-offs within and between SDGs. We then used the UN's SDGs to assess negative and positive impact pathways in different investment sectors and examined which role DFIs can play in achieving development impact in the context of the SDGs. From this analysis, we have derived implications for wider impact management in DFIs as well as for their impact measurement and impact rating systems.

Building upon these results, we have come to the following **five key conclusions and corresponding recommendations** for DFIs on approaching the development impact of investments from a net perspective.

(1) Net-impact is here to stay.

Our interviews and research have shown that many organisations are starting to go into a net-impact direction, thereby scoping possibilities and adapting their rating systems. They are responding to trends of increased public scrutiny and the mainstreaming of the impact investment market. In the medium and long-term, incorporating forms of **net perspectives to impact will likely be inevitable for DFIs**. Not measuring and disclosing wider negative impacts will likely be considered a greenwashing practice – a recently published framework to assess greenwashing practices states as the first assessment criteria: "Hidden trade-offs/selective disclosure", which includes aspects of disclosing negative information and the cumulative impact of activities (Nemes, Stabinsky, Scanlan, et al., 2021). These examples show that it is less a question of "if", but rather of "how" to integrate net-impact. We thus recommend that **DFIs should quickly initiate processes to critically evaluate current practices, and further explore, experiment with, and implement net-impact perspectives into the investment lifecycle**.

(2) Net-impact has clear benefits for DFIs.

Internally, a net-impact perspective sharpens the awareness for good business for impact. It provides a great opportunity to **engage with clients** on various issues – selling additional services and improving return on investment as well as impact. A net-impact perspective **visibly incorporates long-term trends and highlights unsustainable investment practices**. Hereby, it helps to steer clear of long-term risks and contributes to setting clear long-term investment priorities. It creates incentives to find clients working in emerging sectors and technologies to provide solutions to global challenges. Externally, becoming transparent about trade-offs **significantly increases credibility** and allows stakeholders to see both sides, which will also have an effect inward

to work on minimising negative impacts. Disclosing negative effects on the portfolio level can be complemented positively by **demonstrating concrete improvements resulting from investments**, as well as positive impacts. We found that our hypotheses of **utilising an SDG lens** for net-impact provides a helpful framework to address positive and negative impacts and their trade-offs.

(3) Net-impact requires an organisational approach.

Approaching development from a net impact perspective requires organisational changes, not merely changes to impact measurement. The commitment of top-management is key to achieve the required changes. Management can start by asking the question of how scarce resources (capital and time) can be best employed to maximise net-impact while also realising financial returns.

We recommend considering investments, ESG, and impact as integrated aspects when engaging clients and steering the portfolio. This means net-impact has consequences across the entire investment lifecycle and beyond the ESG and impact teams. Impacts can be realised at various levels, and clients can be approached more holistically by seeing **business, ESG, and impact as interwoven issues**. This also means that impact is not merely a topic for the impact-units in DFIs, but a crosscutting theme especially for investment managers.

Any approach to net-impact requires **careful consideration of practicability, ease of understanding and complexity of the systems in relation to the desired depth of net-impact assessments**. They will likely affect the core of the business, hence it's central to include market departments and the organisation into development. This should be flanked by raising awareness and building expertise for net-impact.

(4) Continuous impact learning and staff expertise are essential.

There is the **risk of knowledge gaps** concerning net-impacts. It relates to both the development of ratings, as well as ongoing operations and engagement with clients. Knowledge on **common trade-offs in key portfolio sectors** should be build up to reduce the resources required to investigate those cases and provide a better service for clients. For other more marginal sectors, outside expertise could be commissioned. Expertise is especially required in market departments to secure a high impact potential already in the acquisition process.

The high complexity and heterogeneity of impact-related topics is also a challenge for the experts in the ESG and impact teams who must determine trade-offs, their likelihood, and mitigation options. Continuous **learning should therefore be an essential building block of any net-impact system**. One way to address this challenge could be to start out with sectors where the organisation has a lot of expertise and then building up knowledge over time. Key impact areas and sectors according to the business model should be prioritised internally, whereas for others, outside expertise can be commissioned. Dedicated **impact or sector studies** can help to inform or reform rating systems, standards, and processes during the development and implementation of a net-impact approach.

Building a net-impact rating system should also be done with flexibility in mind: There will be changes to the system over time, emerging from new trends and learning processes. The system must be adaptable to reflect them.

(5) Transparency is key to address trade-offs and complexity.

When it comes to measuring impacts, it is central to remember the multi-dimensional and non-linear complexity of development impacts. We recommend a careful consideration of finding a right balance between defined sector-inherent and context-specific effects. **A net-impact system will always be a reduced image of reality**.

Difficult trade-off decisions must be discussed and made transparent. Legitimate effects exist on both sides and need to be weighed against each other, also considering the time-horizon and severity with which they unfold. A net-impact system can create transparency for consequences of decisions, but it cannot take decisions by itself. The range of negative impacts that are acceptable for desired positive impacts need to be defined before a rating system incorporates them. When acceptable negative impacts are defined, investments outside of this range must consequentially be excluded. Doing so might also cause a shift in the internal mindset, where often a firm belief of "doing good" with little attention to negative pathways is anchored. **Teams might not be prepared to weigh decisions on tough trade-offs** across various categories. This highlights the importance of **clear guidance, transparent data definitions, and standards**.

Aside from internal transparency regarding trade-offs and negative impacts, it is equally important to be transparent externally – while impact management processes are already made transparent in line with the Operating Principles for Impact Management, guidelines for trade-off decisions could be made available to stakeholders and negative impacts should be disclosed publicly at least on a portfolio level.

6 Bibliography

Altieri, M. A., Nicholls, C. I., Henao, A., & Lana, M. A. (2015). Agroecology and the design of climate change-resilient farming systems. *Agronomy for Sustainable Development*, *35*(3), 869–890. https://doi.org/10.1007/s13593-015-0285-2

Attridge, S., Calleja, R., Gouett, M., & Lemma, Al. (2019). *The impact of development finance institutions: Rapid evidence assessment*. Department for International Development. https://odi.org/en/publications/the-impact-of-development-finance-institutions-rapid-evidence-assessment/

Attridge, S., & Gouett, M. (2019a). The impact of development finance institutions: What we know, what we don't know and how to improve. In *Impact of development finance institutions on sustainable development* (S. 70–73).

Attridge, S., & Gouett, M. (2019b). Understanding the impact of development finance institutions in catalysing private investment to tackle climate change and increase access to energy. In *Impact of development finance institutions on sustainable development* (S. 39–41). European Development Finance Institutions (EDFI). https://odi.org/en/publications/impact-of-development-finance-institutions-on-sustainable-development/

Attridge, S., te Velde, D. W., & Andreasen, S. P. (2019). Introduction and overview. In *Impact of development finance institutions on sustainable development* (S. 12–20). European Development Finance Institutions (EDFI). https://odi.org/en/publications/impact-of-development-finance-institutions-on-sustainable-development/

Beloin-Saint-Pierre, D., Blanc, I., Payet, J., Jacquin, P., Adra, N., & Mayer, D. (2009). Environmental Impact of PV Systems: Effects of Energy Sources Used in Production of Solar Panels. In *EU PVSEC Proceedings*. https://doi.org/10.4229/24thEUPVSEC2009

Bizikova, L., Roy, D., Venema, H. D., Khachtryan, A., Borden, C., & Zubrycki, K. (2014). *Water-Energy-Food Nexus and Agricultural Investment: A sustainable development guidebook*. 52.

Boas, I., Biermann, F., & Kanie, N. (2016). Cross-sectoral strategies in global sustainability governance: Towards a nexus approach. *International Environmental Agreements: Politics, Law and Economics*, *16*(3), 449–464. https://doi.org/10.1007/s10784-016-9321-1

bpb. (2021, November 17). *COP 26: UN-Klimakonferenz in Glasgow*. Politik: Hintergrund Aktuell. https://www.bpb.de/politik/hintergrund-aktuell/342741/cop-26-un-klimakonferenz-in-glasgow

Caldés, N., & Rodriguez-Serrano, I. (2018). *Potential contribution of concentrated solar power in meeting the sustainable development goals*. 120001. https://doi.org/10.1063/1.5067130

Campos, J. L., Valenzuela-Heredia, D., Pedrouso, A., Val del Río, A., Belmonte, M., & Mosquera-Corral, A. (2016). Greenhouse Gases Emissions from Wastewater Treatment Plants: Minimization, Treatment, and Prevention. *Journal of Chemistry*, *2016*, 1–12. https://doi.org/10.1155/2016/3796352

Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Seyboth, K., Matschoss, P., Kadner, S., Zwickel, T., Eickemeier, P., Hansen, G., & Schlömer, S. (2011). IPCC special report on renewable energy sources and climate change mitigation. *Prepared By Working Group III of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK*.

EDFI. (2021). *EDFI | European Development Finance Institutions*. EDFI. https://www.edfi.eu/

Eisenmenger, N., Pichler, M., Krenmayr, N., Noll, D., Plank, B., Schalmann, E., Wandl, M.-T., & Gingrich, S. (2020). The Sustainable Development Goals prioritize economic growth over sustainable resource use: A critical reflection on the SDGs from a socio-ecological perspective. *Sustainability Science*, *15*(4), 1101–1110. https://doi.org/10.1007/s11625-020-00813-x

El Chami, D., Daccache, A., & El Moujabber, M. (2020). What are the impacts of sugarcane production on ecosystem services and human well-being? A review. *Annals of Agricultural Sciences*, *65*(2), 188–199. https://doi.org/10.1016/j.aoas.2020.10.001

Fonseca, L. M., Domingues, J. P., & Dima, A. M. (2020). Mapping the Sustainable Development Goals Relationships. *Sustainability*, *12*(8), 3359. https://doi.org/10.3390/su12083359

Forti, V., Baldé, P. C., Kuehr, R., & Bel, G. (2020). *E-Waste Monitor—2020*. United Nations University - Institute for Advanced Study of Sustainability, ITU, ISWA. http://ewastemonitor.info/

Fuchs, S., Kachi, A., Sidner, L., & Westphal, M. (2021). Aligning Financial Intermediary Investments with the Paris Agreement. *World Resources Institute*. https://doi.org/10.46830/wriwp.20.00037

Gardetti, M. A., & Muthu, S. S. (Hrsg.). (2020). *The UN Sustainable Development Goals for the Textile and Fashion Industry*. Springer Singapore. https://www.springerprofessional.de/the-un-sustainable-development-goals-for-the-textile-and-fashion/16898488

Global Infrastructure Hub. (2020). *Low greenhouse gas emission wastewater treatment*. https://www.gihub.org/resources/showcase-projects/low-greenhouse-gas-emission-wastewater-treatment/

GWP. (2020). *Water-Energy-Food-Ecosystems Nexus*. Global Water Partnership. https://www.gwp.org/en/GWP-Mediterranean/WE-ACT/Programmes-per-theme/Water-Food-Energy-Nexus/

Harvey, M., & Pilgrim, S. (2011). The new competition for land: Food, energy, and climate change. *Food Policy*, *36*, S40–S51. https://doi.org/10.1016/j.foodpol.2010.11.009

Hegre, H., Petrova, K., & von Uexkull, N. (2020). Synergies and Trade-Offs in Reaching the Sustainable Development Goals. *Sustainability*, *12*(20), 8729. https://doi.org/10.3390/su12208729

Hickel, J., & Kallis, G. (2020). Is Green Growth Possible? *New Political Economy*, *25*(4), 469–486. https://doi.org/10.1080/13563467.2019.1598964

Hintz, A. (2014). Outsourcing surveillance-privatising policy: Communications regulation by commercial intermediaries. *Birkbeck L. Rev.*, *2*, 349.

Hmiel, B., Petrenko, V. V., Dyonisius, M. N., Buizert, C., Smith, A. M., Place, P. F., Harth, C., Beaudette, R., Hua, Q., Yang, B., Vimont, I., Michel, S. E., Severinghaus, J. P., Etheridge, D., Bromley, T., Schmitt, J., Faïn, X., Weiss, R. F., & Dlugokencky, E. (2020). Preindustrial 14CH4 indicates greater anthropogenic fossil CH4 emissions. *Nature*, *578*(7795), 409–412. https://doi.org/10.1038/s41586-020-1991-8

Hoff, H. (2011). *Bonn2011 Conference: The Water, Energy and Food Security Nexus—Solutions for the Green Economy* (S. 52) [Background paper for the Bonn2011 Nexus Conference]. Stockholm Environment Institute (SEI). https://mediamanager.sei.org/documents/Publications/SEI-Paper-Hoff-UnderstandingTheNexus-2011.pdf

Hubacek, K., Chen, X., Feng, K., Wiedmann, T., & Shan, Y. (2021). Evidence of decoupling consumption-based CO2 emissions from economic growth. *Advances in Applied Energy*, 100074. https://doi.org/10.1016/j.adapen.2021.100074

Hülsmann, S., & Ardakanian, R. (2018). The Nexus Approach as Tool for Achieving SDGs: Trends and Needs. In S. Hülsmann & R. Ardakanian (Hrsg.), *Managing Water, Soil and Waste Resources to Achieve Sustainable Development Goals: Monitoring and Implementation of Integrated Resources Management* (S. 1–9). Springer International Publishing. https://doi.org/10.1007/978-3-319-75163-4_1

ICSU. (2016). *A Draft Framework for Understanding SDG Interactions (Working Paper)*. International Council for Science. https://council.science/wp-content/uploads/2017/05/SDG-interactions-working-paper.pdf

ICSU. (2017). *A Guide to Interactions: From Science to Implementation* (S. 239). International Council for Science. https://council.science/wp-content/uploads/2017/05/SDGs-Guide-to-Interactions.pdf

IEA. (2021). *World Energy Outlook 2021—Executive Summary* (S. 13). International Energy Agency.

IEA/OECD. (2016). *World Energy Outlook 2016*. International Energy Agency/OECD. https://iea.blob.core.windows.net/assets/e4a7e1a5-b6ed-4f36-911f-b0111e49aab9/WorldEnergyOutlook2016ExcerptWaterEnergyNexus.pdf

ILO. (2019). *Water for improved rural livelihoods: Decent work in the rural economy (policy guidance notes*. International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_729058.pdf

ILO, & IFC. (2019). *Sexual Harassment at Work: Insights from the Global Garment Industry* (S. 18). https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_732095.pdf

IPCC. (2007). *IPCC - Fourth Assessment Report: Climate Change 2007*. https://archive.ipcc.ch/publications_and_data/ar4/wg3/en/ch2s2-1-2.html

IPCC. (2014). *IPCC - Fifth Assessment Report—Climate Change 2014*. https://www.ipcc.ch/report/ar5/syr/

IPCC. (2021). *IPCC - Sixth Assessment Report 2022- WG 1—The Physical Science Basis 2021*. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report_smaller.pdf

Jones, P., & Comfort, D. (2020). Leading European Retailers and the Sustainable Development Goals. *Journal of Sustainability Research*, *3*(1). https://doi.org/10.20900/jsr.20200039

Kasperowicz, R., Bilan, Y., & Štreimikienė, D. (2020). The renewable energy and economic growth nexus in European countries. *Sustainable Development*, *28*(5), 1086–1093. https://doi.org/10.1002/sd.2060

Kraus, S. D., Kenney, R. D., & Thomas, L. (2019). A framework for studying the effects of offshore wind development on marine mammals and turtles. *Report prepared for the Massachusetts Clean Energy Center, Boston, MA*, *2110*.

Kumar, P., Ahmed, F., Singh, R. K., & Sinha, P. (2018). Determination of hierarchical relationships among sustainable development goals using interpretive structural modeling. *Environment, Development and Sustainability*, *20*(5), 2119–2137. https://doi.org/10.1007/s10668-017-9981-1

Lapinskienė, G., Peleckis, K., & Slavinskaitė, N. (2017). Energy consumption, economic growth and greenhouse gas emissions in the European Union countries. *Journal of Business Economics and Management*, *18*(6), 1082–1097. https://doi.org/10.3846/16111699.2017.1393457

Leck, H., Conway, D., Bradshaw, M., & Rees, J. (2015). Tracing the Water–Energy–Food Nexus: Description, Theory and Practice. *Geography Compass*, *9*(8), 445–460. https://doi.org/10.1111/gec3.12222

Liu, J., Hull, V., Godfray, H. C. J., Tilman, D., Gleick, P., Hoff, H., Pahl-Wostl, C., Xu, Z., Chung, M. G., Sun, J., & Li, S. (2018). Nexus approaches to global sustainable development. *Nature Sustainability*, *1*(9), 466–476. https://doi.org/10.1038/s41893-018-0135-8

Lonca, G., Bernard, S., & Margni, M. (2019). A versatile approach to assess circularity: The case of decoupling. *Journal of Cleaner Production*, *240*, 118174. https://doi.org/10.1016/j.jclepro.2019.118174

Lusseau, D., & Mancini, F. (2019). Income-based variation in Sustainable Development Goal interaction networks. *Nature Sustainability*, *2*(3), 242–247. https://doi.org/10.1038/s41893-019-0231-4

Lutter, Giljum, Gözet. (2018). *Decoupling material use and economic performance* (Material Flows - The Material Flows Analysis Portal). Vienna University of Economics and Business (WU Vienna) – Institute for Ecological Economics. http://www.materialflows.net/decoupling-material-use-and-economic-performance/

Magendane, K., & Kapazoglou, M. (2021). *Approaches to study SDG interactions: Literature review of relevant frameworks* (S. 15). Dutch Ministry of Foreign Affairs. https://www.nwo.nl/sites/nwo/files/media-files/Approaches%20to%20study%20SDG%20interactions_Literature%20review%20of%20relevant%20frameworks.pdf

Mainali, B., Luukkanen, J., Silveira, S., & Kaivo-oja, J. (2018). Evaluating Synergies and Trade-Offs among Sustainable Development Goals (SDGs): Explorative Analyses of Development Paths in South Asia and Sub-Saharan Africa. *Sustainability*, *10*(3), 815. https://doi.org/10.3390/su10030815

Mekonnen, M. M., & Hoekstra, A. Y. (2011). The green, blue and grey water footprint of crops and derived crop products. *Hydrology and Earth System Sciences*, *15*(5), 1577–1600. https://doi.org/10.5194/hess-15-1577-2011

Michael, K., Kobran, S., Abbas, R., & Hamdoun, S. (2019). *Privacy, Data Rights and Cybersecurity—Technology for Good in the Achievement of Sustainable Development Goals*. 2019 IEEE International Symposium on Technology and Society (ISTAS) 15-16 November 2019, Medford, Boston, MA, USA. https://ieeexplore.ieee.org/servlet/opac?punumber=8930368

Muthu, S. S. (Hrsg.). (2019). *Circular Economy in Textiles and Apparel—1st Edition* (1st Aufl.). Woodprint Publishing. https://www.elsevier.com/books/circular-economy-in-textiles-and-apparel/muthu/978-0-08-102630-4

Nemes, Stabinsky, Scanlan, et al. (2021). *An Integrated Framework to Assess Greenwashing* (2021:1; CSSN Working Paper:). Climate Social Science Network. https://www.cssn.org/cssn-working-paper-an-integrated-framework-to-assess-greenwashing/

Net Zero by 2050 – Analysis. (2021). IEA - International Energy Agency. https://www.iea.org/reports/net-zero-by-2050

Niinimäki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A. (2020). The environmental price of fast fashion. *Nature Reviews Earth & Environment*, *1*(4), 189–200. https://doi.org/10.1038/s43017-020-0039-9

Nilsson, M. (2017). *Important interactions among the Sustainable Development Goals under review at the High-Level Political Forum 2017* (S. 46). Stockholm Environment Institute. http://mediamanager.sei.org/documents/Publications/SEI-WP-2017-06-Nilsson-SDG-interact-HLPF2017.pdf

Nilsson, M., Chisholm, E., Griggs, D., Howden-Chapman, P., McCollum, D., Messerli, P., Neumann, B., Stevance, A.-S., Visbeck, M., & Stafford-Smith, M. (2018). Mapping interactions between the sustainable development goals: Lessons learned and ways forward. *Sustainability Science*, *13*(6), 1489–1503. https://doi.org/10.1007/s11625-018-0604-z

OECD-DAC. (2010). *Quality standards for development evaluation*. OECD. https://doi.org/10.1787/9789264167100-ar

OPIM. (2019). *The 9 Principles | Operating Principles for Impact Management*. https://www.impactprinciples.org/index.php/9-principles

PACE, & accenture. (2020). *Circular Economy Action Agenda: Textiles*. https://pacecircular.org/sites/default/files/2021-02/circular-economy-action-agenda-textiles.pdf

Pham-Truffert, M., Metz, F., Fischer, M., Rueff, H., & Messerli, P. (2020). Interactions among Sustainable Development Goals: Knowledge for identifying multipliers and virtuous cycles. *Sustainable Development*, *28*(5), 1236–1250. https://doi.org/10.1002/sd.2073

Pradhan, P., Costa, L., Rybski, D., Lucht, W., & Kropp, J. P. (2017). A Systematic Study of Sustainable Development Goal (SDG) Interactions. *Earth's Future*, *5*(11), 1169–1179. https://doi.org/10.1002/2017EF000632

Putra, M. P. I. F., Pradhan, P., & Kropp, J. P. (2020). A systematic analysis of Water-Energy-Food security nexus: A South Asian case study. *Science of The Total Environment*, *728*, 138451. https://doi.org/10.1016/j.scitotenv.2020.138451

Quiggin, Daniel, De Meyer, Kris, Hubble-Rose, Lucy, & Froggatt, Antonyy. (2021). *Climate change risk assessment 2021* [Research paper - 14 September 2021]. Chatham House. https://www.chathamhouse.org/2021/09/climate-change-risk-assessment-2021/03-direct-climate-impacts

Scherer, L., Behrens, P., de Koning, A., Heijungs, R., Sprecher, B., & Tukker, A. (2018). Trade-offs between social and environmental Sustainable Development Goals. *Environmental Science & Policy*, *90*, 65–72. https://doi.org/10.1016/j.envsci.2018.10.002

Schneider, P., Avellan, T., & Le Hung, A. (2018). Water-Energy-Food Nexus and Sustainability. In W. Leal Filho (Hrsg.), *Encyclopedia of Sustainability in Higher Education* (S. 1–14). Springer International Publishing. https://doi.org/10.1007/978-3-319-63951-2_474-1

SEI, IISD, ODI, E3G, and UNEP. (2021). *2021—The Production Gap Report*. Stockholm Environment Institute. https://productiongap.org/wp-content/uploads/2021/10/PGR2021_web_rev.pdf

Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: The Great Acceleration. *The Anthropocene Review*, *2*(1), 81–98. https://doi.org/10.1177/2053019614564785

Swinnen, J. (2020). *Competition, market power, surplus creation and rent distribution in agri-food value chains—Background Paper for The State of Agricultural Commodity Markets (SOCO) 2020*. Food and Agriculture Organization of the United Nations (FAO). https://doi.org/10.4060/cb0893en

Tawalbeh, M., Al-Othman, A., Kafiah, F., Abdelsalam, E., Almomani, F., & Alkasrawi, M. (2021). Environmental impacts of solar photovoltaic systems: A critical review of recent progress and future outlook. *Science of The Total Environment*, *759*, 143528. https://doi.org/10.1016/j.scitotenv.2020.143528

Turney, D., & Fthenakis, V. (2011). Environmental impacts from the installation and operation of large-scale solar power plants. *Renewable and Sustainable Energy Reviews*, *15*(6), 3261–3270. https://doi.org/10.1016/j.rser.2011.04.023

UN. (2021). *COP26: The Glasgow Pact*. UN Climate Change Conference UK 2021, Glasgow, UK. https://ukcop26.org/wp-content/uploads/2021/11/COP26-The-Glasgow-Climate-Pact.pdf

UNDP. (2021). *Sustainable Development Goals*. United Nations Development Programme. https://www.undp.org/sustainable-development-goals

UNEP. (2019, Mai 4). *Better sewage treatment critical for human health and ecosystems*. UNEP. http://www.unep.org/news-and-stories/story/better-sewage-treatment-critical-human-health-and-ecosystems

UNESCO. (2016). *The United Nations World Water Development Report 2016: Water and Jobs*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000243938

UNFCCC. (2022). *Fashion Industry Charter for Climate Change—First Progress Report*. Fashion Industry Charter for Climate Change. https://www.fashioncharter.org

United Nation. (2018). *The Sustainable Development Goals Report 2018* (Vol. 19). https://unstats.un.org/sdgs/files/report/2018/TheSustainableDevelopmentGoalsReport2018-EN.pdf

United Nations. (2012). *The Future We Want: Outcome document of the United Nations Conference on Sustainable Development* (S. 41). https://sustainabledevelopment.un.org/content/documents/733FutureWeWant.pdf

United Nations. (2021). *The Sustainable Development Goals Report 2021*. United Nations Statistics Division. https://unstats.un.org/sdgs/report/2021/

USGS. (o. J.). *Wastewater Treatment & Water Use*. United States Geological Survey - Waster Science Tool. Abgerufen 1. November 2021, von https://www.usgs.gov/special-topic/water-science-school/science/wastewater-treatment-water-use?qt-science_center_objects=0#qt-science_center_objects

van Zanten, J. A., & van Tulder, R. (2021). Towards nexus-based governance: Defining interactions between economic activities and Sustainable Development Goals (SDGs). *International Journal of Sustainable Development & World Ecology*, *28*(3), 210–226. https://doi.org/10.1080/13504509.2020.1768452

Vehmas, J., Luukkanen, J., & Kaivo-oja, J. (2007). Linking analyses and environmental Kuznets curves for aggregated material flows in the EU. *Journal of Cleaner Production*, *15*(17), 1662–1673. https://doi.org/10.1016/j.jclepro.2006.08.010

Vital Wave / Caribou Digital. (2014). *Digital Economies in Emerging Markets—White Paper*. Vital Wave / Caribou Digital. https://vitalwave.com/wp-content/uploads/2015/09/Digital-Economies-In-Emerging-Markets-20141218.pdf

Warchold, A., Pradhan, P., & Kropp, J. P. (2021). Variations in sustainable development goal interactions: Population, regional, and income disaggregation. *Sustainable Development*, *29*(2), 285–299. https://doi.org/10.1002/sd.2145

Ward, J. D., Sutton, P. C., Werner, A. D., Costanza, R., Mohr, S. H., & Simmons, C. T. (2016). Is Decoupling GDP Growth from Environmental Impact Possible? *PLOS ONE*, *11*(10), e0164733. https://doi.org/10.1371/journal.pone.0164733

Waring, B., Neumann, M., Prentice, I. C., Adams, M., Smith, P., & Siegert, M. (2020). Forests and Decarbonization – Roles of Natural and Planted Forests. *Frontiers in Forests and Global Change*, *3*, 58. https://doi.org/10.3389/ffgc.2020.00058

WBCSD Forest Solutions Group. (2019). *Forest Sector SDG Roadmap* (S. 48). World Business Council for Sustainable Development. https://docs.wbcsd.org/2019/07/WBCSD_Forest_Sector_SDG_Roadmap.pdf

Weitz, N., Nilsson, M., & Davis, M. (2014). A Nexus Approach to the Post-2015 Agenda: Formulating Integrated Water, Energy, and Food SDGs. *SAIS Review of International Affairs*, *34*, 37–50. https://doi.org/10.1353/sais.2014.0022

Wilson, J. C., & Elliott, M. (2009). The habitat-creation potential of offshore wind farms. *Wind Energy: An International Journal for Progress and Applications in Wind Power Conversion Technology*, *12*(2), 203–212.

World Economic Forum. (2020). *To build back better, we will have to reinvent capitalism*. https://www.weforum.org/agenda/2020/07/to-build-back-better-we-must-reinvent-capitalism-heres-how/

Wu, B. (2020). Chapter 6—Human health hazards of wastewater. In H. Ren & X. Zhang (Hrsg.), *High-Risk Pollutants in Wastewater* (S. 125–139). Elsevier. https://doi.org/10.1016/B978-0-12-816448-8.00006-X

WWF. (o. J.). *Sugarcane | Industries | WWF*. World Wildlife Fund. Abgerufen 31. August 2021, von https://www.worldwildlife.org/industries/sugarcane

WWF. (2005). *Sugar and the Environment—Encouraging Better Management Practices in sugar production* (World Wildlife Fund). https://wwfint.awsassets.panda.org/downloads/sugarandtheenvironment_fidq.pdf

Zelinka, D., & Amadei, B. (2019). Systems Approach for Modeling Interactions Among the Sustainable Development Goals Part 1: Cross-Impact Network Analysis. *International Journal of System Dynamics Applications (IJSDA)*, *8*(1), 23–40. https://doi.org/10.4018/IJSDA.2019010102

Zhang, X., Myhrvold, N. P., Hausfather, Z., & Caldeira, K. (2016). Climate benefits of natural gas as a bridge fuel and potential delay of near-zero energy systems. *Applied Energy*, *167*, 317–322. https://doi.org/10.1016/j.apenergy.2015.10.016

Zhou, X., Moinuddin, M., Xu, M., Zhou, X., & Moinuddin, M. (2017). *Sustainable Development Goals Interlinkages and Network Analysis: A practical tool for SDG integration and policy coherence* (S. 122). Institute for Global Environmental Strategies. https://www.iges.or.jp/en/pub/sustainable-development-goals-interlinkages/en

7 Annexe

Annex I – Analytical Grid Methodology

The analytical grid for the investment sectors (chapter 3.1.3) assessed the following aspects:

- **Investment Area** – the wider sector that the scenario is embedded in, e.g., infrastructure or agriculture.
- **Investment Sector** – the concrete sector being looked at, e.g., concrete or sugar
- **Positive Impacts** (up to 3x)
    - **Target SDG** – Name of the targeted SDG
    - **Dimension** – Impact dimension of the positive contribution, e.g., social, economic, climate, environment
    - **Explanation** – Qualitative explanation of the positive impact pathway
    - **Trade-Off Strength** – Strength of the positive impact; from 1 to 3
    - **Likelihood -** general: Always, Highly Likely, Sometimes, Rarely
- **Negative Impacts** (up to 3x)
    - **Trade-Off SDG** – Name of the negatively impacted SDG
    - **Dimension** – Impact dimension of the negative contribution,
    - **Explanation** – Detailed and qualitative explanation of the negative impact pathway
    - **Trade-Off Strength** – Strength of the negative impact; from -1 to -3.
    - **Likelihood** – general: Always, Highly Likely, Sometimes, Rarely
    - **Mitigation Options** – thematic options for mitigation (thematic options to reduce negative impacts in the sector, e.g., avoiding certain practices); qualitative description; only done for investments that are not classified as -3

The dimensions of "interaction trade-off" and "likelihood" are operationalised as follows:

The category "Interaction trade-off" for the negative impacts is based on Nilsson et al., 2018, who developed a conceptual framework for SDG trade-offs, which we modified and re-applied to investment areas. The range from +3 to -3 can be categorised as follows (the focus of the analysis lies on the negative impacts):

- +3 Exceptional Impact – large positive impacts inherent in the sector/investment
- +2 High Impact – strong impacts that can be partly influenced/improved in the investment
- +1 Supporting Impact – smaller positive impacts that can be influenced in investment
- -1 Constraining Impact – smaller negative impacts that can be influenced in investment
- -2 Counteracting Impact – reduces or neutralises positive impact; partly influenceable in investment
- -3 Cancelling Impact – negates positive impact; inherently featured in investment

The analytical grid will provide us with information on whether the assumed impact trade-off on the SDGs a possibility or a fixed relationship is. For the category of "likelihood", we thus apply the following categories based on a general qualitative assessment:

- Always (1:1 relationship)
- Highly Likely
- Likely
- Sometimes
- Rarely (this usually means it can easily be avoided if proper precautions are taken)

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