

Louvain School of Management

The Integration of SDGs through Intra-Sector Collaboration

The case of the Chemical Sector SDG Roadmap

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Academic year 2018-2019

I would like to thank my thesis supervisor, Carlos Desmet, for giving me advice throughout this thesis, for relentlessly trusting me and for motivating me.

I would like to express my gratitude to my internship supervisor, Laurence Anjoras, who introduced me to the chemical sector, inspired me and helped me in achieving my goals this year and in making the right decisions.

I also deeply thank my family for giving me their continuous support and for following me in all my decisions.

Last, I am grateful to all the interviewees who showed interest in my research and gave their time to share their insights and expertise.

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List of initials

ACC	American Chemistry Council
BoP	Base of the Pyramid
Cefic	The European Chemical Industry Council
CSR	Corporate Social Responsibility
ERM	Environmental Resources Management (Consulting company)
ESG	Environmental, social and governance
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
ICCA	International Council of Chemical Associations
KPI	Key Performance Indicator
MDG(s)	Millennium Development Goal(s)
NGO	Non-Governmental Organization
SAICM	Strategic Approach to International Chemicals Management
SDG(s)	Sustainable Development Goal(s)
SME	Small and Medium Enterprises
SPM	Sustainable Portfolio Management
UN	United Nations
UNGC	United Nations Global Compact
WBCSD	World Business Council for Sustainable Development

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Introduction

Context and Problem Definition

For many years, the sense of urgency demonstrated by the scientific community, NGOs and international organizations such as the United Nations has led to a significant increase in awareness regarding environmental, social and economic issues from an expanding base of stakeholders, including customers but also investors and the private sector (GlobeScan & SustainAbility, 2017; Boston Consulting Group, 2017). Therefore, a considerable number of initiatives were developed in order to tackle today's and tomorrow's challenges. Among these initiatives, one of the most significant and ambitious has been undertaken by the United Nations. In 2015, the 17 Sustainable Development Goals (SDGs) were approved by state members with the purpose to represent a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030 (United Nations, 2015).

The SDGs attracted much attention since their creation from a broad range of stakeholders. More especially, the private sector, recognized by the United Nations as having a critical role in tackling sustainability-related matters (United Nations, 2015), has acknowledged increasing motivations, both internal and external, to integrate the SDGs within their strategy (Corporate Citizenship & Business & Sustainable Development Commission, 2016).

A number of studies have proven that the implementation of the SDGs represents a significant source of added value to companies and society at large. In order to enable companies integrating this new tool in their processes, a variety of projects have been undertaken at different levels, going beyond individual companies' scopes (Business & Sustainable Development Commission, 2017; GRI, UN Global Compact, & WBCSD, 2015).

Among these initiatives, relatively few attempts have been made to leverage sector-level actions directly related to the SDGs. However, in 2017, the "Better Business, Better World" report (Business & Sustainable Development Commission, 2017) highlighted the urgent need to create sector roadmaps, which was brought from ambition to reality in April 2018 by the World Business Council for Sustainable Development (WBCSD) through the creation of SDG Sector Roadmaps guidelines. In July 2018, the Chemical Sector SDG Roadmap was the first roadmap developed by WBCSD, together with leading industry players and sector associations. The purpose of this document is to guide companies from the sector in defining and implementing their sustainability strategy according to the SDGs and to call these companies and external stakeholders for collaborative action (WBCSD, 2018b). As the first one of its kind

and of a series of not yet existing sector roadmaps, a thorough assessment of this collaboration and its output will allow understanding the ability of intra-sector collaborations to answer the needs of businesses regarding the integration of SDGs. Due to the recentness of the initiatives and of the SDG agenda creation, few researchers have addressed this issue yet, leaving behind the untapped opportunity that sector collaboration represents to the integration of SDGs.

Research questions

This research master's thesis aims at contributing to the gathering and production of knowledge regarding the impact and relevance of sector-level initiatives towards the integration of the SDGs. Ultimately, this study will evaluate the advantages and potential limitations of intra-sector collaborations in the context of SDG integration and will infer the implications these findings may have on other sectors than the chemical sector, as well as recommendations for future roadmaps.

Therefore, the main research question lies in assessing the potential of intra-sector collaborations in integrating the SDGs by exploring the case of the Chemical Sector SDG Roadmap. Sub-research questions have been defined to answer the main research question:

1. What do businesses need to (further) integrate the SDGs in their strategies and actions and what are the current challenges they encounter with regard to this matter?
2. What variables can influence the ability of intra-sector collaborations, more especially SDG Sector Roadmaps, to operate successfully and efficiently?
3. Can intra-sector collaborations such as SDG Sector Roadmaps bring additional benefits and if so, to which stakeholders?
4. What are the limits of intra-sector collaborations, based on the case of the Chemical Sector SDG Roadmap? What recommendations can be given to answer these?
5. Under which conditions is the Chemical Sector SDG Roadmap replicable to other sectors?

Research methodology

In order to answer the aforementioned research questions and contextualize them, pertinent scientific, academic and business literature was reviewed and analyzed based on the collection of information from sources including scholarly journals, public and private organizations, the United Nations, WBCSD, industrial reports, and federations.

In order to assess the practical relevance of the Chemical Sector SDG Roadmap, ten in-depth interviews were conducted with internal stakeholders, namely roadmap's contributors, and external stakeholders. These interviews were motivated by the absence of data available

less than a year after the creation and publication of the Chemical Sector SDG Roadmap in July 2018 (WBCSD, 2018b).

Every data collection, production and processing has been performed with respect to scientific quality requirements. This includes taking into account ethical considerations throughout the whole process of interacting with stakeholders, namely interviewees and potential interviewees. The purpose of the interviews, the use and processing of the data gathered, and their degree of confidentiality have been systematically communicated to the relevant stakeholders to ensure mutual agreement regarding any data collection, processing and/or use.

Structure

First, a preliminary **review of the literature** is outlined in order to introduce the SDGs, the role of the private sector, their levels of action and the challenges currently faced by businesses in integrating the SDGs. An in-depth theoretical analysis of the chemical sector and its role, responsibility and interactions with SDGs is presented with the purpose to review the existing initiatives and identify the specificities of this sector in terms of competitive landscape and relation to sustainability. Competitor collaborations are further explored in order to identify their characteristics and define success criteria of collaboration with sector peers.

Second, **the case of the Chemical Sector SDG Roadmap** is studied by introducing its background, structure, contents and contributors. The research methodology is then described, and the Chemical Sector SDG Roadmap is analyzed based on the insights obtained from the interviews conducted in the frame of this research.

Third, **research questions** are addressed through combining the data gained from the literature review and the practical analysis of the Roadmap, followed by a conclusion synthesizing the main findings of this research with regard to the research questions, outlining its implications, its scope and limits, and suggestions for further research.

Limitations and Scope

The SDGs were adopted and issued by the United Nations in 2015 when setting the 2030 agenda, while the Chemical Sector SDG Roadmap was published in July 2018. Due to the recentness of the topic, it constantly receives significant attention. The reader is encouraged to take into account the latest updates made available to assess the relevance of this research. For similar reasons, the companies concerned with the Chemical Sector SDG Roadmap may not have had the time that is necessary to take actions based on the roadmap. This further encourages contextualization from the reader and follow-up of this research. Based on the two

previous arguments, further research is strongly encouraged in order to contribute to updating this research and extending the knowledge base regarding Sector SDG Roadmaps implementation and relevance, regardless of the sector concerned.

This research aims at assessing the collaborative process of elaborating the roadmap, its methodology and frameworks, its audience, its objectives and scope and its structure of contents. Although partly covered, a complete assessment of the accuracy of the technical contents of the Roadmap would require an in-depth scientific analysis from industry experts with extensive knowledge of the industry's problematics, which is out of the scope of the present research. Moreover, the framing used in the Roadmap is here partially analyzed with the sole purpose of evaluating its appropriateness to the target audience. Further research would be encouraged to evaluate the wording and vocabulary used in the Roadmap, requiring a combination of expertise in sustainability and linguistics.

Last, interactions and interlinkages between the roadmap and initiatives issued from other levels of action in the chemical sector will not be thoroughly assessed in order to allow the applicability of the findings from this case to other sectors. Further, this research does not aim at criticizing the SDGs per se. Their pitfalls will only be assessed when this evaluation is necessary to the general assessment of the Chemical Sector SDG Roadmap, for example, in answering research question n°4.

Practical and scientific relevance

This thesis is primarily targeting practitioners who are or may further be considering integrating the SDGs in their corporate strategy. The insights provided by this research could orient their decision-making process when elaborating their sustainability strategy. Moreover, this work may provide insights to any stakeholder studying the possibility to implement the SDGs in future roadmaps, projects or activities and considering intra-sector collaboration. These practitioners comprise companies and associations from the chemical sector but also from other sectors.

Additionally, the recommendations may be of interest to the Chemical Sector SDG Roadmap's contributors willing to reflect on their contribution to the tool and potentially implementing actions in that regard.

Last, the findings provide a knowledge base and a reference for scholars and academics aiming at further investigating the dynamics and relevance of intra-sector collaboration in the integration of SDGs, and in general, sustainability.

Part I. Literature review

Chapter 1. Background and Development of the SDGs

First, this chapter aims at **introducing the SDGs** and the underlying concepts of the 2030 agenda. Second, the **role and responsibility of the private sector** towards this agenda are described, as well as the opportunities the SDGs represent to businesses. Third, the **levels of action for the private sector** are identified, further enabling a focus on sector-level initiatives. Fourth, the current **challenges faced by business regarding SDGs integration** are listed in relation to **research question n°1**, reinforcing the case for the review of existing tools and the development of new ones, for example issued from new types of partnerships or collaborations.

1.1 Introduction to the SDGs

1.1.1 The creation and background of the SDGs

In September 2015, world leaders met at the United Nations (UN) in New York, where they adopted the Sustainable Development Goals (SDGs) shown in Figure 1, a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. The 17 Goals and 169 targets of the 2030 agenda (c.f. Appendix 1) are integrated and indivisible and balance the three dimensions of sustainable development, namely the economic, social and environmental aspects (United Nations, 2015). While past global governance efforts have relied largely on top-down regulation or market-based approaches, the SDGs promise a new type of governance based on non-legally binding goals set by the UN member states (Biermann, Kanie, & Kim, 2017).



Figure 1: The 17 Sustainable Development Goals (United Nations, 2015)

With the willingness to leave no one behind, the SDGs are directed to all types of stakeholders to stimulate action in areas of critical importance for humanity and the planet (United Nations, 2015). This call demonstrates the understanding that sustainability concerns a wide variety of stakeholders, including governments, regulators, non-governmental organizations (NGOs), businesses but also consumers and investors (Boston Consulting Group, 2017). As an illustration, a growing number of global investors are looking to integrate the SDGs into their portfolio analysis, while a number of governments are also starting to make more specific asks of business in this field (WBCSD, 2018d).

The SDGs replace and build on the Millennium Development Goals (MDGs), which started a global effort in 2000 to tackle the indignity of poverty. Even though the SDGs draw on earlier works, their level of ambition and comprehensiveness surpass all existing attempts at global governance based on goal-setting (Biermann et al., 2017). Whereas the MDGs focused on poverty, education and diseases, and were driving an agenda revolving around developing countries, the SDGs ensure the transition to a model encompassing these issues in both developing and developed world, thereby making the business case clearer and directly involving the private sector (Pedersen, 2018).

1.1.2 The interlinkages between SDGs

The SDGs articulate a highly integrated system as individual areas (Anastas & Zimmerman, 2018), representing synergistic re-enforcement (Pradhan et al., 2017). Therefore, the benefits behind the goals for business and society can only be delivered on the condition that systems-thinking is adopted (Anastas & Zimmerman, 2018; Business & Sustainable Development Commission, 2017). According to Allen, Metternicht, and Wiedmann (2018), an effective approach for implementing the SDGs requires prioritization of goals and targets to focus on a reduced set of priorities (or a ‘nexus’), associated with assistance from a combination of analytical approaches and tools to assess interlinkages in order to optimise systemic impact. Otherwise, unintended or even counter-productive consequences may arise (Anastas & Zimmerman, 2018). Therefore, understanding the range of positive and negative interactions among SDGs is key to unlocking their full potential and ensuring that progress in some areas is not made at the expense of progress in others (International Council for Science, 2017).

1.2 The private sector and the SDGs

1.2.1 The involvement of the private sector in the creation of SDGs

Whereas MDGs came out of a typical political UN process with limited interactions outside UN and government circles (Pedersen, 2018), business and industry was designated

‘major party’ in the UN Open Working Group tasked with developing the SDGs (Scheyvens, Banks, & Hughes, 2016). The close involvement of the private sector in the process reveals a conscious transformation during the past decade, as the private sector has become more entwined in development policy and planning (Scheyvens et al., 2016). This transition aims at further strengthening accountability at all levels, in contrast to its disregard and absence at the time of the MDGs (Kumar, Kumar, & Vivekadhish, 2016).

1.2.2 The United Nations Global Compact

The UN Global Compact acts as a reference body with the objective to mainstream the ten principles (c.f. Appendix 2) in business activities worldwide and combine them with the business opportunities behind the SDGs. According to the UN Global Compact, corporate sustainability starts with a company’s value system and a principles-based approach to doing business, namely operating in ways that, at a minimum, meet fundamental responsibilities in the areas of human rights, labour, environment and anti-corruption. By incorporating the principles of the UN Global Compact into strategies and operations, companies are not only upholding their basic responsibilities to people and planet, but also advancing the SDG agenda and setting the stage for long-term success (United Nations Global Compact, n.d.).

Companies can show their commitment to the SDGs by respecting basic standards derived from universal documents such as the UN Global Compact principles, but also the UN Guiding Principles on Business and Human Rights, the ILO Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy and other guidelines such as the ISO 26000 Guidance on Social Responsibility and the OECD Guidelines for Multinational Enterprises (GRI, UN Global Compact, & WBCSD, 2015).

1.2.3 The role of the private sector in the SDGs framework

There is mounting appreciation across the global business community of the key role that the private sector has to play in the realization of the SDGs as a source of finance, a driver of innovation and technological development, and a key engine of economic growth and employment (WBCSD, 2017, 2018c).

As emphasized in the Article 67 agreed to by all 193 UN Member States of the official 2015 agreement, SDGs explicitly recognize the role and responsibility of the private sector:

Private business activity, investment and innovation are major drivers of productivity, inclusive economic growth and job creation. We acknowledge the diversity of the private sector, ranging from micro enterprises to cooperatives to multinationals. We call on all businesses to apply their creativity and innovation to solving sustainable development challenges. (United Nations, 2015, p.34)

These actions are not only to be achieved by large corporations but also by small and medium enterprises. As Business Call to Action and GRI (2016) outline, SMEs play a critical role in achieving the SDGs as they are the backbone of numerous economies.

The private sector has the potential to benefit to society at large and to have a pivotal role in achieving the SDGs through the following non-exhaustive points of action. First, by scaling activities across sectors, borders and products and harnessing business' core role in **generating growth, productivity and jobs**. This will become crucial considering that more than 600 million new jobs are needed over the next 15 years to match growth in the global workforce, while SDGs could have the capacity to deliver more than 380 million jobs (Business & Sustainable Development Commission, 2017). Second, by **accessing private sector innovation** around technologies, products, services, processes and business models through ability and willingness to take risk. Third, by **mobilizing sizable and timely financial resources**, e.g. by leveraging public sector and aid investments with corporate philanthropic, social or commercial investment. Fourth, by accessing **complementary know-how and skills** and harnessing businesses' knowledge of designing business models to meet specific customer needs in a scalable way. Fifth, by **building alliances** to promote responsible practices, as well as spreading broader values and norms with respect to human rights, good governance and accountability, inclusion and equality (SDG Fund, Harvard Kennedy School CSR Initiative, & Inspiris Limited, 2015). Sixth, by **correcting market failures** across borders, by internalizing markets and organizing practices on an international scale (SDG Fund, Harvard Kennedy School CSR Initiative, & Inspiris Limited, 2015; Van Tulder, 2018).

Although every SDG relates to the role of business, two are worth highlighting as cross-cutting themes: **SDG 12** focuses on production and consumption and includes a specific target 12.6 on “adopting sustainable business practices and reporting” whereas **SDG 17** includes two targets on multi-stakeholder partnerships. On top of that, business is expected to be a provider of better labour environment for human development (targets 8.5 and 8.8), to address global issues as financial providers and responsible stakeholders in society (Hayakawa, 2016).

1.2.4 Opportunities of the SDGs for the private sector

The 17 SDGs and their associated targets and indicators represent a long-term political framework which allows businesses to be future-oriented, seek guidance for investments and new business opportunities, foster innovation and market development, and reduce risk and costs, for example by transforming the company strategy and turning its business model into more sustainable versions (Pedersen, 2018). On the other hand, mounting pressures are pushing

businesses to adopt a proactive stance. Comparably to disruption, when sustainability takes off in a sector, it moves at a fast pace. It can therefore give disadvantage to unprepared and unreactive incumbents, while it can allow anticipating companies to drive sustainability to their competitive advantage (Business & Sustainable Development Commission, 2017).

Businesses possess a dual set of motivations when it comes to integrating SDGs in their strategy (Corporate Citizenship & Business & Sustainable Development Commission, 2016).

On the one hand, the SDGs represent positive growth drivers. First, they provide businesses with **opportunities for innovation and market development** since they unveil development gaps and represent unmet market needs. This directly leads to establishing more conscious investment and innovation strategies, generating better anticipation of customer demand and the ability to build positions in growth markets.¹ Second, SDGs exemplify the potential for **internal operational efficiencies, process improvements and resource and cost savings**, by demonstrating the impact and threats of the limitedness of natural resources reinforced by climate change. Efficiency based on strengthened supply chains and secured access to needed resources will allow saving costs in the short term and reducing risk in the long term. Third, **reputation management** is a pivotal element of SDGs integration. By managing the social, environmental and economic negative impacts resulting from private sector activities, by answering customer needs, by engaging and strengthening relationships with internal stakeholders such as employees, and by communicating consistently and effectively on impact and performance, businesses will be more able to maintain trust with key stakeholders, leading to improved customer experience and engagement, brand enhancement and competitive advantage, and secure their license to operate. Fourth, understanding the impact of SDGs on respective sectors and value chains allows enhanced **risk management and prevention** in the supply chain with regard to financial, regulatory and technological aspects, thereby enabling vulnerability minimization. By responding proactively to risks and acting on social responsibilities and obligations, business increases resilience to costs or requirements imposed by the current or future regulatory environment (Corporate Citizenship & Business &

¹ As an example, “The Base of the Pyramid” (BoP) consists in the 3 billion of people living on less than USD 3 a day and 1.5 billion living on below USD 9 a day. These 4.5 billion people represent significant expansion prospects in emerging markets, considering them as potentially important customers, but also diverse new sources of supply and strategic distribution and retail partners. Indeed, access to local small-scale producers allows local sourcing of materials and building stronger and more productive relationships with suppliers, enabling more secure access to local resources. Therefore, that directly leads to an increased access to appropriately skilled and cost-effective employees thanks to the labour pool expansion. As an untapped market segment, positioning as an early-mover can build reputation as a partner of choice and thereby enhance brand value and license to operate (WBCSD, 2016)

Sustainable Development Commission, 2016; CSR Europe, GlobeScan, & Forst & Sullivan, 2017; GRI, UN Global Compact, & WBCSD, 2015; WBCSD, 2017).

On the other hand, inaction regarding the SDGs denote potential growth limiters, due to the risks to be managed, the negative impacts to be reduced, mitigated, or eliminated, and the potential negative impact of inaction on reputation and growth (Corporate Citizenship & Business & Sustainable Development Commission, 2016). Moreover, failure on the goals has huge economic costs, as explained in the following section. As an illustration, rising inequality remains a pivotal growth limiter (Business & Sustainable Development Commission, 2017).

1.2.5 The business case for SDGs

The costs required to achieve the SDGs are substantial. As an illustration, the rough calculations have put “the cost of providing a social safety net to eradicate extreme poverty” at around USD 66 billion annually. Estimates of annual investments in improving infrastructure (water, agriculture, transport, and power) amount to USD 5 to 7 trillion globally. The unmet need for credit for SMEs has been estimated to be around USD 3.5 trillion globally (Intergovernmental Committee of Experts on Sustainable Development Financing, 2014).

However, as demonstrated in the reference report “Better Business, Better World” (Business & Sustainable Development Commission, 2017), the business case for the SDGs amounts to an economic prize of at least USD 12 trillion by 2030 for the private sector. Concurrently, environmental and social issues will increasingly be seen as financial rather than non-financial questions. As a consequence, companies will be expected to be transparent not only about their performance on these topics, but also about the financial risks and opportunities they face in relation to them and the likely effects on value creation (KPMG, 2017).

For many companies, the demand for sustainable products therefore offers opportunities for revenue and margins that outweigh the associated costs (Boston Consulting Group, 2017). However, this limited rationale demonstrates a tension between the dominant business model based on short-term planning with a narrow focus on the business case, and a longer-term sustainable development agenda (Scheyvens et al., 2016). Nevertheless, other moral rationales are involved, the two main ones being the opportunity to align core business activities with the needs of broader society and the importance of the SDGs to the global community combined with the urgency of the issues (GlobeScan & SustainAbility, 2017). On top of the business case, the SDGs represent an opportunity to shape a safer, more prosperous world with a more predictable future enabling smarter investment and innovation strategies (Business & Sustainable Development Commission, 2017).

From an investor perspective, SDGs represent crucial opportunities for multiple reasons. First, as the globally agreed sustainability framework, it can support investors in **understanding the sustainability trends** relevant to investment activity and their fiduciary duties. Second, on a macro level, understanding the SDGs allows investors to **mitigate their exposure to growing and widespread economic risks**, as well as perceiving the key drivers of global economic growth and therefore growth in corporate revenues and earnings, ultimately driving returns from equities and other assets. Third, on a micro level, the SDGs provide a common reference enabling investors to **strengthen their ESG risk frameworks**, but also to shape and articulate their investment strategy to fully benefit from attractive opportunities that solutions to sustainability challenges offer (The Principles for Responsible Investment, United Nations Environment Programme Finance Initiative, & United Nations Global Compact, 2017).

1.3 The levels of action for the private sector

1.3.1 Review of the five levels of action

Concretely, five levels of action are available to companies to drive the transformation. First, the **individual level**, where leaders can clarify and show the case to their peers to gain commitment to the SDGs within their companies and in the business community. Second, the **company level**, where SDGs can be integrated in the strategy and operations of businesses. Third, on **value chain level**, where companies combine complementary skills, technologies and resources and bring new solutions to market. Fourth, on the **sector level**, where peers collaborate to shift the sector to sustainable competition, put in place efforts to raise standards and practices across the entire industry and overcome shared challenges. Fifth, on **macro level** (multi-stakeholder partnerships), by joining forces with government, regulators and civil society organizations to rebuild the Social Contract, shape policies that advance the SDGs and tackle systemic challenges (Business & Sustainable Development Commission, 2017; GRI, UN Global Compact, & WBCSD, 2015).

1.3.2 The need for partnerships and collaborations

Realizing the SDGs and leveraging the market opportunities that they represent requires companies to pioneer new forms of collaboration across industries and economic systems (WBCSD, 2018f). As demonstrated earlier, it is now well established that the SDGs will only be achieved if all stakeholders work together in effective partnerships (SDG Fund, Harvard Kennedy School CSR Initiative, & Inspiris Limited, 2015). Indeed, achieving the agenda will not be possible if companies remain isolated and if only few sustainable pioneers drive the shift. In a 2014 survey (GRI, UN Global Compact, & WBCSD, 2015), 90% of a sample of 38,000

executives surveyed agreed that effectively addressing sustainability issues cannot be carried out in isolation. However, partnerships between businesses and the United Nations, as highlighted in a study from United Nations Global Compact & Accenture (2018), adopt persisting traditional approaches characterized by short-term collaboration and bilateral arrangements, sometimes restricting the ability to scale up impact.

The challenge of ensuring that multiple actors work together is at the heart of many ‘wicked’ sustainability problems. Cooperation between actors across scales, in diverse contexts, and over time, is fundamental to implementing the SDGs (Bowen et al., 2017). SDG 17 explicitly recognizes business as indispensable to “global partnership for sustainable development”. Indeed, SDGs realization will not materialize from a CSR strategy disconnected from the business core and will therefore require companies to integrate SDGs into their long-term business strategies and renew their thinking about stakeholder engagements (Pedersen, 2018). Multi-stakeholder collaboration would maximise impact of the activities in the multiple fields and contribute to enhance awareness and legitimacy of their efforts. They may work as increased incentives for companies and generate virtuous cycles of SDG implementation in the whole society (Hayakawa, 2016).

Currently, based on a survey from GlobeScan & SustainAbility (2017) on 500 sustainability experts, 51% experts are developing or plan to develop products/ services to provide solutions for the SDGs, whereas an encouraging amount of 35% pursues or considers to pursue multi-stakeholder collaborations to support delivery of the agenda. Additionally, from a survey performed in 2017 by CSR Europe and GlobeScan on 160 European business leaders, the majority was open to collaborating with business partners (63%), more than with any other type of stakeholders (CSR Europe, GlobeScan, & Forst & Sullivan, 2017).

1.3.3 Focus on the sector level

Each sector has unique features and requirements for success (Sustainable Development Solutions Network, 2015), therefore many models and solutions are possible and needed, depending on contextual circumstances and the complexity of the challenge. This makes it impossible to adopt a one-size-fits-all approach (Van Tulder, 2018).

Instead, sector peers and stakeholders need to “map their collective route to a sustainable competitive playing field, identifying tipping points, prioritising the key technology and policy levers, developing new skill profiles and jobs, quantifying new financing requirements, and laying out the elements of a just transition” (Business & Sustainable Development Commission, 2017, p.15). As outlined in the reference document “SDG Compass” (GRI, UN Global

Compact, & WBCSD, 2015, p.24), “partners should aim to set shared goals, leverage their respective core competences, depoliticize projects, develop clear governance structures, create a single monitoring framework, focus on impacts, forecast future resource needs, and create a process for knowledge management”. All players have to agree to raise and maintain standards at the same time as preserving competitive dynamics in order to transform a sector towards sustainability growth (Business & Sustainable Development Commission, 2017).

In return, these collaborations can allow partners “to share information, pool scarce or complementary assets and resources, access new sources of innovation, create economies of scale and enhance the legitimacy of their own individual activities” (SDG Fund, Harvard Kennedy School CSR Initiative, & Inspiris Limited, 2015). Ultimately, coalitions of parties shape new institutions that can speed up the spread of disruptive sustainability tremendously, in particular when supported by (big) incumbents (Van Tulder, 2018).

The findings of the 2014 sustainability & innovation global executive study and research project conducted by BCG, the MIT Sloan Management Review and UN Global Compact (Kiron et al., 2015), and the research of DiVito and Sharma (2016), define the four most important drivers of sustainability-related collaborations, as listed in Table 1.

Kiron et al. (2015)	DiVito and Sharma (2016)
Boost brand reputation	Communicate effectively with regulators on public policy
Improve product and service innovation	Support new technology development by sharing uncertain returns and pooling knowledge
Foster market transformation	Develop shared standards for businesses within an industry
Mitigate risk	Reduce risks that threaten an entire industry

Table 1: Key drivers of sustainability-related collaborations (DiVito & Sharma, 2016; Kiron et al., 2015)

However, as reported in the reference document “Better Business, Better World”, not all collaborative initiatives have been effective, and few so far have targeted SDGs specifically (Business & Sustainable Development Commission, 2017). Among these initiatives, we can cite sector-specific schemes such as the International Council on Mining and Metals’ transparency principles and the chemical industry’s Responsible Care program issued by International Council of Chemical Association (ICCA); cross-industry forums such as the World Business Council for Sustainable Development (WBCSD); and pre-competitive standards to assure collective high standards of sustainable conduct such as the Consumer Goods Forum (aiming at zero net deforestation by 2020 and developing actions plans for

sustainable sourcing of commodities), the Global Agri-business Alliance (aiming at improving rural livelihoods, mitigating climate change, contributing to global food security and other SDGs), and the GSMA association (representing mobile operators worldwide, which identified four priority goals as well as the ways the industry can progress towards these goals).

1.4 Current challenges of the private sector

1.4.1 Progress to date

The Sustainable Development Goals report 2018 (United Nations, 2018) highlights that progress is being made in some areas but also demonstrates others where development is clearly insufficient to meet the SDGs and their targets by 2030. Therefore, the report particularly emphasizes the need to foster a sense of urgency and to initiate immediate and accelerated actions through collaborative partnerships for example.

In terms of perceptions, based on a survey made in 2017 on 500 sustainability professionals over the world, 9% surveyed professionals feel positive about the level of progress made to date, whereas 36% are neutral towards it, leaving 54% perceiving the progress as poor, particularly in SDGs 1, 10, 14 and 15 (GlobeScan & SustainAbility, 2017), as it can be shown in Figure 2.

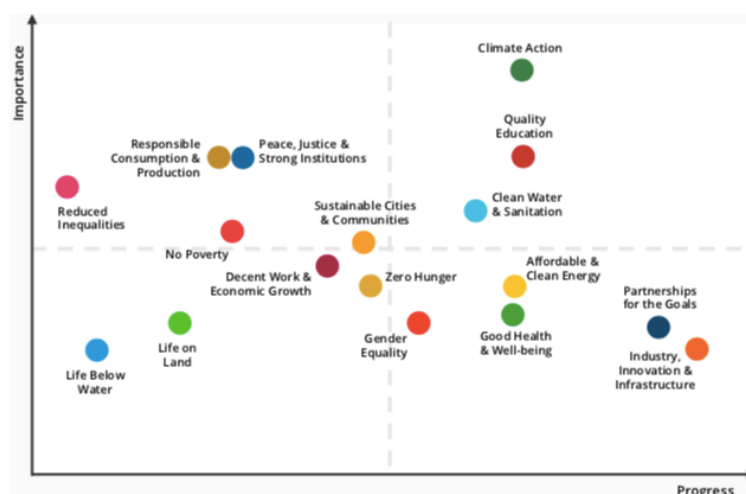


Figure 2: Perceived importance of SDGs vs. achieved progress (GlobeScan & SustainAbility, 2017, p.16)

Despite the evolution of SDGs awareness and the business case for the SDGs, a low recognition of the SDGs in society as a whole can still be observed. Consequently, companies may be uncertain about how citizens evaluate corporate efforts towards SDGs and therefore how much their efforts enhance their corporate value, ultimately leading to inaction (Hayakawa, 2016). As a survey (GlobeScan & SustainAbility, 2017) performed on 500 sustainability professionals outlines, the private sector is perceived as one of the poorest contributors to

progress towards the SDG agenda, with 49% perceiving it as a poor contributor and only 9% as a good one. The results demonstrate the existence of challenges with regard to the integration of SDGs from a business perspective, which requires an identification of these key issues.

1.4.2 Nature of the challenges

This section will attempt at answering the **research question n°1** identified in the introduction. From the results of a global survey (WBCSD, 2018a) on 250 companies from WBCSD and WBCSD's global network partners, the biggest barriers to internal engagement on the SDGs are: the lack of understanding of the business case, the lack of clarity on policy, the intrinsic complexity of the agenda, and the absence of clear targets and standardized indicators to monitor and communicate progress. Key limitations include a lack of comparability between companies, the need for more context-based reporting over time so that the implications of metrics and targets can be better understood and scenario analysis for climate-related reporting (WBCSD, 2018d).

Despite the existence of 169 concrete **targets**, many of them remain relatively **vague** and are purely **qualitative**, leaving room for interpretation and leading to weak implementation (Biermann et al., 2017). Indeed, when the agenda came out, politicians have considered the targets as too numerous to be easily communicated, potentially leading to a lack of comprehensiveness and coordination in the efforts, rendering measurement of progress complex (Brende & Hoie, 2015). This obstacle is also revealed in the fact that companies give more focus on goal level (49%) rather than target level (36%), demonstrating a missed opportunity for meaningful engagement, since targets provide the required granularity to pinpoint critical impact areas and translate them into business solutions (WBCSD, 2018a). As a consequence, the complexity and volume of targets may hinder industry players, including SMEs (which represent the majority of global economic activity), from reporting on their contributions to these goals (GRI, PwC, & United Nations Global Compact, 2017).

Furthermore, **complexity and systems thinking** leads to a lack of prioritization and choice stress (Van Tulder, 2018). This can be shown through the selection of SDGs by companies: 29% narrow down the agenda on less than 5 goals, 58% on 5 to 10, and 13% on more than 10 (PwC, 2018). From a survey of PwC (2018), in some cases, companies select SDGs that correspond to existing activities (such as SDGs 8, 12 and 13, considered as the most obvious SDGs from a business perspective), rather than envisioning and identifying new actions that could contribute to the SDGs (Van Tulder, 2018). As a consequence, misleading prioritization could lead to negative developments and missed opportunities for 'non-

prioritized' goals and targets, due to the strong and complex interlinkages between SDGs (International Council for Science, 2017), as discussed in 1.1.2, and which have not yet been meaningfully addressed (Haas, 2017). As a recommendation, priority SDGs must be carefully selected, by taking the time to consider indirectly connected SDGs, such as 15, 1, 10, 2, 16, 14, which are consistently disregarded (WBCSD, 2018a) due to budgetary, political and resource constraints as well as specific needs and policy agendas (International Council for Science, 2017), and because these high-level goals can be seen as priorities for the government rather than for the business.

Further, on top of being an actor that can potentially solve challenges, the private sector must acknowledge its **contribution to and its complicity in the creation of some of these problems**, making the industry very regarded by stakeholders with high expectations towards corporate social coherence (Scheyvens et al., 2016). However, based on WBCSD survey (2018a) on 250 companies, businesses are focusing predominantly on the positive impacts that they can have on this agenda (69%), whereas only 37% are currently taking action to identify their potential negative impacts, representing a missed opportunity to provide a balanced view to stakeholders. In the same way, companies see the SDGs more as a tool to identify business opportunities than risks. The survey also shows that 58% companies focus on the impacts of their direct operations, compared to 37% embracing their impacts on the wider value chain. Another survey (KPMG, 2017) on CSR reporting on almost 5,000 companies highlights that simply linking corporate responsibility activity thematically to the SDGs is insufficient. People want to know how companies are contributing to achieving the goals, the actual impact of those positive contributions, and how company activities are exacerbating the challenges the SDGs seek to solve, and what that negative impact is in real terms.

Moreover, the **internal engagement** is concentrated and mainly managed/owned by sustainability, communications and CEO departments and offices; challenges still remain with regard to integrating the SDGs into other strategic functions. Consequently, only 10% of the companies surveyed by WBCSD in 2018 are disclosing forward-looking SDG targets, demonstrating a lack of wider integration within companies (WBCSD, 2018a).

There is no **single, uniform methodology** for measuring and reporting business progress and impacts on the SDGs (GRI, PwC & United Nations Global Compact, 2017, 2018). Additionally, Business Call to Action and GRI (2016) noted that clear variations are observed between businesses in terms of reasons to look at impact and approaches to measurement. However, a first attempt towards the creation of a harmonized indicator set and methodology for companies has been made by GRI and the UN Global Compact through two documents

providing indicators and frameworks translating each of the SDGs into business actions (GRI, PwC & United Nations Global Compact, 2017, 2018). These documents are based on the SDG Compass, created by the same bodies together with WBCSD with the aim to guide companies on how they can align their strategies, measure and manage their contribution to the SDGs through a 5-step framework (GRI, UN Global Compact, & WBCSD, 2015) depicted in Figure 3.



Figure 3: The five steps of the SDG Compass guide (GRI, UN Global Compact, & WBCSD, 2015, p.5)

Without a procedurally well-designed, conceptual indicator framework for selecting and/or designing indicators, the results of SDGs assessments may be ambiguous and confusing (Janouskova, Hak, & Moldan, 2018). SDG Watch Europe recommended to adopt an appropriate and inclusive procedure to revise indicators, relying on the participation of researchers and strategy experts to develop a comprehensive monitoring and assessment system including all sustainable development dimensions (SDG Watch Europe, 2017).

Addressing and evaluating sustainability requires a broad system view to integrate the different aspects. Therefore, more work is needed to develop new methods and tools to allow the evaluation of existing processes and contribute to the construction of more sustainable systems (Jia, Li, Wang, & Qian, 2016). Besides developing new scenarios, models, and indicators, it is necessary to assess the existing ones and account for their strengths and weaknesses, in particular in their role as policy support instruments (Janouskova et al., 2018).

Chapter 2. The Chemical Sector: Characteristics and Approach towards Sustainability

This chapter intends to examine in more detail the chemical sector's characteristics and its relation to sustainability, and will further contribute answering **research question n°5**. First, the main **current trends of the industry** are explained, including the general positioning of the sector, its current and projected performance and future trends. Second, the **relations between the chemical sector and sustainability** and in particular the SDGs are explored, allowing an in-depth understanding of the role, responsibility and current implementation of the SDGs of the chemical sector. Third, the **collaborations between sector peers within the chemical sector** are reviewed and analyzed in order to identify the areas for improvement and underline the importance of this type of collaborations.

2.1 General trends within the chemical sector

2.1.1 Positioning of the chemical sector and inherent characteristics

The chemical sector's position in the value chain is generally considered as upstream and can be referred to primary sector activities as it involves raw material extraction and production. As a consequence, this sector feeds almost all other sectors further down the economic value chain (Corporate Citizenship & Business & Sustainable Development Commission, 2016). Concretely, in 2017, about 48% of the industry's global output was used in other sectors, mainly manufacturing industries, while 38% went to private consumption, mainly sold through retailers, and 12% was exported (Deloitte, 2017b). As the European Chemical Industry Council (Cefic) highlights in its Sustainability Charter (2016), "the chemical industry as "the industry of industries" is a key player in the enabling of a projected 10 billion people's access to decent living standards within the boundaries of our planet". Additionally, chemicals (including pharmaceuticals, rubber and plastics) is the leading sector in terms of added value, with EUR 299.1 billion added value in 2015 from the industry (Cefic, 2018a).

Based on the Global Industry Classification Standard (MSCI, 2019), the chemical industry, as part of the materials sector, is divided into five sub-industries: commodity chemicals, principally producing industrial chemicals and basic chemicals; diversified chemicals, manufacturing a diverse range of chemical products not classified in the other sub-industries; fertilizers and agricultural chemicals; industrial gases; and specialty chemicals, producing high value-added chemicals used in the manufacture of a wide variety of products.

Strategic ambition runs along a continuum, where a company's position depends on its options. Therefore, companies focused on commodity chemicals generally have few possibilities for differentiation and will tend to have fewer opportunities, whereas specialty chemical companies have more options, as they are closer to end consumers who reward sustainability efforts. Consequently, companies with a high public profile pay greater attention to benefits to their reputation and will therefore make the case for sustainability more likely than less known companies, which will rather focus on direct financial impacts (Boston Consulting Group, 2017).

2.1.2 Current performance of the chemical sector

In 2017, the world chemical sales amounted to EUR 3.475 trillion, with China ranked as first sales region (EUR 1.293 trillion), followed by EU (EUR 542 billion) and NAFTA (EUR 519 billion) including EUR 466 billion from USA (Cefic, 2018a). Among EU member states, more than 80% of chemical sales are generated in seven EU countries, namely Germany, France, Italy, the Netherlands, Belgium, Spain and United Kingdom (Cefic, 2018a). In line with these results, the level of world investment in the sector reached EUR 202.2 billion worldwide, representing a 2.3 times growth compared to 2007. However, clear trends are observed per region, highlighting China as the top region in terms of investment in both absolute values and growth, as it represented 44% of global investment in 2017 (Cefic, 2018a).

The global chemical industry (excluding pharmaceuticals) grew by 3.5% in 2017, aligned with 2016 growth level (+3.4%) (BASF, 2018), reaching USD 4 trillion global chemical revenues, while USD 3 trillion were hit for the first time in 2008 (Deloitte, 2017b), testifying a remarkable growth of the industry in the last decade. Chemical production in the EU expanded at a much faster rate as a result of growing demand from local customer industries and higher exports (2017: +3.8%; 2016: +0.4%). By contrast, the chemical industry in Asia saw lower growth (2017: +4.1%; 2016: +5.2%), explained by the decline of growth in China, even though marginally counterweighed by the unusual strong growth in Japan, primarily from higher exports to China. As a matter of fact, the overall effect of chemical manufacturing actually contributes to nearly 26% of USA GDP, according to the American Chemistry Council (ACC) (as cited in Deloitte, 2017b).

As for 2018, as the 22nd annual Global CEO Survey of PwC (2019) on chemical trends emphasizes, in contrast with the extraordinary pressures faced by the chemical sector for more than a decade (originating from product commoditization, raw materials volatility, fluctuating markets and rapidly expanding competition), 2018 initially delivered strong results with

increasing profits, tight capacity and encouraging global demand. In line with this trend, 92% of chemical companies' CEOs surveyed were optimistic about their organisation's 12-month revenue growth prospects, which is the highest confidence level in five years. However, the three-year growth outlook is at its lowest point, namely 85% compared to at least 90% for each of the five previous years. On top of macroeconomic concerns related to the interaction of sharp deceleration in China's economy, volatility in oil prices, Brexit uncertainties and fragility of some eurozone banks, greater concerns about sustainability trends bring increased tension. As an illustration, the impacts of resource and materials substitution, decarbonization, renewable energy and waste elimination have been rated by CEOs as the top four transformational factors, with respectively 54%, 46%, 40%, and 38% of them considering these impacts as high (PwC, 2019).

2.1.3 Projections for the chemical sector

As a report from ATKearney (2012) on the 2030 prospects for the industry emphasizes, the key trend in the global economy is Asian growth, catalysed by the increasingly fast integration of regional economies and societies worldwide. Another factor is the exodus of populations into large cities, particularly in China. Last, rising consumer purchasing power will drive the demand for chemicals across Asia. As an implication of these combined factors, the global economy is gravitating eastward, and ATKearney (2012) predicts that at least half of the top 10 chemical companies in the world will be Asian or Middle Eastern, leading to a deconsolidation of the chemical industry. Cefic (2018a) estimates that 67.8% of the world sales in 2030 will be in Asia, among which 49.9% world sales will be in China.

As a reaction, European companies are predicted to build individual plans of action and to continue their roles as pioneers in developing innovative products, participating in and further developing innovative industries in Europe. Their actions will include defending the European market, participating in Asian growth, and developing growth platforms by aligning with global mega trends such as alternative feedstock and energy sources, improved efficiency and energy storage, environmental technology, intelligent materials, and nutrition. (ATKearney, 2012). However, the European share of global chemical sales is estimated to reduce from 18.8% in 2017 to 13.4% (Cefic, 2018a).

Globally, from the synthesis report on the global Chemicals Outlook II from UN Environment Programme (2019), chemical sales are predicted to reach EUR 6.6 trillion by 2030, compared to almost half (EUR 3.47 trillion) in 2017 (UN Environment Programme, 2019). The growth rate of chemical production is projected to exceed that of population growth

at least until 2030. In other words, per capita consumption of chemicals will know a gradual increase, which highlights the need to achieve sustainable consumption and production, as referred to by SDG 12. As an extension, it reinforces the need to decouple material use from economic growth, enhance resource- and eco-efficiency, advance sustainable materials management, and prioritize source reduction, reuse and recycling (UN Environment Programme, 2019).

As a report from VCI & Deloitte (2017) outlines, a large proportion of the changes expected over the coming years has a disruptive character for the chemical industry. Several of these trends are closely linked to the digitalization of business models, while many developments relate to sustainability topics and circular economy concepts. Moving from the globalization era (1980-2010) characterized by horizontal M&A and global segment leaders, the chemical sector has now adopted “on purpose” technology, characterized by products such as hybrid materials and spin electronics. As a report on Digitalization in Chemical Distribution (Deloitte, 2017a) outlines, whereas the old world (defined as “More is Better”) was characterized by commoditization, deflation and dematerialization, the new world (expressed as “Sustainable is Smarter”) integrates new materials, circular economy sustainability and disruptive technologies. As a consequence, these disruptive changes provide chemical companies with opportunities in new growth areas but also convey complex challenges.

2.2 The chemical sector and sustainability

2.2.1 The perception of the chemical sector

Due to the nature of its activities, the chemical sector inherently has a high impact on the environment. Also, it often operates in areas of conflict or jurisdictions where there is poor enforcement of labour, environmental or business integrity standards. These conditions shape the sector as exposed to greater risk from malpractice with regard to bribery, corruption, child labour, poor health & safety, worker exploitation, as well as pollution (Corporate Citizenship & Business & Sustainable Development Commission, 2016). Consequently, this business-to-business industry experiences sustainability pressure because of the expectations of the consumer goods companies it supplies, on top of other factors making this major industrial and carbon-heavy sector embrace sustainability (CSR Europe & PwC, 2018).

Before 2000, the chemical industry faced little demand for sustainability beyond the need to protect worker health and safety and prevent environmental pollution. Since then, ambitions have broadened. Indeed, there has been an increased pressure from consumers, general public, NGOs, retailers, and investors (Boston Consulting Group, 2017). According to

the results of a survey (GlobeScan, 2013) on 1,000 representative adults per country in 26 countries, the chemical industry was rated by the global public as the second worst performer on CSR. In 2014, a similar survey (GlobeScan, 2014) performed on representative samples of 1,000 adults per country in 24 countries confirmed that the chemical industry is among the less trusted industries, more markedly among developed countries.

2.2.2 Definitions of green and sustainable chemistry

In reaction to these pressures, the chemical sector has attempted to position itself as a sustainability pioneer relatively early. A systematic approach to the design of chemistry aligned with sustainability was introduced in 1991, defined as “the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances” and codified by a set of principles in 1998 as stated by Anastas and Warner (cited in Anastas & Zimmerman, 2018). This approach, known as **green chemistry**, has been practiced in academia and industry worldwide and is considered as an important scientific foundation towards enhanced integration of sustainability (Anastas & Zimmerman, 2018).

The definition of green chemistry emphasized one of the two domains of ethical issues related to chemistry, namely the external domain, consisting in the issues affecting the world outside of the institution, including society and the environment. A new approach, called **sustainable chemistry**, emerged and broadened the scope by including the second domain of ethical issues, the internal domain, which is related to profession and research ethics relevant within the chemical community and mostly the responsibility of individual people (Mehlich, Moser, Van Tiggelen, Campanella, & Hopf, 2017). The holistic approach of sustainable chemistry therefore distinguishes itself from green chemistry and from operational safe use of chemicals (Blum et al., 2017); although it encompasses green chemistry and must respect its principles, it provides additional aspects in order to enable and empower the conduct and impact of chemistry of sustainability (Anastas & Zimmerman, 2018). These aspects include health and environment but also social conditions, research, science and economic dimensions (Blum et al., 2017). As a direct implication, this approach requires considering an ecosystem of economics, policy, interdisciplinary engagement, equity, education, regulation, metrics, and awareness (Anastas & Zimmerman, 2018), the related system of actors, institutions and culture, and encompassing the entire lifecycle of chemical products. Therefore, it demonstrates the responsibility of all stakeholders along the lifecycle chain, requiring them to join efforts to develop common strategies for action and activities (Blum et al., 2017).

2.2.3 The role of the chemical sector in achieving the SDGs

The role of the chemical industry in society is incontestable. According to the UN Environmental head Erik Solheim, the industry provides a number of products from which environmental and societal issues arise (Stringer, 2018). In the business case made in the “Better Business, Better World” report (Business & Sustainable Development Commission, 2017), USD 12 trillion can be leveraged by sustainability by 2030, including USD 4.3 for energy and materials, USD 3.7 for cities and urban mobility, USD 2.3 for food and agriculture and USD 1.8 for health and well-being. All these focuses are directly or indirectly impacted by the chemical sector, which further accentuates its position as a pivotal player.

The chemical industry has been looked on as a major contributor towards achieving the SDGs since their launch (Stringer, 2018). Indeed, it is considered as a sector with touchpoints across SDGs, having strong relevance towards multiple goals. Achim Steiner, executive director of the UN Environment Programme, confirms that chemical products play a direct role in multiple SDGs, including SDG 3, 6, and 12 (Chemical Watch, 2015). As an illustration, the SDGs set ambitious targets for improving global health by reducing dependence on hazardous chemicals through SDG targets 3.9, 6.3, and 12.4, the latter explicitly addressing sound management of chemicals (Rossi, Peele, & Edwards, 2018). Moreover, the sector is closely linked to SDGs 14 and 15 (Corporate Citizenship & Business & Sustainable Development Commission, 2016) and may have other strong but complex linkages with SDGs 2, 7, 8, 9, 11, 13 and 17 (Blum et al., 2017), as demonstrated in Table 2.

Direct role (Chemical Watch, 2015)		
		
Close linkages (Corporate Citizenship & Business & Sustainable Development Commission, 2016)		
		
Strong but complex linkages (Blum et al., 2017)		
		
		
		

Table 2: Chemical sector's role and linkages with regard to SDGs (Blum et al., 2017; Chemical Watch, 2015; Corporate Citizenship & Business & Sustainable Development Commission, 2016)

2.2.4 Opportunities of the SDGs for the chemical sector

The transformation of stakeholders' expectations and the increasing pressures on a range of sustainability measures create a window of opportunity for chemical companies to

shift to solution providers, rather than product sellers responsible for these problems (PwC, 2019). From a broad perspective, integrating sustainability offers benefits to multiple parties, including the chemical community, in terms of public trust and sound translation from science and technology to economy and business; and society, through more sustainable management of risks as well as social and environmental impacts (Mehlich et al., 2017).

Undeniably, the greater focus on sustainability trends and SDGs presents new growth opportunities for chemical companies that were not possible before (PwC, 2019). Each of these opportunities has been associated with sets of SDGs, based on a report on SDGs & Sectors (Corporate Citizenship & Business & Sustainable Development Commission, 2016)², as shown in Table 3. First, **innovation & market development** can be achieved by designing and offering new products and services that address environmental & health challenges. Second, **operational efficiency** can significantly **reduce costs**, as the chemical sector is a large consumer of water and energy and is well positioned to contribute to energy efficiency and greenhouse gas reduction in other sectors. Third, **reputation management** can be enhanced by managing potential negative social and environmental impacts associated with the sector, including health effects of chemicals, labour rights, child labour, health and safety, pollution. Moreover, addressing chemicals, waste, and pollutions problems can promote economic growth; as an illustration, the industry can be a significant player in addressing the challenges of packaging and in expanding the reach of recycling (PwC, 2019). Fourth, fostering sustainable management of depleting natural resources can further advance **risk management and reduction** (Corporate Citizenship & Business & Sustainable Development Commission, 2016).

Growth opportunities (Corporate Citizenship & Business & Sustainable Development Commission, 2016)	
Description	Related SDGs
Innovation and market development	   
Efficiency and cost savings	   
Reputation management	     
Risk reduction	  

Table 3: SDGs related to growth opportunities of the chemical sector (Corporate Citizenship & Business & Sustainable Development Commission, 2016)

² The report on SDGs & Sectors uses the Industry Classification Benchmark, which includes 10 industry sectors. These opportunities are made for the Basic Materials, encompassing the chemical sector, together with forestry, papers, metals and mining sectors.

More specifically, the ICCA (2017) has listed 6 impact areas that the chemical sector has on the affiliated SDGs presented in Table 4. These are further confirmed by KPMG and UN Global Compact (2018) in the SDG industry matrix report which emphasizes four opportunities for shared value for the chemical sector, namely energy for all, zero-carbon energy, sustainable production and community development.

Impact areas (ICCA, 2017)	
Description	Related SDGs
Health and well-being	  
Sustainable consumption and production	
Energy, environment, sustainable cities	    
Sustainable economies	 
Learning and education	  
Partnerships and capacity building	

Table 4: SDGs related to impact areas of the chemical sector (ICCA, 2017)

With regard to SDG 12, the change in public preferences toward sustainable production and consumption requires the development of new products and business models. In a circular economy, the chemical sector can utilize growth potentials: for example, by supporting customers in reaching their sustainability targets or extending their core business with new circular business models, taking into account the whole life cycle (VCI & Deloitte, 2017).

2.2.5 The current integration of sustainability within the chemical sector

Although the SDG program is relatively recent, many chemical companies are already aligning their strategy with the goals (Axon & James, 2018). Chemical companies and industry associations have released individual strategies, such as Cefic's sustainability charter (2017), the American Chemistry Council's (ACC, n.d.) sustainability principles, the Sustainable Portfolio Management also called SPM (Solvay, 2018b), or BASF Eco-Efficiency analysis tool.

The 2014 sustainability & innovation global executive study and research project conducted by BCG, the MIT Sloan Management Review and UN Global Compact (Kiron et al., 2015) showed that 85% of the surveyed chemical companies reported having a sustainability strategy, which is higher than any other industry studied. However, this research also indicated that companies may struggle to develop effective business cases for investment, since only 36% said their company had developed a proven value proposition for sustainability. In line with

these results, a survey on 4,900 businesses (KPMG, 2017) demonstrated that 81% of companies from the chemical sector were reporting on Corporate Responsibility in 2017, which has seen an increase of 6 percentage points since 2015, the highest rate compared to other sectors.

2.3 Collaboration in the chemical sector towards sustainability and SDGs

2.3.1 The need for collaboration

Anastas and Zimmerman (2018) argue that as a consequence of the centrality of the chemical sector in the SDG agenda, an integrated interconnected system must be used to address sustainability challenges, rather than individual methods. This calls for diversity among the actors involved in advancing the SDGs in the sector, allowing to frame a broad range of perspectives, based on the principle that “diversity begets resilience and homogeneity begets vulnerability” (Anastas & Zimmerman, 2018). Nowadays, science is highly embedded into a network of stakeholders and interests, which enforces scientists to communicate their advancements to non-scientists, including the public to a large extent (Mehlich et al., 2017).

These arguments are supported by the report on SDGs & Sectors (Corporate Citizenship & Business & Sustainable Development Commission, 2016), which categorizes sectors based on their level of linkages with SDGs and the opportunities and risks provided by these SDGs. From this mapping, three role categories emerge: the growth nexus, the risk nexus and the enablers, as plotted in Figure 4.

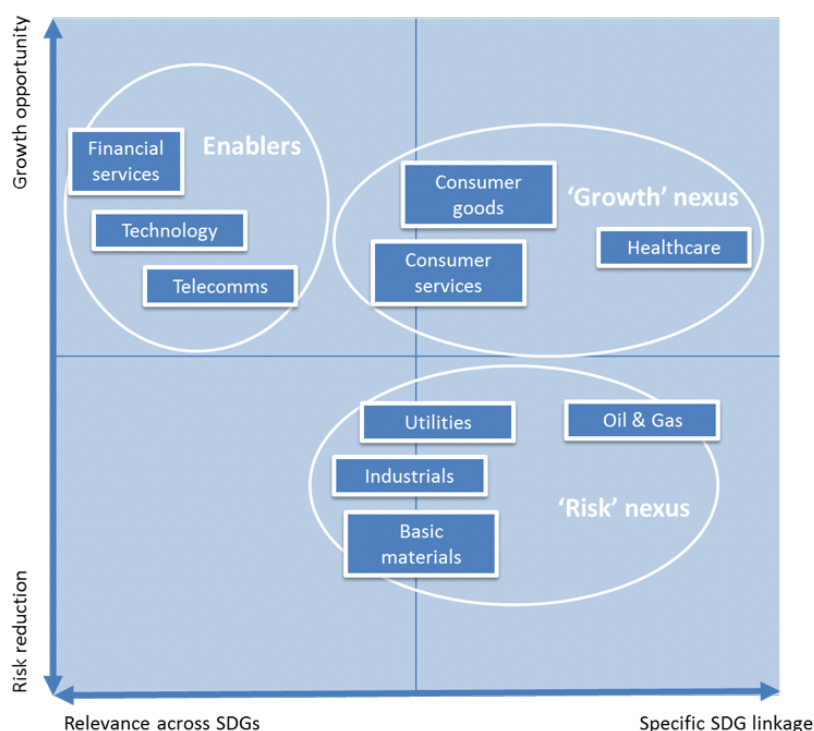


Figure 4: The three types of nexus based on sectors classification (Corporate Citizenship & Business & Sustainable Development Commission, 2016, p.20)

The chemical industry, falling under the Basic Materials sector³, is part of the risk nexus, together with high-impact industries such as Oil & Gas. For this category, engagement requires focusing on systemic change and coalition building, otherwise the sector may “shy away from the bigger and most material challenges” (Corporate Citizenship & Business & Sustainable Development Commission, 2016, p.21).

2.3.2 Existing collaborations in the chemical sector related to sustainability

Results of a research from CSR Europe and PwC (2018) on 16 European sector associations show that the 2 chemical associations surveyed were ranked 4th and 5th in terms of sustainability maturity with scores averaging 62%, which is 10 percentage points above the average maturity level. Moreover, a research from BCG, MIT Sloan Management Review and UN Global Compact (Kiron et al., 2015) found that among the 2,500 enterprises reviewed, the chemical industry showed one of the most collaborating attitudes for business activities such as Research & Development, Supply/ procurement, Manufacturing/ service, and product use.

Multiple collaborations have been brought to life to support the sector in the development, design and application of chemical products, although to date, most are not directly aligned to SDGs (Axon & James, 2018). A few of these initiatives are cited in the next paragraphs.

Responsible Care, a worldwide collaboration of chemical companies, aims at increasing worker safety and environmentally sound management of chemicals by adopting robust health, safety and environmental protection policies around the responsible use of chemicals since 1984. Every three years, multi-stakeholder teams verify that member companies are following the principles. Since 1992, member companies have substantially reduced toxic substance and greenhouse gas emissions; improved air and water quality; reduced hazardous waste; and improved workplace, process, and community safety (DiVito & Sharma, 2016; ICCA, 2019).

Together for Sustainability is a voluntary commitment of 19 multinational companies collaborating with actors within their supply chains on improvements in health and safety, environment and social matters. The programme provides instruments to over 8,000 suppliers to identify strengths and areas for improvement and to advance sustainability (Cefic, 2017).

³ The “Basic Materials” industry sector includes the chemical sector, together with forestry, papers, metals and mining sectors.

UN's global chemicals program, the Strategic Approach to International Chemicals Management (SAICM), established in 2006, elaborated plans for global cooperation in **sound management of chemicals and waste (SMCW)** beyond 2020 by creating a legally non-binding initiative with a multi-stakeholder approach (Honkonen & Khan, 2017; Stringer, 2018).

In the continuity of its Sustainability Charter, Cefic (2017) launched the **Chemistry CAN** initiative, highlighting the potential of the chemical sector and its main contribution to the SDGs and, in particular, to four key aspects, namely low-carbon economy, resource efficiency, circular economy and “people and planet”, or the prevention of harm to humans and the environment through the entire life cycle (Cefic, 2016, 2017).

2.3.3 Next steps

The existence of these numerous but independent initiatives demonstrates a gap and an opportunity for a harmonized and systematic tool to assess the development, manufacturing and use of chemical products, in order to allow measurement of benefits that can be mapped onto specific SDG indicators (Axon & James, 2018). As an example, proposed recommendations to the aforementioned SMCW include the need to reaffirm links with SDGs and targets (including 3.9, 6.3, 12.4, 12.5 and 14.1) but also with the broad agenda as the sector addresses all SDGs directly or indirectly (Honkonen & Khan, 2017). Therefore, there is a need for further developing methodologies and mechanisms to use such indicators as well as appropriate instruments to comprehensively evaluate approaches or solutions based on measurable and quantifiable indicators (Blum et al., 2017).

In order to further develop sustainable chemistry in collaboration with all stakeholders on a global scale, there is a need for a “Roadmap of Sustainable Chemistry” based on a step-wise approach to attain the SDGs (Blum et al., 2017). According to CSR Europe and PwC (2018), stakeholders across all sectors should support efforts to develop robust sectorial SDG Roadmaps to guide their sector's shift to sustainable development and galvanise sector transformations to address SDG risks and opportunities. An open willingness to share best practices across the chemical industry would serve to facilitate the realization of such a tool (Axon & James, 2018). Knowledge, activities and competencies in the area of sustainable chemistry need to be bundled and networked internationally through strengthened collaborations between stakeholders (Blum et al., 2017). As a reward, these active strategies will generate long-term value for companies, their shareholders, the public and the planet (Rossi et al., 2018).

Chapter 3. Competitor collaborations in the frame of Sustainability

The purpose of this chapter is to define competitor collaborations dynamics and identify the success factors of intra-sector collaborations, thereby introducing an answer to **research questions n°2 and 3**. First, the concepts of **knowledge systems and partnerships** are defined, and the classification of collaborations is introduced. Second, the **drivers, benefits and challenges of collaborations** are identified. Third, the **variables of successful collaborations** are outlined, and recommendations are proposed to tackle the previously identified challenges.

3.1 Definition and classification of competitor collaborations

3.1.1 Definition of competitor collaborations

Partnerships in general relate to the informal and formal interactions between stakeholders as they seek to share knowledge but also build the trust required for efficient interactions (McAllister & Taylor, 2015). In particular, knowledge systems can be viewed as networks of actors connected by formal and informal relationships that dynamically combine doing, learning, and knowing (Tengo et al., 2017). As far as the private sector is concerned, Rycroft (as cited in Petrescu, Rus & Negrusa, 2014) defines networks of firms as specific types of structure, created for active collaboration, either open-ended or limited to a specific task. Within these networks, organizations “create, acquire and integrate diverse knowledge and skills required to innovate complex technologies” (Petrescu, Rus & Negrusa, 2014, p.596-597).

3.1.2 Classification of competitor collaborations

DiVito and Sharma (2016) classify collaborations between competitors in four categories, based on two features: the nature of the collaboration (cooperation vs. competition) and its structure (formal vs. informal). Characteristics of these features are outlined in Table 5.

Cooperation	Competition
Participants have similar goals, therefore more likely to achieve collective goals.	Individual firms' interests are protected at the expense of collective goals.
Information is freely shared.	Hesitance about sharing information.
Willing to implement internally the decisions made by the collaboration, even if they lead to significant changes.	Unwilling to make significant changes within their organization to implement collective decisions.
Likely to remain engaged for the long term, even after the agreements expire.	Motivated to stay in the collaboration and mindful of the resources spent (time, money).

Informal structure	Formal structure
Trust between members is based on relationships, which encourages rich information sharing between firms.	Required information exchange leads to all firms sharing similar kinds of information.
Barriers to entry, participation, and exit in the collaboration are low.	Clear criteria for entry, participation, and exit. Penalties discourage firms from being passive participants and spur them to implement collective decisions. Scorecards, dashboards, and other visible measures can track participation.
Ad-hoc decision making.	Well-defined structures and clear decision-making processes. Clear milestones and interim steps support progress toward collective goals.
Free riding is possible due to lack of formal structures, though it becomes less likely as the relationships between firms grow.	Financial penalties decrease free riding.
Firms hold each other accountable.	Formal structures make individual firms more accountable.

Table 5: Classification of collaborations between competitors (DiVito & Sharma, 2016)

Additionally, many competitor collaborations start with an informal structure and become more formal over time. Informal structures work best when firms have a similar level of urgency around the sustainability issue and are overall more attractive for firms; therefore, they increase the membership base (DiVito & Sharma, 2016).

3.2 Benefits and challenges of competitor collaborations

3.2.1 Benefits and drivers of competitor collaborations

Horizontal collaborations between industry's competitors, including SMEs, are playing an increasingly important role (Bernal, Burr, & Johnsen, 2002). Firms' incentives to join a collaboration are diverse. In the case of sustainability collaborations, these motivations range from external pressure from stakeholders to internal motivations, such as a firm's sustainability values or the prospect of financial gains (DiVito & Sharma, 2016). Additionally, since the search of competitive advantage is part of the main drivers of collaborations, competitor

collaborations dynamics imply that companies need to possess and offer competitive advantages superior to those of competitors (Bernal et al., 2002).

By pooling their resources and exchanging information and expertise, firms may benefit from a large array of advantages. Indeed, being in a position of vulnerability due to a changing industry and technological challenges encourages firms to join forces with competitors possessing complementary resources (Gnyawali & Park, 2011) in order to acquire better adaptation to market challenges (Petrescu, Rus, & Negrusa, 2014). Baum, Cown and Jonard found that other various factors can drive companies to form innovation network, including social capital, complementary knowledge stocks and knowledge dynamics (as cited in Petrescu, Rus & Negrusa, 2014). Indeed, research results from Leea, Parkb, Yoonc, and Park indicate that networking can be an effective way to facilitate open innovation among these companies (as cited in Petrescu, Rus, & Negrusa, 2014), thereby allowing them to enjoy rapid innovation and knowledge transfer and develop new business opportunities such as internationalization (Bernal et al., 2002). Further, these collaborations may enhance the capabilities of a company, thereby broadening the scope of services offered (Bernal et al., 2002) and allowing them to benefit from increased business productivity (Petrescu, Rus, & Negrusa, 2014).

Beyond the company level, competitor collaborations may also generate positive impacts on the entire industry by advancing technological innovation and fostering benchmarking (Gnyawali & Park, 2011). This economic development is strengthened by the participation of numerous companies (including SMEs) and the presence of benefits including: the applicability of outcomes to all partners, the enhanced ability to deal with complexity, and the enhancement of learning possibilities (Forfas, as cited in Petrescu, Rus, & Negrusa, 2014).

3.2.2 Challenges of competitor collaborations

Collaborating partners are recommended to anticipate and manage the paradoxical factors of these types of relationship in order to manage competitor collaborations and generate positive outcomes (Gnyawali & Park, 2011). Indeed, competitor collaborations may be challenging as they may lead to high levels of tension and loss of knowledge to a competitor-partner, causing power variations between industry players (Gnyawali & Park, 2011).

DiVito and Sharma (2016) outline numerous challenges that may be encountered during each stage of collaboration between competitors in the frame of sustainability. These include: motivations asymmetry, the decrease in involvement of resources over the course of the collaboration, the fear of sharing more than receiving, the lack of implementation capabilities, the need to define outcomes valid to every participant, and the management of the continuity

and closure of the collaboration, based on regulatory changes and firms' motivations. In particular, the study of Petrescu, Rus, and Negrusa (2014) demonstrates that SMEs are generally reluctant to join an innovation network for reasons including: lack of awareness of the potential benefits of a network, the perception of these collaborations as a competitive threat, their risk-adversity, the lack of resources to get involved, and organizational rigidity.

Moreover, representation is a crucial challenge. Partnerships often implicitly preselect partners with high capacity, thereby excluding inadvertently those most vulnerable (McAllister & Taylor, 2015). Since scientific knowledge is produced in a context of power relations and is therefore not equally distributed, some knowledge may be considered the domain of specialists or persons of specific positions (Tengo et al., 2017). Therefore, multiple factors must be carefully considered, including: identification of knowledge holders and their institutions, their selection, their engagement, the representation form allowed, and well-designed processes that build trust and communication across barriers of language, culture, worldviews and experience (Tengo et al., 2017). As a reward, managing representation in an inclusive way may allow enhanced plurality in the context of sustainability. Plurality recognizes that sustainability problems can be experienced and understood differently by different groups, therefore different framings may produce different results (Blythe, Nash, Yates, & Cumming, 2017). However, as recommended by Haas (2017) regarding the need for expert advice for implementing the SDGs, inclusiveness should not be valued over effectiveness. More precisely, relevant knowledge and the ability to debate with others are also part of the equation.

3.3 Factors of success of competitor collaborations

3.3.1 Significant variables of competitor collaborations

Reniers, Dullaert, & Visser (2010) identified 12 drivers and variables on which the stability of horizontal collaborations depends. These are classified into soft factors, hard factors and independent factors. The **soft factors** influencing horizontal collaborations include: openness and transparency between companies; trust and confidence of an organization in the reliability of other organizations; cultural fit, which is used to identify which partners are suited for collaboration; and external willingness to collaborate, representing the belief of the collaborator that the partnership is of an importance that requires maximum efforts. Second, the **hard factors** consist in: benchmark results concerning potential partner, allowing the identification of strengths, weaknesses, opportunities and threats in the frame of a potential partnership; the driver of market position's enhancement; the driver of return on collaboration investments; potential investigations into a potential partner's financial situation; and the

possibility of knowledge flows between partners. Last, **independent factors** comprise external innovation potential, i.e. the possibility of a collaborative arrangement leading to innovation; the extent to which a partner is willing to adapt, change, optimize some of its activities for the benefit of a collaboration; and the level of complementarity/ of being supplementary. Regarding this last point, the SDG Fund, Harvard Kennedy School CSR Initiative, and Inspiris Limited (2015) further explain that competence of all partners must be identified, and their specific capabilities and strengths need to be reflected in relevant roles and responsibilities.

Kiron et al. (2015) also found from their survey on 2,500 commercial enterprises that the greater the amount of **former partnerships**, the larger the chances for sustainability collaborations to be successful. Although identified by Reniers et al. (2010) as a potential variable, the results of their empirical research did not position it as a pivotal factor.

3.3.2 Recommendations over the three steps of competitor collaborations

DiVito and Sharma (2016) have identified different steps in the collaboration process, as well as recommendations to face the challenges inherent to these phases.

a) The formation stage

During the first step, firms must align their motivations, define a common goal and systematically refer to it in internal communications and collective decisions (DiVito & Sharma, 2016). Successful initiatives begin with a period of trust and relationship building, during which differences in epistemologies are discussed and approaches to working together are established (Blythe et al., 2017). As emphasized by SDG Fund, Harvard Kennedy School CSR Initiative and Inspiris Limited (2015), successful partnerships set clear expectations around ways of working and timeframes for delivery. As Van Tulder et al. outline, “the more companies are able to define their own internal priorities, the more they can line up with partners across their own sector, and the more they are able to build an enabling environment that can create radical or disruptive innovation” (as cited in Van Tulder, 2018, p.106).

b) The evolution stage

During the second step, four points of attention are highlighted. First, collaborations are recommended to **lock in firms’ resource commitment** through formal structures (such as mandated attendance and annual membership fees) and involve firms’ top leaders to ensure continued resource allocation. Second, DiVito and Sharma (2016) recommend the following: having formal structures ensuring member firms that the **knowledge shared** will not be used against them; developing relationships based on **trust**; and encouraging firms to **lead by example**. Third, in order to ensure implementation, collaborations are encouraged to develop a

volunteer auditing group composed of a subset of participating firms; and to encourage firms with more resources to **assist smaller firms** (DiVito & Sharma, 2016). The SDG Fund, Harvard Kennedy School CSR Initiative, and Inspiris Limited (2015) further add that successful partnerships often employ an intermediary organization. Fourth, it is encouraged to involve member firms to **divide collaboration's long-term outcomes** into smaller, more concrete, short-term ones; and to use **feedback loops** (DiVito & Sharma, 2016). The SDG Fund, Harvard Kennedy School CSR Initiative and Inspiris Limited (2015) also encourage clear focus and purpose of partnership outcome and insist on the need for mutual benefit for all partners.

c) The closure stage

During the last step, firms need to reassess their desire to stay in the collaboration based on their priorities and convene the firm's leaders to discuss the (long-term and intangible) benefits and costs issued from participation. Collaboration leaders are encouraged to discuss with the participants the costs and benefits of different options (DiVito & Sharma, 2016). As added by SDG Fund, Harvard Kennedy School CSR Initiative, and Inspiris Limited (2015), sustained partnerships are self-managed either through continued engagement of the partners or through a mechanism to replace the original partners.

3.3.3 Decision-making processes in competitor collaborations

Decision-making in multi-stakeholder partnerships can range from highly centralized, where decision-making power resides with a single entity, to highly decentralized (or 'collaborative') decision-making where the aim is to achieve consensus among partners (Innes and Booher, as cited in MacDonald, Clarke, & Huang, 2018).

The findings of MacDonald et al. (2018) indicate that for multi-stakeholder partnerships in complex environments, decentralized decision-making is more likely to result in partnership capacity than centralized. Information and communication systems that provide partners with updates on partnership activities and progress, opportunities for training, and chances to interact with other partners are part of these decentralized designs, as well as monitoring and evaluation systems that engage and re-engage partners at different stages of plan implementation (Clarke and Erfan, as cited in MacDonald et al., 2018). The SDG Fund, Harvard Kennedy School CSR Initiative, and Inspiris Limited (2015) also affirm that equity between all partners, each represented by an equal stake and voice, regardless power or influence, is crucial.

Part II. Practical Analysis: The Chemical Sector SDG Roadmap

Chapter 4. The Chemical Sector SDG Roadmap: Contextualization

This chapter aims at introducing the Chemical Sector SDG Roadmap and the documents and initiatives which led to the creation of its parent document, the SDG Sector Roadmaps guidelines created by WBCSD. First, the **drivers of the SDG Sector Roadmaps initiative** are outlined, further emphasizing the influence of the “Better Business, Better World” report (Business & Sustainable Development Commission, 2017). Second, the **SDG Sector Roadmaps guidelines** are reviewed, by describing the document’s characteristics and key contents. Third, the **Chemical Sector SDG Roadmap** is introduced from a **factual perspective**, allowing to describe its publication, its structure of contents and its contributors.

4.1 The drivers of the SDG Sector Roadmaps initiative

4.1.1 Motivations

The motivations for sustainability-related collaborations and for the development of sustainability documents by peers have been demonstrated in previous sections (c.f. 1.3.3).

In particular, the “Better Business, Better World” report (Business & Sustainable Development Commission, 2017) encourages industries to create detailed roadmaps to guide sectors’ shift to sustainable development and SDGs and assess the impact of that shift on progress towards the goals. According to the report, roadmaps would allow multiplying new opportunities, helping incumbents managing the risks of sustainability disruption, and avoiding governments’ drastic action that would happen in the case of lack of initiatives from the sector.

Further, according to WBCSD, the roadmap exercise allows sectors to articulate a common vision for how the industry can contribute to the SDGs and establish collective pathways to drive and facilitate contributions. The purpose of a roadmap is dual: the roadmap is a call to action for the sector but also an engagement of others. Companies and sectors benefit from this tool as it helps the sector to strengthen its license to operate, manage operational and regulatory risks, and open up new growth markets (WBCSD, 2018e), as aligned with the opportunities identified in 1.2.4.

4.1.2 Recommendations from the “Better Business, Better World” report

The “Better Business, Better World” report (Business & Sustainable Development Commission, 2017) outlines the following key recommendations for future SDG sector Roadmaps:

1. **Develop a vision of the sector 2030 outlook** if SDGs were treated as a strategic framework for better growth. Address crosscutting goals that relate to basic human rights, rather than company-specific targets.
2. **Map the most significant, urgent and material issues** and identify the areas of change needed to realize the vision. Identify key markets and value chains, activities that need to transition, and the drivers for efficient redeployment of resources and a just transition.
3. **Define potential solutions to these issues**, including new technologies, business models, products and services that will increase consumer satisfaction and solve societal problems. Clarify to stakeholders the tipping points to be reached in any specific market to scale these solutions.
4. **Describe potential barriers to solutions** and analyse **options** for overcoming them that would be fair to all sector players involved, including their workforces and people in their supply and distribution chains.

4.2 The SDG Sector Roadmaps framework (WBCSD)

4.2.1 Creation and contributors

Following the advice of the “Better Business, Better World” report (Business & Sustainable Development Commission, 2017), the SDG Sector Roadmaps framework was released on April 17, 2018 by WBCSD and ERM (Environmental Resources Management), and refined with the experience gained through the piloting of these guidelines with a coalition of leading chemical sector WBCSD member companies and industry associations, who have been early pioneers of the methodology (WBCSD, 2018f), as it will be described in Chapter 5.

4.2.2 Audience

Based on this framework, the main audience is the sector itself, which benefits from practical guidance and inspiration through the roadmap. Moreover, the roadmap can be used as a reference point for wider stakeholders such as policymakers, investors and civil society willing to deepen their understanding of the potential of particular sectors to contribute to the SDG agenda and the maturity of their efforts. Importantly, a sector roadmap also aims at inspiring other sectors to launch their own roadmap (WBCSD, 2018e).

4.2.3 Key steps

According to WBCSD, a sector roadmap is a step-by-step process that companies from a given sector can follow as they join their forces to define and realize a common vision of the industry contribution to the SDG agenda. This intends to be a set of broadly applicable guidelines, relevant across national, regional and global levels (WBCSD, 2018e).

To achieve this goal, the framework is framed in a 3-steps process which follows each of the recommendations previously cited (c.f. 4.1.2), as depicted in Figure 5:

1. Establishing their sector's current level of interaction with the SDGs with respect to its impact on the SDGs throughout the value chain;
2. Identifying the sector's most significant opportunities for impact;
3. Establishing key action items and monitoring systems in order to chart a course towards the sector's 2030 vision.



Figure 5: Key steps in developing an SDG Sector Roadmap (WBCSD, 2018e, p.5)

4.2.4 Key components and enablers

Throughout the process of creating a framework for SDG Sector Roadmaps, WBCSD has decided on a set of six core components for meaningful roadmaps, detailing the aforementioned steps (c.f. Figure 5):

1. **State a clear, ambitious but realistic vision** of where the sector aspires to be and what the sector aims to achieve in relation to the SDGs by 2030 and beyond. The vision should be set based on the sector's current position and its level of ambition to contribute to the SDGs, and reached via consensus with stakeholders, considering industry dynamics, sector and company maturity in terms of sustainability, value chain characteristics, and geographic scope and scale.
2. **Demonstrate how the sector interacts with the SDG agenda** and which of the SDGs it can impact the most. The guidelines recommend using a qualitative scale to manage the scale and complexity of the SDG mapping at target level. It also recommends renewing periodically the assessment of the potential of the sector as well as other steps.
3. **Identify key impact opportunities** where the companies involved can have the most significant collaborative impact on achieving the SDGs while unlocking business value. This can be done through sector but also stakeholder roundtable sessions.

4. **Explore actions** that sector organizations can take to move towards advancing these opportunities and make sure potential value is achieved. Short-term actions (1-3 years) typically involve process innovation, medium-term actions typically take several years, and long-term actions are directed to 2030.
5. **Understand common barriers and identify impact accelerators** within the sector and across its value chain.
6. **Engage with key stakeholders** across the sector's value chain.

On top of these components, the effectiveness of the roadmap depends on the recognition and undertaking of efforts regarding three key enablers. First, companies and partners must explore aligned cross-sector visions, the means to scale change, shared value chain dependencies and opportunities, the combination of knowledge and resources related to data collection and monitoring, and the co-creation of solutions and innovation. Second, the roadmap must anticipate and address data needs by undertaking actions on capacity building, identifying new collection methods and championing innovative partnerships. Last, the roadmap should seek to support the required conditions for innovation, including technological innovation and scaling of transformative new products and processes (WBCSD, 2018e).

Last, progress monitoring, measuring and reporting is strongly recommended. In order to do so, a champion can be made responsible for the implementation of monitoring and communications plan. Additionally, a governance framework may be established in order to regularly engage participants. Moreover, a communications strategy including the delivery of updates on progress towards the SDGs should be made and should seek to engage internal stakeholders but also external stakeholders such as governments, industry associations, consumers, employees, sector peers, civil society and media. Last, annual sectoral reporting is encouraged, as well as regular monitoring meetings of participants and potentially, individual disclosures of companies' progress (WBCSD, 2018e).

4.3 Description of the Chemical Sector SDG Roadmap

The Chemical Sector SDG Roadmap is the first SDG Sector Roadmap issued by WBCSD and was released in July 2018, following the guidelines.

4.3.1 Publication

The roadmap is available in English in **pdf format** on the website of WBCSD. Additionally, an executive summary in Japanese is provided (WBCSD, 2018b).

It is possible to access to the contents of the roadmap through an **interactive website**, displaying the contents in a user-friendly way at <https://sdgroadmaps.wbcd.org/>. For example,

every reference the roadmap uses can be easily accessed. Moreover, navigating the roadmap is made easier by introducing headlines. Additionally, further information is provided on this dedicated microsite, including updates on progress regarding the implementation of the Roadmap. These updates are at the moment (May 2019) all grouped in Part 3: Pathways to 2030 and currently concern 5 out of the 18 impact opportunities. The reader has the possibility to interact with the impact opportunities by clicking on them and then accessing additional information on the actions undertaken by WBCSD, roadmap contributors and other WBCSD members.

4.3.2 Structure of contents

The document is divided into 4 main chapters, as described below.

a) Overview

First, the roadmap starts with a **foreword** stating the potential of the SDGs and the business case made in “Better Business, Better World” report (Business & Sustainable Development Commission, 2017), to which WBCSD contributed. Then, it emphasizes the importance of partnerships with sector peers in order to realize the SDGs and more concretely, the SDG Sector Roadmap guidelines, the methodology created by WBCSD in April 2018 to achieve that purpose. Further, delight is shared regarding the contribution of project members and significant emphasis is put on the ambition and purpose of the Roadmap. Last, the desired next steps are underlined and represent a call for action. Subsequently, quotes from WBCSD and co-chairs (Solvay and AkzoNobel) CEOs are presented, giving a tone from the top, emphasizing the instrumentality of this type of collaboration towards the SDGs and the role of the industry, and summarizing the purpose, contents and conclusions of this roadmap. Contributors (co-chairs and project members) are then disclosed.

Second, the **executive summary** depicts the purpose, the audience, the method and approach of the roadmap. Then, it outlines the main findings, including the priority SDGs identified and the impact opportunities related to prioritized SDGs. Finally, the road to 2030 is initiated, showing the next steps of the roadmap and encouraging stakeholders to contribute.

Third, the **introduction** provides a definition of the SDGs, explains the role of business in realizing the SDGs and the opportunities they represent. Then, it justifies the need for a SDG Sector Roadmap, based on the recommendations of the “Better Business, Better World” report (Business & Sustainable Development Commission, 2017). Last, it outlines the method and approach of this roadmap, including the link to the guidelines created by WBCSD, the contributors and their main actions.

b) Part 1: The chemical sector and the SDGs

First, the chapter **describes the chemical sector** and its complexities. The categories of manufacturers are described, together with an overview of the chemical sector value chain. Further, it provides facts and figures showing the role and responsibility of the chemical sector. Last, it provides highlights of the chemical sector existing sustainability initiatives.

Second, the **impact of the chemical sector** on each of the 17 SDGs is demonstrated with examples and for some of them, case studies.

Third, **key goals for the sector** are defined by explaining the method and approach used in the prioritization process and by showing the mapping exercise which led to these conclusions. More specifically, the graph (c.f. Figure 6) is composed of a vertical axis (the sector potential to contribute to SDGs) with a scale from low to high, and a horizontal axis separated in two parts, namely the current level of negative impact and the current level of positive impact on a scale from low to high. This mapping is aligned with the SDG Sector Roadmap guidelines (WBCSD, 2018e). Each SDG is positioned twice (once for negative impact and once for positive impact) and ten priority goals where the industry is the most relevant, has the greatest chance of near-term success and can make the biggest contribution, are selected. SDG 17 is noted as not considered as a priority goal but recognized as a recurring theme and central to the roadmap exercise.

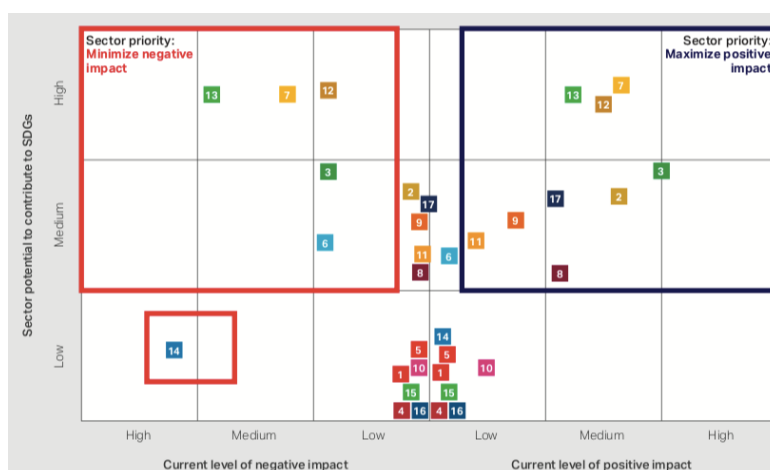


Figure 6: Prioritization of SDGs (WBCSD, 2018b, p.19)

c) Part 2: Impact opportunities

First, the roadmap presents **a summary of the areas for sector innovation, the key themes and cross-cutting factors**, and the **impact opportunities** across key SDGs for the sector, as illustrated in Figure 7. The cross-cutting factors (human rights; the need for a low

carbon economy; circularity and digitalization) are then further described and their transformative impact on the chemical sector is highlighted.

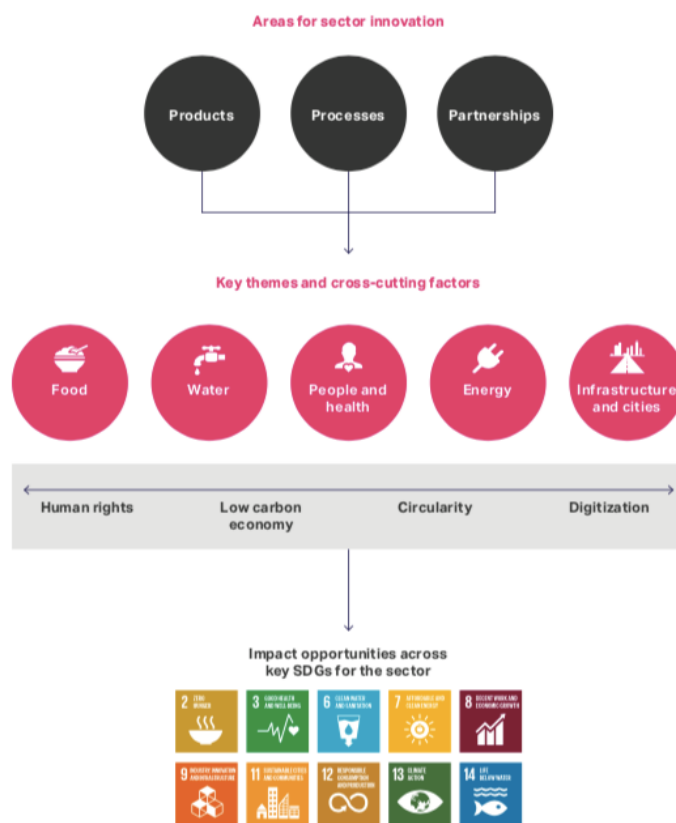


Figure 7: Process of identification of impact opportunities (WBCSD, 2018b, p.21)

Next, the roadmaps derives ways it can have impact in five different fields (food, water, people and health, energy, infrastructure and cities), by choosing key impacted SDGs, providing additional evidence on the impact of the chemical sector and outlining 18 **impact opportunities**, together with their own prioritized SDGs and more specifically, the SDG targets they directly relate to.

d) Part 3: Pathways to 2030

First, this part summarizes the findings from previous sections and highlights tangible actions that the sector can take to maximize its potential for positive SDG impact across short, medium and long-term time horizons. These **impact pathways** are illustrated in the form of tables. For each impact opportunity, the category of sector innovation is assimilated (product, process, partnership), and key action points are underlined. For each of these points, key partners, level of input from sector (from low to high), timeframe (from short-term to long-term), associated SDGs, associated SDG targets and level of potential impact (from low to high) are identified and described.

Second, the road to 2030 is enlightened by reminding the **purpose of the roadmap** and describing the **next efforts** to be undertaken by leading chemical sector representatives from WBCSD. Therefore, it calls other stakeholders for action and contribution through sharing ideas with WBCSD and it informs that updates on the progress regarding the implementation will be made available on a microsite, as explained in 4.3.1.

Third, the authors **thank** the roadmap contributors (name and company), the coordination team (from WBCSD and ERM) and a **disclaimer** explains, among other things, that although the document is released in the name of WBCSD, it does not mean that every WBCSD member agrees with every word. Last, WBCSD is described and contact details are provided (including social media links).

4.3.3 Contributors to the Roadmap

a) Coordinators

WBCSD is a CEO-led, not-for-profit organization based in Switzerland. The organization comprises more than 200 leading companies from all business sectors, working together to accelerate the transition to a sustainable world, and complemented with a Global Network of 70 national business councils. The organization initiated the roadmap initiative and proposed its chemical sector members to take part to this collaboration. WBCSD had a coordination role during the roadmap process (WBCSD, 2018b).

ERM is a management consulting services company based in the United Kingdom. ERM had a coordination role during the roadmap process (WBCSD, 2018b).

b) Contributors

The contributors to the roadmap are all operating worldwide and are considered as leading in terms of size, impact and sustainability maturity. Therefore, all companies and associations involved have a strong background in sustainability strategy and implementation and use the SDGs in their business processes. Some of Cefic's, ACC's and Solvay's initiatives have already been cited in 2.2.5. As members of WBCSD, most contributing companies have participated to numerous collaborative projects, including Portfolio Sustainability Assessment and Life Cycle Assessment. This will be further described in 5.4.1.

The company profile of the contributors is described in Table 6, including the role of companies in the roadmap, their localization, and their 2017 revenues in EUR. This information was found in companies' respective annual reports, taking into account the currency conversion rate on June 2, 2019 (AkzoNobel, 2018; Covestro, 2018; Dow Chemical Company, 2018; DSM,

2018; Evonik Group, 2018; Mitsubishi Chemical Holdings, 2018; Sabic, 2018; Solvay, 2018a; Sumitomo Chemical, 2018).

	Type of organization	Role in the Roadmap	Headquarters	Revenues in 2017 (EUR)
AkzoNobel	Company	Co-chair	Netherlands	9.6 bi
American Chemistry Council	Industry trade association	Project member	United States	
Cefic	Industry trade association	Project member	Belgium	
Covestro	Company	Project member	Germany	14.1 bi
Dow Chemical Company	Company	Project member	United States	55.8 bi (\$62.5 bi)
DSM	Company	Project member	Netherlands	8.6 bi
Evonik industries	Company	Project member	Germany	14.4 bi
Mitsubishi Chemical Holdings	Company	Project member	Japan	30.7 bi (¥3,724.4 bi)
Sabic	Company	Project member	Saudi Arabia	35.6 bi (\$39.9 bi)
Solvay S.A.	Company	Co-chair	Belgium	10.1 bi
Sumitomo Chemical	Company	Project member	Japan	18.1 bi (¥2190.5 bi)

Table 6: Identity and description of Chemical Sector SDG Roadmap's contributors

Chapter 5. The Chemical Sector SDG Roadmap: Empirical Analysis

This chapter aims at analyzing the Chemical Sector SDG Roadmap based on the primary data collected from in-depth interviews with contributors and non-contributors, crossed with theoretical concepts introduced in previous chapters. First, the **research methodology** is explained by outlining its purpose, the type of data collection used, the nature of the data collected and the limits of the methodology. Second, the **interviewees** are introduced based on their profile, their company and their relation with the roadmap, complemented by in-depth information in Appendix 3. Third, the analysis of the roadmap is divided into **key aspects of attention**, each of them thoroughly analyzed through paralleling the insights obtained from interviews.

5.1 Research Methodology

5.1.1 Purpose of the qualitative analysis

The Chemical Sector SDG Roadmap was issued in 2018 by WBCSD, ERM, co-chairs and contributors including companies and associations from the chemical sector. Although the Roadmap includes a methodology section, it provides limited information on the creation process and the details of the collaboration, including the motivations of collaborating companies and the nature of their role in the creation of the tool. Moreover, even though working groups allowing progress monitoring are mentioned, there is no public evidence of their existence yet. Further, no specific recommendations for the roadmap have been publicly displayed yet, although it received both criticism and appraisal. Additionally, since the roadmap's main target audience is the chemical sector players, a complete assessment would require collecting the opinions from non-contributors, namely experts and/or companies who have not been directly involved in the creation of the roadmap in order to analyze the results and perceptions of the tool, its benefits and limitations, the rationales behind (not) using it, the improvements needed etc.

In order to analyze the Roadmap in an accurate and comprehensive way, it is therefore necessary to collect primary data from WBCSD, ERM, co-chairs, contributors and non-contributors in order to fill in the information gaps derived from the aforementioned reasons. Regarding interviewees' selection, attention was paid to the diversity of the participants, in terms of activity, region of activity, company size and level of maturity towards sustainability.

5.1.2 Type of data collection

Since the primary data collection aims at gathering opinions in an open environment, qualitative analysis through individual interviews are privileged. Ultimately, this allows the co-production of data and enables every participant to express his or her ideas in a setting where sincerity and openness are facilitated. For the same purpose, semi-directive interviews were chosen, in order to leave the space necessary to the collection of opinions and understanding of attitudes, while providing a minimal structure to the interviewee.

Due to the need for diversity in the interviewees' selection and based on the decision made for the data collection method, Skype or call interviews were selected.

All interviews were recorded and transcribed, as agreed with each interviewee, and can be found in Appendix 3.5. In a few cases, data have been slightly adapted to improve the readability and/or to preserve the confidentiality of some information.

5.1.3 Nature of the data collected

The interviews conducted aimed at gaining not publicly available insights and opinions regarding the roadmap from industry experts. First, interviews with contributors allowed acquiring information on the creation process of the roadmap, the collaboration dynamics, the methodology used and its application to this specific roadmap, and the next steps of this initiative launched by WBCSD. Further, participants shared their understanding of and opinion on the roadmap, including its target audiences, its accuracy, its applicability to different types of chemical sector companies, associations and organizations, and how these parties use or may use the roadmap. Moreover, the needs and expectations of interviewees, especially non-contributors, were explored in order to analyze if the roadmap answers them and therefore infer potential rooms for improvement. Last, all interviewees were asked their opinion on this type of collaboration and the role of sector roadmaps towards integrating the SDGs across companies.

5.1.4 Limits of the data collection

The number of interviews conducted was limited due to various factors. First, the document is not commonly known by chemical organizations since it was released less than one year ago and because it is not considered as a program or as a standard of the industry. Second, contributors to the roadmap (and sometimes non-contributors) often have leading roles and high responsibilities within their organizations, restricting their availabilities. Third, in a context of fostered data privacy protection, obtaining contact details of specific individuals was not authorized without their consent. Fourth, some regions such as China are complex to be

reached via online channels. Fifth, awareness of documents such as the roadmap requires a prior strong interest in or knowledge of sustainability, which further limits the scope of interviewees interested in this research. Sixth, both contributors and non-contributors may have internal company regulations which prevent them from sharing this type of information for competitive reasons.

5.2 Description of the interviewees

Ten interviews were conducted in the first half of 2019, totaling **425 minutes** of conversations. The interviewees are identified in Table 7 according to their role in the roadmap (if any) and the organization they work in. The interviewees are further described in Appendix 3.4.

Name of the interviewee	Role	Organization
Michel Washer	External	Solvay S.A.
Dominique Debecker	Co-chair	Solvay S.A.
Jean-Claude Pierre	External	Scott Bader Co. Ltd.
Anonymized interviewee	External	Local branch of worldwide company National representative of Cefic
Ann Dierckx	Project Member	Cefic
James Gomme	Coordinator	WBCSD
Luís Araújo	External	National representative of Cefic
Linden Edgell	Coordinator	ERM
Anonymized Project member	Project Member	Anonymous
Mark Didden	Co-chair	AkzoNobel

Table 7: Identity of the interviewees

5.3 Overview of the opinions regarding sustainability and SDGs

5.3.1 The importance of SDGs and further steps for integration

During the interviews, participants shared their beliefs on the importance of SDGs and sustainability at large, as well as the challenges they create.

According to J.-C. Pierre, sustainability can drive innovation, since it allows looking at the business environment from a different, possibly unusual and creative perspective (J.-C. Pierre, interview, April 16, 2019). Whereas MDGs were less known, SDGs are considered by numerous companies as a recognizable and comprehensive set of goals (M. Didden, 21 May 2019) and a successful and substantial framework (D. Debecker, interview, April 5, 2019),

aligned with current societal challenges (A. Dierckx, interview, April 18, 2019; M. Didden, 21 May 2019). The SDGs are of increasing importance to a range of stakeholders, not only NGOs and governments but also customers and investors, confirming the data provided in 1.1.1. Part of this enthusiasm can be explained by the ability of SDGs to account for both positive and negative impacts on a given goal, therefore being an easier approach than the traditional stakeholder value (M. Washer, interview, March 29, 2019).

However, in order to tackle the challenges presented by SDGs, attention must be paid to different aspects. Some of these have already been identified in the literature review (c.f. 1.4.2) and are corroborated or completed by the information provided by the interviewees. First, value and standards must be regularly defined and updated due to the dynamic nature of sustainability (M. Washer, interview, March 29, 2019). Further, sustainability value must be constantly quantified to convince decision-makers, although value from achieving the SDGs goes beyond direct benefits (Anonymized interviewee, interview, April 18, 2019). This is in line with one of the key current challenges identified in the literature review, namely the **lack of understanding of the business case** due to the **complexity of value definition**. Moreover, sustainability decision-making always requires compromises, partly due to interlinkages inherent to the SDGs but also to sustainability at large (M. Washer, interview, March 29, 2019), which relates to the **intrinsic complexity of the agenda** mentioned in the literature review due to its **systemic approach**. Additionally, one of the biggest challenges is to show people how companies are contributing towards sustainability (J.-C. Pierre, interview, April 16, 2019), namely **reporting**. Further, with regard to overall progress, J.-C. Pierre believes that change is too slow (J.-C. Pierre, interview, April 16, 2019). Also, confusion appears due to the existence of a **large number of frameworks** (J.-C. Pierre, interview, April 16, 2019; Anonymized interviewee, interview, April 18, 2019) while companies want to rely on a central framework (M. Washer, interview, March 29, 2019). This large amount of existing material and initiatives can complexify decisions (Anonymized project member, interview, May 13, 2019). Last, smaller companies may lack time, human and financial resources, and guidance to integrate SDGs into their strategy (Anonymized interviewee, interview, April 18, 2019).

When analyzing potential solutions, as highlighted in 1.4.2, D. Debecker explains that the system must be disarticulated by focusing on the target level in order to develop action plans. Moreover, the framework must be aligned with business decisions, by identifying and aligning the opportunities to have both increased economic return and impacts on delivering the SDGs (D. Debecker, interview, April 5, 2019). Moreover, sustainability revolves around stakeholders' expectations, beyond the company internal focus (M. Washer, interview, March

29, 2019). Last, J.-C. Pierre outlines the need to further embed a systems-thinking approach and re-define the notion of success (J.-C. Pierre, interview, April 16, 2019).

5.3.2 The characteristics and the role of the chemical sector

Interviewees shared their perception and understanding of the chemical sector's complexity, importance and reputation, confirming the data provided in the literature review.

The industry's **complexity** is due to the constant interactions between players, as competitors are suppliers and customers of each other, and to the diversity and heterogeneity of players (D. Debecker, interview, April 5, 2019; M. Didden, interview, May 21, 2019). Also, the chemical sector is the **backbone** of the civilization as any field of activity depends on the chemical sector; the more developed the chemical industry, the more developed the other industries (Anonymized interviewee, interview, April 18, 2019). Therefore, the chemical sector can activate circularities in other sectors (M. Washer, interview, March 29, 2019).

As M. Washer explains, the chemical sector has known bad **reputation**, therefore, companies need to show actions beyond commitments. According to him, the chemical industry has to transform from an industry which was privileging economic performance over environmental footprint, to a **solution provider**. In order to do so, the sector needs to acknowledge that some value chains are not operating sustainably and to make its own activities circular in order to be prepared to **disruption** in the coming years with the move to a low-carbon economy and to circular economy (M. Washer, interview, March 29, 2019). Moreover, awareness must be raised within the industry and companies must understand the need to collaborate on these issues (J.-C. Pierre, interview, April 16, 2019).

5.3.3 The perception of partnerships: Importance and competitive threats

The interviewees gave multiple reasons why partnerships in sustainability are crucial.

First, guidelines and rules must be collectively defined in some situations in order to decrease the complexity which rises from the use of too many different methodologies (D. Debecker, interview, April 5, 2019). Moreover, no company has the financial means and technical capabilities to solve systemic issues on its own, therefore, circular economy needs to be discussed between all entities involved in the value chain, both inside and outside (M. Washer, interview, March 29, 2019). Having a common approach is thus more efficient, quicker and may be of higher quality than independent actions (M. Didden, interview, May 21, 2019). J.-C. Pierre agrees and clarifies that problems can be solved either in industry or across the value chain. He outlines that his company is developing new partnerships with suppliers and customers since he believes that "success will be across the full value chain because the

problems are too complex to be solved by one player.” (J.-C. Pierre, interview, April 16, 2019). Additionally, the anonymized interviewee believes that sustainability will be tackled when a critical mass of owners will understand that what is at stake goes beyond financial figures and reputation concerns (Anonymized interviewee, interview, April 18, 2019).

Also, the constant relationships between chemical firms do not only concern competition but are also aimed at joining forces to reinforce sustainability (D. Debecker, interview, April 5, 2019). Although there is a ranking among chemical companies according to how sustainable they are, there is a strong belief that the challenge requires collaboration. Therefore, the competition is not at the level of setting priorities, but rather on the product level (A. Dierckx, interview, April 18, 2019). As J.-C. Pierre says, some fundamental issues are more urgent than beating competitors. Sharing about common actions and directions does not represent a threat, in opposition to why and how it is done (J.-C. Pierre, interview, April 16, 2019). M. Washer adds that in the roadmap or in other methodologies, the real value does not lie in the document but in the actions taken from it, allowing differentiation. The latter must be kept in mind when interacting with competitors, even in the context of sustainability (M. Washer, interview, March 29, 2019). L. Edgell also emphasizes the need to pay attention to not compromise any legal requirements during these collaborations, as everyone seeks a competitive edge (L. Edgell, interview, May 8, 2019). Last, the shared approach remains relatively new due to institutional boundaries and companies want to collaborate while defining their own differentiated strategies (Anonymized project member, interview, May 13, 2019).

J.-C. Pierre believes that collaborations are an efficient way to achieve SDGs by 2030 (J.-C. Pierre, interview, April 16, 2019). As the director of a national association, L. Araújo agrees that this type of collaborations is crucial and testifies that regular meetings are held about the issue of sustainability within the association (L. Araújo, interview, May 3, 2019). The anonymized project member adds that it gives clarity about the opinion of different players and therefore allows building a common foundation, based on which companies can further engage and collaborate (Anonymized project member, interview, May 13, 2019).

5.4 Methodology of the Roadmap

5.4.1 Participants

a) Nature of contributors

First, WBCSD is a federation which includes a large number of chemical companies, who are used to work together following processes such as the roadmap's and therefore have a **history of sector collaboration**. Indeed, WBCSD has undertaken numerous projects with its

members, for example on life cycle analysis and portfolio sustainability assessment (J. Gomme, interview, April 30, 2019; M. Didden, interview, May 21, 2019). As an example, multiple project members have past experience with WBCSD and with competitors (D. Debecker, interview, April 5, 2019; M. Washer, interview, March 29, 2019; M. Didden, interview, May 21, 2019; Anonymized project member, interview, May 13, 2019).

Second, participation is encouraged among **WBCSD members**, considering that there is an annual membership fee which may restrict a number of companies to engage, such as SMEs (although they benefit from special conditions). Thus, the roadmap is representative of WBCSD members, rather than of the whole sector (D. Debecker, interview, April 5, 2019). Despite that, participation was on a voluntary basis and there was no additional requirement to be a contributor (Anonymized project member, interview, May 13, 2019). Regarding the absence of some big players, D. Debecker explains that more companies were involved in the beginning during preparatory meetings, but then withdrew, possibly due to resource allocation and priorities setting (D. Debecker, interview, April 5, 2019).

Therefore, companies involved in the creation of the roadmap are **leading companies** which, by definition or by design, are progressive and have a high maturity level in terms of sustainability (M. Didden, interview, May 21, 2019). According to J. Gomme, the natural starting point is with companies which have the time and resources to start to think about this agenda and which can create significant changes (J. Gomme, interview, April 30, 2019). The contributors interviewed confirmed their maturity in terms of sustainability (D. Debecker, interview, April 5, 2019; M. Washer, interview, March 29, 2019; A. Dierckx, interview, April 18, 2019; M. Didden, interview, May 21, 2019).

Because of the **diversity** of the chemical sector, the industry cannot be represented even by leading companies as they all have their own specialized businesses (D. Debecker, interview, April 5, 2019). This may lead to biases in the selection of issues, which can however be compensated by the presence of an independent body, ERM, and two sector associations. In the opinion of D. Debecker, “the more diverse we are, the better the results”, but also the more complex (D. Debecker, interview, April 5, 2019). M. Washer agrees and adds that multi-stakeholder groups can be found in other bodies such as GRI or UN Global Compact (M. Washer, interview, March 29, 2019). According to D. Debecker, contributors represent around 10% of the sector turnover, although in his opinion, contributors are representative to a certain extent of the chemical industry (D. Debecker, interview, April 5, 2019). J. Gomme confirms that the contributors represent a significant market share and that, in terms of practicalities, it would be impossible to bring the entire industry together (J. Gomme, interview, April 30, 2019).

Two chemical associations also contributed to the roadmap, Cefic and ACC. Cefic was involved due to their experience and knowledge, since there was a clear alignment between the roadmap and their own initiatives such as Chemistry CAN (A. Dierckx, interview, April 18, 2019). J. Gomme explains that the idea was to get their expertise, leverage them as a key strategic partner and promote the roadmap to their communities. Although Cefic is an association, they did not consult their members regarding the roadmap, due to the timeframe of the project (J. Gomme, interview, April 30, 2019). Since they had already performed internal exercises and questionnaires for their own programs, they could apply them for the roadmap (A. Dierckx, interview, April 18, 2019). L. Araújo, national representative of Cefic, confirms that multiple meetings are held every year during which countries can share their opinions and priorities (L. Araújo, interview, May 3, 2019). The anonymized interviewee, national representative of Cefic, explains that Cefic represents the sum of all its members' ideas, which also include international players (Anonymized interviewee, interview, April 18, 2019).

Moreover, the roadmap involves extensive technical and strategic input from **ERM** global experts with cross-sector experience in tackling SDG issues (ERM, 2018). In order to coordinate and facilitate the roadmap, ERM was engaged by WBCSD, following the methodology of the SDG Sector Roadmaps guidelines that they created with WBCSD. ERM contributed to the methodology, the collaborative process and the contents of the roadmap, as they conducted external research and involved their own chemical sector experts in order to provide an external perspective (L. Edgell, interview, May 8, 2019). Additionally, WBCSD had past experience with ERM, which has been a WBCSD member since its foundation and has worked on a number of projects with them. ERM also had past experience with other project members and associations, since most of them are ERM's clients on an individual basis, which may have facilitated the process (L. Edgell, interview, May 8, 2019).

b) International representativeness

WBCSD and contributors wanted to be as representative of the planet as possible. Contributors are from Europe, Japan and USA, which are regions with very distinct cultures and approaches, for example regarding the climate transition (D. Debecker, interview, April 5, 2019). A. Dierckx adds that sharing opinions with Japanese and American colleagues was particularly interesting as it broadened the scope of conversations and allowed comparing concepts (A. Dierckx, interview, April 18, 2019).

Taking into account the current trends and prospects pointing towards **Asia and especially China** (as outlined in 2.1.3), the presence of more Asian companies would have enhanced the representativeness. Indeed, no Chinese company is part of the contributors,

although China hosts some of the biggest chemical companies and should therefore be involved in these discussions (L. Edgell, interview, May 8, 2019). Not involving Chinese companies and including only few American ones may create biases in the roadmap, as it remains relatively European-centred (Anonymized project member, interview, May 13, 2019).

5.4.2 Methodology and decision-making process

a) Initiation

As highlighted in 4.1.2, the roadmap was the result of the “**Better Business, Better World**” report (Business & Sustainable Development Commission, 2017) which recommended the creation of sector roadmaps (J. Gomme, interview, April 30, 2019). According to D. Debecker, it is common for WBCSD to be deeply involved in early stages in the development of new concepts related to the SDGs for example. WBCSD proposed to implement the roadmap initiative with a logic by sector to their members, including Solvay, who was also part of the executive committee. Consequently, there have been discussions with Solvay and other Board members to “take the temperature” (D. Debecker, interview, April 5, 2019).

Then, WBCSD and ERM created a framework, the **SDG Sector Roadmaps guidelines**, on how sector roadmaps can be conducted following a 3-step process (L. Edgell, interview, May 8, 2019). The chemical sector was selected as the first sector roadmap due to the strong interest coming from the industry members (L. Edgell, interview, May 8, 2019; M. Didden, interview, May 21, 2019). Therefore, they also helped in piloting and testing the guidelines in order to make amendments based on the chemical sector’s experience of the framework (J. Gomme, interview, April 30, 2019). The guidelines were edited at the same time as the creation of the Chemical Sector SDG Roadmap (D. Debecker, interview, April 5, 2019) in order to ensure the guidelines were practical (L. Edgell, interview, May 8, 2019).

b) Governance type and decision-making process

The governance type is typical of WBCSD; co-chairs take the coordination role, spend more time and resources in understanding the topic, and prepare the meetings and the calls to prepare the ground so that it can be discussed in larger groups in an efficient and result-oriented way. AkzoNobel and Solvay took the lead in shaping the project with the help of ERM and WBCSD (D. Debecker, interview, April 5, 2019; M. Didden, interview, May 21, 2019).

The decision-making process was based on discussions rather than votes. There were no conflicts or strong disagreements since everyone kept its own individual commitments. As D. Debecker says, “it is a natural process, a co-construction rather than competition” (D. Debecker, interview, April 5, 2019). M. Didden clarifies that co-chairs were first consulted to

propose directions when dilemmas appeared during the process, with the agreement of WBCSD and the other contributors. WBCSD took care ensuring that the members were taking ownership, which was confirmed by AkzoNobel representative (M. Didden, interview, May 21, 2019) and ERM. As a coordinator, ERM's duty was to encourage member companies to actively take decisions (L. Edgell, interview, May 8, 2019).

A. Dierckx explains that the conversations were open and honest because the participants had a sustainability mindset, namely a strong common wish to have impact and to call for action (A. Dierckx, interview, April 18, 2019). The project was per se very collaborative. In any of the exercises, there were constant interactions with stakeholders with the aim to reach agreements on industry's priorities (L. Edgell, interview, May 8, 2019).

c) Steps and meetings

First, a questionnaire was completed by each contributor at SDG target level and requested information on the relevance of each of these targets to the chemical industry, the impact anticipated, the timeframe, the impact for the business, the difficulties etc. (D. Debecker, interview, April 5, 2019; M. Didden, interview, May 21, 2019). ERM participated to the creation of spreadsheets and questionnaires to facilitate and open the dialogue to contributors and to map priorities based on their company focus on the SDGs (L. Edgell, interview, May 8, 2019). They helped creating the guidelines to structure the discussions, collected inputs from the project members to then translate them into meaningful priorities and impact areas (M. Didden, interview, May 21, 2019). All in all, information was collected based on participants' knowledge of the sector, and third-party industry expertise, alongside published literature (WBCSD, 2018b). Indeed, already existing initiatives were reviewed, leading to a gap analysis highlighting the areas where work needed to be done (M. Didden, interview, May 21, 2019).

Afterwards, the result was a list of the most meaningful targets, meaning those where the highest impact is expected at the same time as the largest business rewards (D. Debecker, interview, April 5, 2019). A number of workshops were then held to assess and explore the level of potential the sector has to drive change for each of the mapped SDGs (WBCSD, 2018b).

On top of this prioritization exercise, there was a combination of monthly calls between WBCSD, ERM and the two co-chairs, follow-up on the actions, physical meetings (where contributors were present physically or by call) and several calls (D. Debecker, interview, April 5, 2019; M. Didden, interview, May 21, 2019). Afterwards, a document was produced, with the help of ERM (L. Edgell, interview, May 8, 2019) and, on that document, input was requested from contributors (D. Debecker, interview, April 5, 2019). A. Dierckx confirms that they had several face-to-face meetings in Geneva, extensive calls where targets were discussed one by

one, multiple brainstorming sessions and in the end, a lot of actions were suggested (A. Dierckx, interview, April 18, 2019). ERM also explains that there were several workshops with member companies to refine the impact pathways (L. Edgell, interview, May 8, 2019).

5.4.3 Communication of the roadmap

On top of its publication on the website of WBCSD, the tool was communicated through different channels by WBCSD but also by some contributors.

J. Gomme explains that WBCSD used a traditional approach and shared the roadmap through their channels and referees. They also launched it at the High-Level Political Forum at the UN in July 2018, during which there was also a business-focused event, the SDG Business Forum, where the CEO of Solvay, Mr. Clamadieu, spoke about the process, the benefits and the highlights of the roadmap. Since then, other events occurred and a continued roll-up process was in place, either from WBCSD or from contributors. When framing the roadmap to members or other companies, the tool is implicitly encouraged to be used but was not made mandatory. As J. Gomme explains, for any company willing to join WBCSD subsequently, WBCSD would introduce the roadmap as a tool available for their use and as an invitation to projects emerging from that roadmap (J. Gomme, interview, April 30, 2019).

ERM confirms to have participated in some external webinars (L. Edgell, interview, May 8, 2019) and also shared the tool among its own experts in order to allow the roadmap to gain more traction by using it in some of its processes (L. Edgell, interview, May 8, 2019).

Other contributors shared the roadmap internally. Cefic distributed it to its members, by mail, on the website, in sustainability forums and on social media. Cefic implicitly encourages its members to use it, rather than explicitly, since Cefic has its own charter to be promoted and implemented (A. Dierckx, interview, April 18, 2019). L. Araújo, president of a national association and Cefic national representative, confirms that the roadmap is certainly helpful to communicate sustainability to member companies, although this is done in an implicit and indirect way (L. Araújo, interview, May 3, 2019). The anonymized interviewee informs that although he probably received the information, his workload and the amount of information received does not allow him to process each e-mail, especially when it does not represent a key issue at the local level (Anonymized interviewee, interview, April 18, 2019).

Some recommendations were issued by interviewees. The anonymized project member emphasized the importance to make the document public and to spread the word as much as possible to broaden the audience (Anonymized project member, interview, May 13, 2019). Based on M. Washer's personal opinion, in terms of communication, individual companies may

have more impact than federations (M. Washer, interview, March 29, 2019). The anonymized interviewee suggests emphasizing advertising and online communication through social media in order to broaden the audience and emotionally engage it. He also shares his belief that awards may be created, therefore making a marketing tool out of the roadmap through logos recognizing company's efforts (Anonymized interviewee, interview, April 18, 2019). However, J. Gomme explains it will not happen (J. Gomme, interview, April 30, 2019).

5.4.4 Follow-up of the roadmap

a) Microsite and progress monitoring

In the roadmap, it is clearly stated that updates on progress regarding the implementation of the roadmap will be made available on a continuing basis via a dedicated microsite (WBCSD, 2018b). J. Gomme confirms that a microsite was created to update new initiatives that companies are taking to implement some of their actions (J. Gomme, interview, April 30, 2019). D. Debecker explains that the microsite was developed to report on the follow-up and progress of this report, which is unusual at WBCSD. He adds that an SDG program at WBCSD is monitoring at the same time as duplicating the work for other sectors. However, monitoring progress can be slow (D. Debecker, interview, April 5, 2019). A. Dierckx argues that there is an intent to monitor the activities, in particular the ones related to sustainable portfolio management, but adds that the microsite currently has limited actions reported (A. Dierckx, interview, April 18, 2019). Contributors may not be all aware of this microsite, as the anonymized project member shared that the microsite was not known by the company (Anonymized project member, interview, May 13, 2019).

Cefic also intends to monitor sustainability progress among its members, including information on the roadmap use, although the system is not yet operational (A. Dierckx, interview, April 18, 2019). Additionally, J. Gomme informs that companies continue defining actions and discussing collaborations towards the ambitions stated in the roadmap. He adds that WBCSD is looking for new partners to join and develop the actions that have been identified and continues working with sector associations (J. Gomme, interview, April 30, 2019). M. Didden confirms that programs will be developed based on the areas identified in the roadmap (M. Didden, interview, May 21, 2019). These statements are aligned with the contents of the roadmap (c.f. 4.3.2 Structure of contents). However, all these activities are not yet implemented.

b) Further reviews and updates

According to J. Gomme, the roadmap may need to be revisited depending on the needs of companies. Otherwise, updates on the microsite may be sufficient (J. Gomme, interview,

April 30, 2019). In D. Debecker's opinion, the roadmap is not planned to be reviewed, since the SDG framework will not change, the contributors are representative enough, and the impacts of the chemical industry will likely remain constant (D. Debecker, interview, April 5, 2019). M. Washer emphasizes that updates would be welcome on a 3-4 year basis (M. Washer, interview, March 29, 2019). A. Dierckx adds that there should be updates in principle, but the methodology should be conserved (A. Dierckx, interview, April 18, 2019). L. Araújo agrees that updates should be done (L. Araújo, interview, May 3, 2019). L. Edgell believes that there may be iterations, updates or case studies as people will recognize the need to move faster (L. Edgell, interview, May 8, 2019). The anonymized project member adds that iterations or updates would be welcome as sustainability is an evolving science and therefore, some results may need to be reviewed in two years (Anonymized project member, interview, May 13, 2019).

Although a consensus emerges among the interviewees regarding the need to update (at least incrementally) the roadmap, the contents of these updates vary.

First, J. Gomme clarifies that **more roadmaps** will be created, as the more sectors they work on, the more the process is refined. He also affirms that the next step is systemic transformation, bringing sectors together to explore opportunities for **cross-sector collaborations** (J. Gomme, interview, April 30, 2019). Indeed, the chemical sector often collaborates with other sectors with which there are clear links and interactions (D. Debecker, interview, April 5, 2019) and, as M. Washer says, "it is team *value chain* rather than team *chemical*" (M. Washer, interview, March 29, 2019). A. Dierckx and ERM agree that the next step would be to do the exercise with the whole value chain, going beyond recognizing that the value chain partners are needed in theory (A. Dierckx, interview, April 18, 2019; L. Edgell, interview, May 8, 2019). The anonymized interviewee explains that the chemical sector is organized under an industrial approach, but collaborations should also be created between industries such as pharmaceuticals, constructions, materials, cement etc. (Anonymized interviewee, interview, April 18, 2019). Last, attention must be paid to continue engaging companies by organizing cross-functional workshops for example, by inviting investors, companies, and downstream users (Anonymized project member, interview, May 13, 2019).

On top of this prevalent need, ERM emphasizes the importance to demonstrate traction in the next years to **reach a critical mass** of companies in order to further attract others, including from China (L. Edgell, interview, May 8, 2019). WBCSD could for example leverage its presence in Shanghai (Anonymized project member, interview, May 13, 2019). According to M. Washer, updates would ideally include how to address both positive and negative impacts

and would describe recent achievements. He adds that, since many other documents already exist (including projections from Cefic, Essenscia, bodies producing scenario analysis), what is mostly needed is real action with quantified effect (M. Washer, interview, March 29, 2019).

Another point, the **involvement of smaller companies**, was significantly highlighted by interviewees but did not receive consensus. As explained above, the membership fees attached to WBCSD possibly restricted smaller companies to be part of the process. Interviewees have shared additional insights about the interest of involving smaller players in the future, confirming some trends identified in the literature review.

Because of their ability to allocate resources to sustainability and of the importance of their impact, large companies have the responsibility to share their knowledge with smaller companies and explain their actions in order to allow them moving faster by knowing where to start. Additionally, large companies have complexities to manage which small companies operating on narrower locations do not have, in terms of stakeholder identification and expectations, and impact measurement (M. Washer, interview, March 29, 2019). Moreover, involving too many small companies may have been complex since the timeframe was very short (J. Gomme, interview, April 30, 2019). A. Dierckx adds that it is hard to include more diverse companies in the process and explains that it is more the role of sector associations such as Cefic (A. Dierckx, interview, April 18, 2019).

J.-C. Pierre explains that it is not common to have a partnership approach when you have a limited company size because smaller companies may not have the knowledge, the mindset of open innovation or the experience (J.-C. Pierre, interview, April 16, 2019). The anonymized interviewee and L. Araújo have the same opinion regarding the difficulty for small companies to be part of these initiatives because of their lack of resources but argue that smaller companies should be invited or involved in the future (Anonymized interviewee, interview, April 18, 2019; L. Araújo, interview, May 3, 2019). According to J.-C. Pierre, although he would have liked to be part of the exercise, he comments that involving smaller companies would probably not have led to other outcomes and thinks that if it is coming from lower level, it may be less efficient (J.-C. Pierre, interview, April 16, 2019). If participating, the anonymized interviewee would have emphasized the importance to understand the motivations of each participant (Anonymized interviewee, interview, April 18, 2019). L. Araújo would not like to be part of the exercise because of his other responsibilities (L. Araújo, interview, May 3, 2019).

5.5 Contents of the roadmap

5.5.1 Materiality analysis and SDGs prioritization

J. Gomme explains that the roadmap is based on the document issued from UN Global Compact and GRI, “Integrating the SDGs into reporting”, emphasizing the idea of integrating both positive and negative impacts (J. Gomme, interview, April 30, 2019). Therefore, SDGs prioritization was conducted in order to identify the most critical focus areas for the sector in view of maximizing its capacity for SDG impact (WBCSD, 2018b). Interviewees shared their opinions on this prioritization and the accuracy of the matrix.

As sustainability is new and maturing, there are **diverse opinions** around what constitutes good or best practices when it comes to identifying priority SDGs or opportunities and actions. J. Gomme remains open to the discussion by explaining that disagreeing with the materiality analysis is normal since the roadmap is a start to the conversation enabling to move the conversation forward (J. Gomme, interview, April 30, 2019). The roadmap must be seen as a recommendation; therefore, it does not restrict company to focus on the roadmap’s priority SDGs (Anonymized project member, interview, May 13, 2019).

The roadmap clarifies that many **interconnections** exist across SDGs and affirms that this was taken into account in selecting key SDGs (WBCSD, 2018b). However, D. Debecker clarifies that the meaning of the interdependencies between SDGs and targets was not completely understood during the creation of the roadmap (D. Debecker, interview, April 5, 2019). Moreover, due to the industry diversity, all SDGs could be selected, which eventually led to a large set of priority SDGs (M. Didden, interview, May 21, 2019). Nevertheless, J. Gomme explains that without making prioritization, no action will be done. He adds that non-prioritized SDGs were not forgotten (J. Gomme, interview, April 30, 2019).

M. Washer underlines two points of attention. First, material issues at the industry scale are not necessary material on the company level, creating differences which should be recognized. Second, carefulness must be applied to not only prioritize SDGs where one has positive impact, thereby avoiding the ones leading to negative impact (M. Washer, interview, March 29, 2019). According to L. Araújo, although countries face specific key issues, the SDGs outlined in the roadmap accurately represent the important issues for the chemical sector (L. Araújo, interview, May 3, 2019). However, the industry challenges identified also depend on the nature of the working group. Decisions such as ranking SDG 15 as low may be due to the fact that the agriculture sector underrepresented compared to basic and specialty chemicals (Anonymized project member, interview, May 13, 2019). Criticism also addressed the low level of potential of contribution for SDG 14, indicating a lack of interest in addressing plastic pollution, or the impact on SDG 12, criticized as too low considering its direct relation with the chemical sector (Stringer, 2018). However, J. Gomme further clarifies that the impact ranked

as low is not necessarily low and should be understood as lower than other impacts (J. Gomme, interview, April 30, 2019). However, the **scale used in the roadmap** does not allow the reader to make this distinction, as it uses the notions “low” and “high” and does not bring explanatory comments.

5.5.2 Level of generalization and details

In its ambition to target a broad audience, the roadmap attempts to find a balance between generalization and the presence of implementation steps. The document’s structure was mainly decided by ERM and WBCSD, based on the SDG Sector Roadmaps guidelines (D. Debecker, interview, April 5, 2019).

In terms of generalization, the first chapters allow companies with no SDG awareness to understand what SDGs are, the relevance they have to business and how the sector interacts with them (J. Gomme, interview, April 30, 2019). Further, making a business case was necessary in order to get traction and show the opportunities behind sustainability, on top of the challenges (L. Edgell, interview, May 8, 2019). According to L. Araújo, generalization is important in this type of documents (L. Araújo, interview, May 3, 2019). ERM further adds that they tried to find a balance in the structure of the document in order to reach a broad audience. For example, the highlighted thematic areas are relevant for some businesses but not for others, depending on their activities etc. (L. Edgell, interview, May 8, 2019). One of the co-chairs confirms the importance to remain at a high level in the discussions, due to the scope of the sector’s activities, and adds that a top-down approach should be used in the future (M. Didden, interview, May 21, 2019).

Regarding the amount of details, J. Gomme argues that it was not possible to include specific targets due to the inherent complexity of the sector, the length of the value chain, the expanded scope of activity and impacts of products. Therefore, a set of actions was issued, but not at the level of specific KPIs (J. Gomme, interview, April 30, 2019). Moreover, according to the director of ACC, Bryan Kuppe, a list of specific goals, timelines and objectives was not the intention (Stringer, 2018), which is confirmed by M. Didden (M. Didden, interview, May 21, 2019). ERM further explains that the approach largely depends on the nature of the working group (L. Edgell, interview, May 8, 2019). However, according to J.-C. Pierre, the roadmap remains very high-level and its applicability would be increased if implementation guidelines were included (J.-C. Pierre, interview, April 16, 2019). M. Washer emphasizes that for a roadmap to be efficient as a mean of communication, milestones and precise targets should be added to go beyond qualitative elements (M. Washer, interview, March 29, 2019). L. Araújo

also explains that the targets are very general and that details for implementation cannot be found in the roadmap (L. Araújo, interview, May 3, 2019). However, M. Washer clarifies that other bodies exist to achieve that purpose, such as GRI (M. Washer, interview, March 29, 2019).

The anonymized interviewee adds that reports often contain extensive introductions and a large number of pages with complex messages, whereas the key contents may only represent a small part of the document. He explains that messages need to be made simpler in order to efficiently target a broad audience (Anonymized interviewee, interview, April 18, 2019).

5.5.3 Elements of context and framing

Throughout the roadmap, a positive framing is used, by emphasizing the potential to drive positive impact and the opportunities for the sector.

D. Debecker explains that the document is action-driven and deeply connected with the daily business because it is described as a business opportunity (D. Debecker, interview, April 5, 2019). J. Gomme insists on the fact that the roadmap was also addressing how the sector can manage its negative impacts, as it looks at where both positive and negative impacts identified by GRI and the UN Global Compact could be addressed (J. Gomme, interview, April 30, 2019).

Overall, J.-C. Pierre argues that the roadmap provides a realistic and comprehensive picture of the industry (J.-C. Pierre, interview, April 16, 2019). L. Araújo affirms that the cross-cutting factors mentioned in the roadmap match the national priorities, which are circular economy and the low-carbon economy, and that there is no important thing missing (L. Araújo, interview, May 3, 2019). Moreover, the roadmap aims at being in the continuity of other initiatives taken in the industry. Action points include leveraging resources to accelerate the international roll-out of the Responsible Care program and enhancing support of the UN's global chemicals program, SAICM (Stringer, 2018), both described in 2.3.2.

However, M. Washer believes that the roadmap may not be ambitious or critical enough as it does not emphasize the urgency of the actions to be made, and would like to see documents in which the industry recognizes that some of the value chains need to transform profoundly and start to address it. M. Washer emphasizes that this problem is inherent to federations as they are an aggregate between players with different motivations. Therefore, disruptive trends such as circular economy and low-carbon economy tend to be shown as less disruptive as possible (M. Washer, interview, March 29, 2019). A. Dierckx adds that some critics were made with regard to the missing mention of the downsides of the chemical industry. In her opinion, the document could include more upfront the broader society and be less inward-looking (A. Dierckx, interview, April 18, 2019). The anonymized interviewee argues that he would like to

see evidence on tangible actions and budgets allocated to sustainability initiatives, on top of commitments stated in the document (Anonymized interviewee, interview, April 18, 2019).

5.6 Purpose of the roadmap and applicability

5.6.1 Overall purpose

The purpose of the roadmap is to be an agenda-setting framework showing the **collective objective** the industry should look for (D. Debecker, interview, April 5, 2019; M. Didden, interview, May 21, 2019). Aligned with the mission of WBCSD, it aims at bringing companies together to tackle sustainability challenges which are too big for isolated companies. By doing so, impact on these challenges are scaled up (J. Gomme, interview, April 30, 2019; M. Didden, interview, May 21, 2019). Jean-Pierre Clamadieu, former CEO of Solvay, asserts that the Roadmap clearly outlines where companies can simultaneously unlock significant business opportunities and contribute in the SDG agenda, across the sector and through collaboration with other sectors (ERM, 2018). Indeed, the roadmap persistently emphasizes the importance of partnerships with sector peers but also cross-sector partnerships (WBCSD, 2018b).

D. Debecker outlines that SDGs need to be made clear for the business by looking at it at the target level, which is why they decided to join forces and common intelligence and create a list of actions and business opportunities (D. Debecker, interview, April 5, 2019). Cefic's representative argues that there needs to be a conscious exercise to identify the gaps and where to direct action, rather than showing contribution in all areas. The role of the roadmap is therefore to guide companies where the highest impact can be made, moving beyond the mapping exercise (A. Dierckx, interview, April 18, 2019).

Whereas the report has to be seen as a communication vehicle, the real interest is to be in the action and not to aim at a perfect document (D. Debecker, interview, April 5, 2019). M. Washer explains that the value of the roadmap depends on the exercise of understanding how it can be applied to a specific company to then differentiate oneself from competitors (M. Washer, interview, March 29, 2019). J. Gomme confirms that the document is a start to the conversation, rather than a definitive end, and that the roadmap can be used for its methodology, which can be applied to sectors but also to companies.

According to B. Kuppe, ACC's director of sustainability, the roadmap offers a strategic foundation for companies to interpret their own strategies to contribute to the SDG agenda, by facilitating the translation of sustainability strategies into the language of SDGs (Stringer, 2018). For example, individual materiality analyses will differ from the one proposed in the framework, since the goal is to take the roadmap as a baseline to then position the company

according to the impact areas and their importance to the company (D. Debecker, interview, April 5, 2019). M. Washer also emphasized the importance the roadmap can have in the process of building, reviewing and validating a company materiality matrix. As he says, “having a materiality matrix at the industry level allows to see the differences and shows the necessity to be able to explain why there are differences.” (M. Washer, interview, March 29, 2019). J.-C. Pierre shared that, in order to link the SDGs with its current activities, the company used the roadmap as a reference point (J.-C. Pierre, interview, April 16, 2019). As an illustration, L. Araújo agrees that the roadmap was important to remind the most relevant areas of impact and adds that based on national priorities, targets were selected among the ones highlighted in the roadmap (L. Araújo, interview, May 3, 2019).

However, there are limiters to the use of the roadmap. J.-C. Pierre argues that because some strategies are already well embedded, integrating the roadmap may be complex for some (J.-C. Pierre, interview, April 16, 2019). A. Dierckx explains that because Cefic already has its own strategy, their own use of the roadmap was limited but would have been higher otherwise (A. Dierckx, interview, April 18, 2019). However, J. Gomme clearly explains that the roadmap can be complementary to existing strategies, since some actions can only be done with a critical mass on a sector level, rather than on a company level (J. Gomme, interview, April 30, 2019).

5.6.2 Target audiences

According to the roadmap, the chemical industry is the main audience, as it aims at identifying potential opportunities for collaboration and to inspire action. Additionally, it targets other “interested groups of stakeholders in other sectors” by providing them with a picture of the industry and its capacity to contribute to the SDGs through cross-sector cooperation. Moreover, the roadmap is an invitation to industry peers as well as other public and private sector stakeholders to collaborate around efforts for SDG action (WBCSD, 2018b).

J. Gomme explains that the roadmap targets all companies, whether they contributed or not, as well as companies that are not members of WBCSD or that are not in a leading phase, with the aim to make them understand how to take action towards the SDGs (J. Gomme, interview, April 30, 2019).

The next points will analyse the specific target audiences the roadmap is addressed to.

a) Small companies and limited level of awareness

J. Gomme confirms that some smaller companies use the roadmap as a reference (J. Gomme, interview, April 30, 2019). Although the contributors did not write the roadmap with SMEs in mind (M. Didden, interview, May 21, 2019), the document can indeed inspire smaller

companies including national federations members, which can benefit in particular from the mapping. However, Cefic could not confirm if the roadmap was used among them (A. Dierckx, interview, April 18, 2019). J.-C. Pierre also believes that it may be perceived as being more applied to bigger companies. However, according to him, the roadmap does not hinder smaller companies to embark on it, although he has no knowledge of small companies using the roadmap (J.-C. Pierre, interview, April 16, 2019). L. Araújo argues that part of the role of the national association is to inform and raise awareness of the member companies about sustainability, which can be indirectly facilitated by the use of the roadmap (L. Araújo, interview, May 3, 2019). According to M. Washer, an approach where you try to understand who you are impacting the most and what can help you (stakeholder expectations followed by a materiality analysis) can indeed be applied to any organization of any size (M. Washer, interview, March 29, 2019). The anonymized project member explains that for SMEs, the interest lies in using the roadmap as a starting point to draw conclusions for internal strategies, depending on the commitment of top management and company's purpose and intent in using the tool (Anonymized project member, interview, May 13, 2019).

Another argument in favor of the roadmap's applicability is the ease of understanding of the language, which makes it very concrete (J.-C. Pierre, interview, April 16, 2019), which L. Araújo confirms (L. Araújo, interview, May 3, 2019). However, the anonymized interviewee disagrees regarding the easiness of the language and argues that as a small company, they are overloaded with information, which makes it difficult to get informed on all initiatives (Anonymized interviewee, interview, April 18, 2019).

M. Washer emphasizes that the roadmap may be even more useful to companies which are in the beginning of their sustainability journey. However, he advises them to start by looking at what is happening inside their scope of activities and further on the impacts beyond it (M. Washer, interview, March 29, 2019). Similarly, in case of no awareness, the anonymized interviewee explains that change must first arise internally, either from down to top by educating individuals or from top to down from the owners rather than from European associations. He emphasizes that culture, education and awareness are crucial and should happen before using the roadmap (Anonymized interviewee, interview, April 18, 2019). L. Araújo adds that the principles apply to all industry members in general, although the ways to achieve the goals and issues may be different based on the size of the company or the country of operation (L. Araújo, interview, May 3, 2019). According to the anonymized interviewee, tackling sustainability issues requires the ability to afford resources investment (Anonymized interviewee, interview, April 18, 2019), which may be difficult for small companies.

b) Contributors

J. Gomme describes that the main goal for contributors consisted in the value of having these conversations around the SDGs, the role of the industry and how they can work more closely together on realizing the SDGs (J. Gomme, interview, April 30, 2019). A. Dierckx explains that one of the most interesting results of the collaboration was the possibility of sharing opinions with international peers (A. Dierckx, interview, April 18, 2019). As the anonymized project member shared, collaborations within WBCSD are helpful and inspiring and provide opportunities to learn from others' initiatives as well as to actively participate to support the SDG agenda (Anonymized project member, interview, May 13, 2019).

M. Washer explains that Solvay performed its own materiality analysis, identifying where the company had the most impact, positive or negative, at the same time as WBCSD did it for the chemical sector. Based on the list of WBCSD, Solvay made some modifications to their analysis based on the specificities and activities of the company. By reviewing the SDGs on which Solvay had the most impact and comparing them with WBCSD, Solvay validated their materiality analysis. M. Washer adds that Solvay shifted from including all SDGs to focusing on 7 priority SDGs (M. Washer, interview, March 29, 2019). Moreover, Cefic also recognizes the need to update its own goals and therefore refers to the roadmap as an example of best practices (A. Dierckx, interview, April 18, 2019). Also, the anonymized project member explained that different areas of future action were defined based on the roadmap exercise (Anonymized project member, interview, May 13, 2019).

Other advantages include reputation enhancement, through quotes in the roadmap for co-chairs (D. Debecker, interview, April 5, 2019; M. Didden, interview, May 21, 2019) or visibility to investors (Anonymized project member, interview, May 13, 2019). Further, the roadmap helped raising awareness among AkzoNobel's employees on the topic and the contribution of the company, creating a sense of pride (M. Didden, interview, May 21, 2019).

ERM also shared the tool among its own experts in order to raise internal awareness and ensure that the employees' knowledge was up to date with the contents, priorities, main direction and commitments of the roadmap. In order to do so, webinars and exercises were given internally. As a consequence, ERM was better equipped and informed to give implementation advice to their clients, thereby answering the typical implementation challenge of these tools by translating the roadmap into pragmatic solutions, allowing it to gain more traction (L. Edgell, interview, May 8, 2019).

c) External stakeholders

The roadmap also serves as a good engagement tool for other stakeholders, including the **United Nations** (J. Gomme, interview, April 30, 2019), **policy-makers and governments** (M. Didden, interview, May 21, 2019). M. Washer indicates that the roadmap may be useful for external stakeholders willing to know more about the chemical sector's main areas of impact and compare it with other industries. He adds that it may help in changing some perceptions of the chemical industry and showing how the industry is evolving (M. Washer, interview, March 29, 2019). A. Dierckx confirms that the roadmap may help shaping an overall image of the sector and therefore potentially change mindsets (A. Dierckx, interview, April 18, 2019).

Although the roadmap is not primarily aimed at **investors**, D. Debecker adds that this document may be helpful to engage discussions with them and to show impacts and business opportunities of the chemical sector related to SDGs (D. Debecker, interview, April 5, 2019). Even though investors would still analyze the risks of individual companies, the roadmap could show them that the sector is moving (A. Dierckx, interview, April 18, 2019; M. Didden, interview, May 21, 2019). Further, ERM has used the roadmap with investors, as it can provide relevant clues to them about the industry perspectives, and because chemical investment remains a pivotal challenge (L. Edgell, interview, May 8, 2019). Indeed, some topics require changes to the current investment models, which is a good reason why the roadmap should target investors, although it may not be doing it explicitly. As an illustration, investors may be willing to reach out to roadmap contributors, since they collected insights on sustainability matters (Anonymized project member, interview, May 13, 2019). However, J. Gomme explains that although there are elements in the roadmap that may be useful to investors, other more detailed or relevant pieces of work exist, for example, the SDG benchmark from the World Benchmarking Alliance. In conclusion, he argues that all these tools combined with the roadmap can provide a comprehensive picture of the industry (J. Gomme, interview, April 30, 2019). J.-C. Pierre argues that the key is to make investors understand that some frameworks are pivotal and that companies following them may give indicators that they are in the right direction to contribute to the SDGs and therefore bring confidence (J.-C. Pierre, interview, April 16, 2019). However, M. Didden clarifies that the tool is not aimed at enhancing comparability between firms (M. Didden, interview, May 21, 2019).

According to D. Debecker, the roadmap is also aimed at **other industries** (D. Debecker, interview, April 5, 2019). A. Dierckx explains that the true value of the report is that it combines multiple actions from the industry and may give direction to other sectors and inspire them (A. Dierckx, interview, April 18, 2019).

The anonymized interviewee adds that it is crucial to target individuals on other levels such as **employees** to expand the reach of the roadmap (Anonymized interviewee, interview, April 18, 2019). Although documents similar to the roadmap tend to target the executive level, the roadmap would still be accessible to employees or non-sustainability professionals (J. Gomme, interview, April 30, 2019; M. Didden, interview, May 21, 2019).

5.7 Replicability to other industries

J. Gomme explains that the guidelines need to be flexible in order to be applied to other sectors. At the moment (May 2019), a forestry roadmap is ongoing, and its process leads to different types of contents; since the sector has a narrower scope of activity and a shorter value chain than the chemical industry, details and KPIs can be included. Work is also being done at a more granular level with the Indian cement sector. Additionally, a project has been launched with IPIECA for the oil and gas sector and other opportunities are continuously explored. He further adds that the roadmaps will all look different depending on the nature of the sector, the companies involved in it, the level of ambition, how advanced a sector is in terms of sustainability considerations, and the decisions made related to the involvement of other institutions (such as NGOs or the United Nations) (J. Gomme, interview, April 30, 2019). M. Didden confirms that the amount of priority SDGs may be narrower for sectors such as utilities and cement, which have more similar operations and outputs than the chemical sector (M. Didden, interview, May 21, 2019).

D. Debecker thinks that sharing insights on barriers of common interest regarding sustainability can be applied to any sector. As outlined in 5.3.3, there is no competitive threat in these collaborations as they are motivated by the need to join forces and to increase overall efficiency of strategies and resources allocation (D. Debecker, interview, April 5, 2019). M. Washer agrees that any industry is able to launch this type of initiative (M. Washer, interview, March 29, 2019). L. Edgell shares this opinion and adds that the only condition is the availability of a unifying body such as WBCSD or industry associations, enabling the development of cooperation and trust (L. Edgell, interview, May 8, 2019). A. Dierckx explains that since the roadmap does not include any sensitive information, no competitive threat should interfere and prevent companies from other sectors to share similar information (A. Dierckx, interview, April 18, 2019). In contrast, J.-C. Pierre explains that roadmaps may not always be reproduced in other industries, as contexts in which differentiation is poor and cost-competition is strong, or fast-moving environments can make the exercise difficult (J.-C. Pierre, interview, April 16, 2019).

Discussion

This chapter aims at assessing the impact and relevance of sector-level initiatives towards the integration of the SDGs, evaluating the advantages and potential limitations of intra-sector collaborations in the context of SDG integration and inferring the implications these findings may have on other sectors than the chemical sector. In order to do so, this chapter will answer to the five sub-research questions described in the Introduction by combining the inputs from the literature review and from the description and analysis of the roadmap, based on ten interviews conducted with six roadmap participants and four external stakeholders.

Research Question 1. Challenges of the business regarding SDGs integration

Challenges and needs from the business with regard to the integration of SDGs were clearly identified in 1.4 and 5.3.

Challenges include the lack of understanding of the business case combined with the need to quantify sustainability value to convince decision-makers, the lack of clarity on policy, the intrinsic complexity of the agenda, the great amount of targets combined with the absence of clear targets and standardized indicators to monitor and communicate progress, the lack of comparability between companies, the exaggerated focus on goal level, the limited selection of priority SDGs (which tends to focus on SDGs where action is already implemented, directly linked to the business namely inward-looking), a predominant focus on positive impacts and on impact of narrow operations, the concentration of internal management of sustainability, the need for a centralized methodology for measuring and reporting progress, the dynamic character of sustainability requiring updates on value definition and standards, the large number of frameworks, and the lack of resources for implementation.

Research Question 2. Factors of success of intra-sector collaborations

Influencing variables of intra-sector collaborations were identified in Chapter 3 and analyzed based on the information collected from in-depth interviews regrouped in Chapter 5.

Initiation

As demonstrated by a study from United Nations Global Compact and Accenture (2018), collaborations between the private sector and United Nations are characterized by the traditional approach they use, their short timeframe and their bilateralism, which may restrict the ability to scale up impact. In that sense, having WBCSD as an intermediary allowed multilateral collaboration between participants. Moreover, WBCSD's experience in developing

tools with businesses, in particular with the chemical sector, enabled strengthening the impact of the collaboration by facilitating its process.

The Chemical Sector SDG Roadmap is one of the first sector roadmap directly linked to the SDGs and was created as a response to the “Better Business, Better World” report (2017), demonstrating the newness of this type of initiatives. However, prior to creating the roadmap, guidelines were drafted by WBCSD and ERM in order to develop a robust methodology common to all SDG Sector Roadmaps, which further facilitated the collaborative process.

Categorization of the collaboration and identity of participants

In relation to the categorization made by DiVito & Sharma (2016) as referred to in 3.1.2, the collaboration on the roadmap was based on the formal structure provided by WBCSD to its members, characterized by barriers to entry such as annual membership fees. Further, the involvement of firms’ leaders among participants or through quotes in the document may have allowed a strengthened resource commitment. However, the roadmap initiative itself did not require additional financial resources and was open to all WBCSD members, rendering it informal within WBCSD. Moreover, this collaboration was based on cooperation, rather than competition. Indeed, no competitive threat was identified by the interviewees as the information shared were not differentiating factors but common understanding and awareness on sustainability issues. Participants were aligned in terms of motivations, had a common mindset and willingness to join forces due to the sense of urgency, had past experience of collaboration and possessed relevant knowledge and the ability to debate with others. Therefore, information was freely shared, and participants were willing to implement the roadmap in their core. These elements further demonstrate a strong alignment with the variables influencing the stability of horizontal collaborations identified in 3.3.1.

Governance structure

The governance structure of the collaboration consisted in a member-led decision-making, which allowed decentralized decision-making processes. All members possessed an equal voice, even though two co-chairs were designated to steer the collaboration, ensure implementation and facilitate decision-making when required. Moreover, an intermediary organization, ERM, was involved, which provided an external perspective to the collaborative process. Decisions from participants and co-chairs were systematically made in agreement with WBCSD and ERM.

Monitoring and updates

A microsite was put in place by WBCSD in order to update actions from WBCSD members (including roadmap participants) towards the pathways identified in the roadmap. In this way, the collaboration is maintained over time, without significant additional resources directly linked to it. WBCSD also contributes to these actions by collaborating with sector associations and prospecting new partners. Moreover, as members of WBCSD, participants have chances to interact with each other as WBCSD meetings are held at least twice per year.

Research Question 3. Benefits of intra-sector collaboration to stakeholders

Benefits of intra-sector collaborations to internal and external stakeholders were described in 3.2.1 and identified during in-depth interviews as summarized in Chapter 5.

Contributors

Through their contribution, participants enhanced their reputation towards customers and investors, their adaptation to market challenges, acquired knowledge from different perspectives, and ultimately contributed to the SDG agenda, which in this case, is aligned with the purpose of participating companies. Moreover, they could benefit from the contents of the roadmap and the insights shared in the collaboration to revise their own internal strategy and further enhance it. Last, the roadmap can be used as a communication tool to raise awareness and understanding of the SDGs internally.

External stakeholders

The roadmap aims at providing chemical companies and associations with an agenda-setting framework making the case for collaborative action. Companies can review or even initiate their sustainability strategy by taking the roadmap as a reference and then differentiate their own priorities and actions. Although mainly targeted to large companies, the roadmap is applicable to smaller companies, who can benefit from the resources and knowledge leveraged by leading companies. Ultimately, intra-sector collaborations can generate positive impacts across the industry and advance collaborative action towards SDGs.

Documents such as SDG Sector Roadmaps can also enhance the understanding of the sector's role with regard to the SDGs to a wide range of stakeholders, including investors, customers, suppliers, and employees. However, the roadmap does not provide opportunities for benchmarking. The ability to target employees may contribute to tackling the challenge of concentrated internal engagement regarding sustainability, outlined in **research question n°1**.

Moreover, other sectors can be inspired from these documents, which allows systemic change to take place through initiating future roadmaps and calling for collaborative action.

Enablers

Multiple enablers of the extension of beneficiaries were identified. First, **the structure of contents** of the document and its **level of generalization** allowed reaching a broader audience. Second, the nature of the contents, especially in the first chapters, emphasized the **incentives** for the chemical sector to adopt SDGs. Third, the **language level of difficulty** of the document was also adapted to a wide range of stakeholders, regardless their understanding of sustainable development or even of the chemical sector. Fourth, the roadmap clearly **stated which stakeholders it aimed at** and other potential interested parties. Fifth, the **communication** of the roadmap through multiple channels (including sector associations and ERM) expanded the scope of impact.

Research Question 4. Limits of intra-sector collaboration and recommendations

Although studying the case of the Chemical Sector SDG Roadmap allowed outlining some of the success factors of intra-sector collaborations, limits were identified with regard to different elements based on the analysis of the roadmap and the entire literature review. Consequently, recommendations are given with regard to six main topics, which are the clarity and transparency of the scope and purpose of the roadmap, the implementation guidelines it provides, the accuracy of its contents, its representativeness of the industry, its communication strategy and traction leveraged, and its monitoring processes and updates.

Clarity and transparency of scope and purpose

Overall, transparency and clarity must be brought in these documents. First, clarifying the purpose of the document, even at the cost of limiting its scope, would facilitate the **intended use of the tool for companies**. In terms of sustainability, a lot of challenges are encountered by companies in order to further integrate the SDGs, as demonstrated in **research question n°1**. Therefore, stakeholder expectations are numerous and although it is understandable that it is not possible to address all of them in one single document, clear statements must provide information on which expectations this document aims at answering. For example, smaller companies or companies in the beginning of their sustainability strategy may not be aware of the steps to initiate based on the roadmap. Companies that already have a clearly defined internal strategy may also wonder how the framework can be complementary to their actions. Potential uses include defining sustainability strategy or reviewing it based on the roadmap, communicating to investors, and raising awareness among employees, as explained by the interviewees. Second, communicating a clear scope would enable **anticipating criticism**, namely stating that this document's first aim is to be a start to the conversation, rather than

being a perfectly representative document of the industry with fixed priority SDGs. Third, transparency regarding the scope would enable **further steps** to be clearly identified and recognized as such, rather than seen as rooms for improvement. For example, cross-sector collaboration has been named as a next step by interviewed contributors, which cannot be clearly understood from the roadmap contents.

Implementation guidelines

In the specific case of the chemical sector, due to the inherent complexity and diversity of the industry, no specific details for implementation, such as KPIs, could be derived from the document. The lack of timelines and specific goals and objectives was seen as disappointing by some interviewees but also according to external criticism (Stringer, 2018). As explained by interviewees, this problem may not appear for some sectors due to the past experience of collaboration of the working group or due to the nature of the sector itself. However, other sectors may encounter similar problems, which is why improvements must be made. Linking this document with other complementary tools would enable anticipating this type of criticism and would also allow bringing more clarity to the companies and associations willing to tackle the issues proposed by the SDG agenda. Indeed, based on the criteria established by Verboven and Vanherck (2016), usability and applicability are central characteristics for effective sustainability tools for SMEs. Therefore, practical outcomes on the operational level and an extensive catalogue of simple actions on product, process, organizational level, are a prerequisite.

Accuracy of contents

Critics also address the accuracy of some of the contents present in the roadmap, including the priority SDGs derived from the materiality analysis. The roadmap prioritizes SDGs 2, 3, 6, 7, 8, 9, 11, 12, 13 and 14. By prioritizing these 10 goals, the roadmap efficiently understands the need to reaffirm links with SDGs and targets (including 3.9, 6.3, 12.4, 12.5 and 14.1) but also with the broad agenda as the sector addresses all SDGs directly or indirectly (Honkonen & Khan, 2017). However, it does not include SDG 15, to which the sector is closely linked and which represents reputation management and risk reduction opportunities, nor SDG 16, which enables enhanced reputation to the chemical sector through compliance to legal requirements (Corporate Citizenship & Business & Sustainable Development Commission, 2016). To this problem, contributors and coordinators answered that the goal of the roadmap is not to be a perfect document, but a call for collaborative action. On top of clarifying the roadmap's purpose, more explanations could be provided regarding the selection process of the

SDGs and its meaning on the industry level but also on the company level. For example, further details could be given regarding the possibility for companies to apply a similar process to the one used in the roadmap, and therefore derive customized actions and pathways.

Additionally, the issue of interlinkages between the SDGs could be further addressed. The International Council for Science (2017) gives recommendations to prevent overlooking the interlinkages between SDGs, including the systematic identification of interactions among the SDGs to inform priority-setting and the mapping of existing institutions and actors to assess strengths and weaknesses of status quo for delivering the SDGs. Following this internal process, the nature of interlinkages could be further explained in the roadmap through a statement explicating the need for prioritization (as advised by Allen, Metternicht, and Wiedmann, 2018), its consequences, the essence of interlinkages, and highlighting that non-prioritized goals should not be overlooked, which was confirmed by J. Gomme. As explained during interviews, the qualitative scale used in the roadmap (from low to high) should be understood in a relative way, namely as going from lower to higher. This type of precision would be welcome in order to completely grasp the concept of the matrix.

Moreover, some of the roadmap contents, such as this particular materiality matrix, are relatively inward-looking. As the matrix relies on the current impact of the industry and its potential of impact, it does not involve external stakeholders, at least directly. The external input from ERM experts has been helpful in addressing this issue, although in the future, external stakeholders' perceptions and expectations could be collected in order to provide a more realistic and comprehensive picture. One solution to this lack of initiative is the reversed materiality, aiming at departing from societal needs and ambitions and understanding their effect on business (Van Tulder, 2018). As one of the interviewees recommends, the roadmap would need to include more upfront the broader society (A. Dierckx, interview, April 18, 2019). This recommendation goes in line with the GRI G4 guidelines (GRI, as cited in Calabrese, Costa, Ghiron, & Menichini, 2017), according to which materiality analysis is a participatory process, which must involve interactive dialogue with stakeholders both internal and external to the organization, thereby allowing a better treatment of subjectivity through multidimensionality. Considering that 48% of the industry's global output was used in other sectors in 2017 (Deloitte, 2017b), involving value chain partners may be particularly relevant.

Further, the modest sense of urgency and the veracity of the positive statements regarding the industry impact and history are also subject to debates and are pointed out as a lack of ambition. Indeed, interviewees shared that there could be more ambition in the roadmap (M. Washer, interview, March 29, 2019; L. Edgell, interview, May 8, 2019) and the roadmap

would need to recognize both positive and negative impacts and suggest actions on how to address them (M. Washer, interview, March 29, 2019). According to Joe Digangi, senior scientist and technical advisor for the International POPs (Persistent Organic Pollutants) Elimination Network, the industry history of promoting sustainable development in all communities can be proven as untrue if developing and transitioning economies are taken into account. Moreover, he adds that the scenarios presented are insufficient considering the current impact of fossil fuels used on the environment and on people (Stringer, 2018). On top of the arguments cited above, roadmap initiators must first agree on the purpose of the roadmap and by extension, the willingness to engage the audience by stressing the opportunities behind the SDGs, or the need to provide a realistic picture emphasizing the need for urgent action and the risks for the industry. Indeed, the private sector being seen as a poor contributor to the SDGs (GlobeScan & SustainAbility, 2017), a positive and opportunity-driven framing may help changing this perception, while it may also provide an unrealistic picture of the industry, leading to a lack of recognition of the business' contribution to negative impacts on the SDGs.

Representativeness

Representativeness is a complex issue to tackle. First, its meaning must be clarified: should the contributors represent the whole sector? Should the contents of the roadmap represent the whole sector? Although both can be sought, it appears from the interviews and the literature review that leading companies are often put at the forefront of these initiatives due to their resources and the knowledge they acquired. Moreover, although diversity must be embraced, efficiency must be preserved and therefore, the number of participants to initiatives with similar processes to the roadmap is limited per se. Knowing that the chemical sector is extremely diverse, this leads to the fact that it is impossible to represent the whole sector through the contributors, even though challenges faced by leading companies are faced among most of the industry members. That is one of the reasons why contributors and coordinators explained that representativeness was not an aim of the roadmap. Some interviewees (non-contributors) confirmed that although they may have liked to be part of the contributors, they did not know what contents they could have added. However, some of them also emphasize that for companies which are in the early stages in their sustainability journey, some basic needs are not answered by the roadmap.

The participating companies account for around 5.7% of global sales in 2017 according to companies' respective sales outlined in 4.3.3 and the global industry output identified in 2.1.2, while Cefic's and ACC's members amount of sales cannot be calculated but represent

regions respectively accounting for 15.6% and 13.4% of total sales in 2017 (Cefic, 2018a). However, in the case of the chemical sector, the approach of representing the industry based on leading companies was feasible. For future roadmaps, it is necessary to analyze in detail the industry prior to choosing participants in order to identify the issues for each type of party and see if there are commonalities which can allow large and leading companies to represent the interests of others.

Additionally, representativeness in sustainability contexts should be by design aligned not only with the current state of the industry, but also with its prospects. Therefore, in order to set pathways to 2030, it is recommended to analyze in detail the prospects of the industry, which, in this case, indicate that 67.8% of the world chemical sales in 2030 will be in Asia, among which 49.9% world sales will be in China (Cefic, 2018a).

Moreover, small companies present more reticence to be part of intra-sector collaborations because of their lack of awareness of the potential benefits of a network, the perception of these collaborations as a competitive threat, their risk-adversity, the lack of resources to get involved, and organizational rigidity (Petrescu, Rus, & Negrusa, 2014). Therefore, WBCSD membership (composed of an annual fee) may hinder a number of small companies to contribute to these tools. Therefore, a recommendation for WBCSD or other unifying bodies would be to seek alternative ways to include small companies in the process. Of course, bringing incentives to these small companies may be a recommendation, however, modifying the membership fee would go beyond the scope of this roadmap. Since these companies call for contents that are more adapted to their needs but do not possess the resources or knowledge to contribute to them, another solution would be to collect their needs in terms of tools in a systematic way in a preliminary phase. Of course, this recommendation assumes that the purpose of the roadmap is to target as many industry members as possible. This can be facilitated by collaborating with other bodies such as the UN Global Compact.

Overall, being open to contributors that are not members, in this case of WBCSD, may enable enhanced representativeness and additional insights, as it was the case by involving associations. Keeping this flexibility and opening doors to external parties could be further emphasized for future roadmaps.

Communication strategy and traction

In order to reach a large number of companies, communication is crucial. The nature of the contributors allowed mobilizing pivotal actors such as associations, which were able to spread the word to their members. However, the roadmap is not highlighted as a pivotal

document in these communications. Most importantly, companies in the beginning of their sustainability journey are overloaded with tools and information regarding sustainability, without knowing how to prioritize them.

Recommendations would be to seek pivotal partners such as the United Nations to emphasize the importance and relevance of this kind of document and introduce it as a first document of introduction. Another option is to seek further commitment from participating members, associations or external bodies to promote the roadmap as an introductory document. In order to implement this, formal commitments could be adopted by contributors as part of their participation to the roadmap, as companies may reach other audiences through their own channels, by displaying it on their website for example. A communication strategy must be set up and formalized by roadmap initiators and contributors in order to select the most relevant channels to use in order to reach the roadmap's target audience(s). Last, the timing of the roadmap may have played a role in its integration from companies. Launched in July 2018, the roadmap was mostly promoted in the following months, although promotion is still an ongoing process. This time of the year may not have been the most appropriate to receive maximal traction due to the summer holidays and due to the already defined year strategy and the ongoing reporting attached to it. Indeed, annual reports are a continuous process often starting before the seventh month of the calendar year, thereby delaying at least to one year later potential integration of the roadmap insights within the strategy.

In terms of contents, in order to optimize the usability of this document and replace it in its context, clear references to other key documents should be made, including documents produced by GRI suggesting implementation steps and indicators. In line with the willingness to reach a broader audience including smaller companies and countries like China, it would be interesting to translate the document into the languages mostly used in the industry and/or aligned with the industry prospects, such as in Chinese, Japanese or Arabic. Depending on the purpose of the roadmap and its derived target audience(s), the language style should be adapted. Currently, the roadmap is mainly targeting corporate sustainability managers. The language used may not be efficient for other targets such as small companies which may not have the expertise from within to process this type of document. A recommendation would be to keep the original document as it is and to complement it with action-driven summaries or factsheets, addressed to other types of audience.

Monitoring and updates

The chemical sector was a logical choice as a first sector roadmap, due to its role, the enthusiasm demonstrated by sector members, its history of collaborations towards sustainability and its prevalence among WBCSD members. However, being the first to implement WBCSD SDG Sector Roadmap guidelines implies that there is no similar experience to rely on. Therefore, this roadmap allowed to refine the original guidelines, but also to identify rooms for improvement for future roadmaps.

Moreover, although the microsite exists and can be useful to further leverage the roadmap and update it, it is not leveraged as much as it could. First, the strategy behind the microsite and the expected contributions from roadmap participants should be made explicit and formalized during the roadmap process. Contributors could be incentivized to share their actions through benefits such as increased reputation and visibility. Second, in order to allow these benefits and to fully exploit the microsite, its purpose and contents should be broadly communicated by contributors, WBCSD and other partnering bodies. Moreover, this microsite could enable WBCSD to easily update the roadmap in the future, as for example, some actions are linked to 2020 goals or initiatives.

Research Question 5. Conditions for replicability to other sectors

The replicability of the roadmap to other sectors was evaluated based on Chapter 2 and the opinions shared by interviewees, as outlined in Chapter 5.

As presented in the results of **research question n°2**, no competitive threat was identified by the interviewees as the information shared were not differentiating factors but common understanding and awareness on sustainability issues. These results also demonstrate identified success factors of the roadmap. Whereas the Chemical Sector SDG Roadmap participants were efficiently positioned to embody these success factors, this may not be the case for other sectors.

Specificities of the chemical sector

The chemical sector and the roadmap's participants present numerous specificities that must be taken into account in assessing the replicability of the roadmap. First, the chemical sector is characterized by its heterogeneity and diversity, and the constant interactions between competitors, who also communicate as suppliers and customers of each other. These **specific competitive dynamics** can foster the creation of collaborations. Oppositely, cost-competition and poorly differentiated sectors may negatively influence the ability to conduct successful intra-sector collaborations. Second, the industry has a **strong record of past collaborations**,

including among roadmap's participants, which may have facilitated the collaborative process. Third, the chemical sector demonstrated a strong **willingness to join forces** due to the pressure of external stakeholders, the disruptive trends upcoming, the clear business opportunities emerging from sustainability and the regulatory pressure, which may not be the same for other sectors. Fourth, the chemicals are the **most represented sector among WBCSD members**; another initiating body may be required for under-represented sectors within WBCSD. Fifth, due to the **substantial scope of activity of the sector**, sustainability challenges of large companies can also be applied to small(er) companies, which may be different for other sectors.

Future roadmaps and variations

The chemical industry is driven by the necessity to reduce business risks, together with utilities, oil and gas, industrials and other basic materials industries. This “risk nexus” has been considered in 2.2.4 as requiring systemic change and coalition building, therefore increasing the chances of these sectors to be at the core of future roadmaps. As an illustration, WBCSD is currently working on forestry and cement sectors, which are part of this risk nexus.

Since the chemical sector is very heterogeneous and diversified per se, specific indicators could not be provided in the context of the roadmap. However, sector roadmaps of more homogeneous and less complex industries may include more details on implementation steps and prioritize a narrower set of SDGs. Moreover, sector roadmaps may differ in their purpose and target audiences, thereby influencing the identification of the most relevant and appropriate communication mechanisms, participants and collaborative process. Further, depending on the level of sustainability maturity in the sector and the number of ongoing initiatives (on all levels including sector level), the participants may differ in nature and may include other types of stakeholders such as the United Nations, researchers, industry experts etc. Other influencing factors include the timeframe of the collaboration, the existence of a motivated unifying body aware of the legal requirements, the incentives of roadmap participants, the previous collaboration experience of the working group etc.

Last, WBCSD and ERM created guidelines for SDG Sector Roadmaps and improved them based on the experience of the chemical sector in drafting the first SDG Sector Roadmap. However, each sector has unique features and requirements for success (Sustainable Development Solutions Network, 2015), therefore further updates to the original methodology may be required based on the acquired experiences of other SDG Sector Roadmaps.

Conclusions

Purpose of this research

This research master's thesis studies the role, the impact and relevance of sector-level initiatives towards the integration of the SDGs by examining the case of the Chemical Sector SDG Roadmap, the first SDG Sector Roadmap issued by WBCSD, ERM, leading member companies in the chemical sector and associations. In order to analyze this subject, the main research question was decomposed into five sub-research questions, as described in the Introduction. These questions have been answered by combining the outputs of the literature review on the SDGs, the chemical sector and competitor collaborations, with the analysis of the Chemical Sector SDG Roadmap, based on the results from ten in-depth interviews (totaling 425 minutes) with roadmap's contributors and external stakeholders.

Main findings

First, the **challenges of businesses** with regard to the integration of SDGs were assessed. It was found from the literature review and the empirical analysis that although numerous initiatives and tools are available to businesses, companies face multiple challenges. These include the lack of understanding of the business case behind sustainability and the SDGs, the intrinsic complexity of the SDG agenda, the absence of clear targets and standardized indicators to monitor and communicate progress on SDGs, the lack of SDGs prioritization, the concentration of internal engagement, the need to constantly update the definition of value and standards due to the dynamic nature of sustainability, confusion due to the existence of a large number of frameworks, and the lack of resources, especially for SMEs.

Second, the **success factors of intra-sector collaborations** were studied based on the literature review and interviews. The identity and experience in collaborations of the unifying body (in this case, WBCSD) were highlighted as enablers, together with the creation of a robust methodology prior to the roadmap. Moreover, the roadmap was based on a cooperation spirit and a semi-informal structure. Therefore, alignment between the participants in terms of mindset, knowledge and purpose and the presence of continuous communication processes were important success factors. Decentralized decision-making with the assistance of an external organization were also demonstrated as pivotal, combined with updates on partnership activities and progress, and monitoring and evaluation systems.

Third, the **benefits provided by intra-sector collaborations** were identified, not only to direct contributors but also to external stakeholders. Contributors benefited from reputation

enhancement, improved readiness to disruptive trends and knowledge sharing. Together with other sector companies, they could use the contents of the roadmap to further implement their sustainability strategy. Documents such as SDG Sector Roadmaps can also enhance the understanding of a sector's role by a wide range of stakeholders, under the conditions that the language used in the document, the structure and nature of contents, and the communication channels leveraged are adapted to these audiences. These stakeholders include investors, customers, suppliers, and employees. Moreover, other sectors can be inspired from these documents, which allows systemic change to take place.

Fourth, **limits of intra-sector collaborations** were assessed, and **recommendations** were provided. For example, the need for transparency and clarity with regard to the document's purpose was highlighted, together with some recommendations related to the limited amount of details regarding implementation steps in the roadmap. Further, the accuracy of contents was critically evaluated in order to emphasize rooms for improvement in terms of contextualization, framing and methodology. Moreover, representativeness was underlined as a crucial challenge which needs to be tackled in competitor collaborations, through the use of alternative ways to mobilize a broader scope of actors, regardless their size and sustainability maturity. Last, solutions to communication and traction's challenges were provided, as well as further rooms for improvement of monitoring and updates.

Fifth, the **possibility to replicate intra-sector collaborations** such as roadmaps **to other sectors** was evaluated. On the one hand, the chemical sector has inherent characteristics which may have facilitated this intra-sector collaboration, including its competitive dynamics, its motivations, its history of collaborations and its sustainability maturity. On the other hand, the type of collaborations analyzed in this context does not represent significant competitive threats to participants, as the opinions, information and knowledge shared are not confidential. Variations may be observed in future roadmaps, in terms of level of details, purpose, target audiences, nature of participants etc. based on numerous factors including the motivations and competitive dynamics of the sector. Future roadmaps will likely concern sectors that are part of the "risk nexus", namely utilities, oil and gas, industrials and basic materials industries.

Implications

The results of this research can be applied to intra-sector collaborations, in particular knowledge collaborations leading to the production of documents in the frame of the SDGs. Although this study focuses on the SDGs, most findings can be generalized to intra-sector knowledge collaborations around sustainability at large.

Following the increasing calls for sector initiatives, a number of intra-sector collaborations will likely be conducted in the next years. WBCSD announced that two additional sector roadmaps will be issued this year. Moreover, monitoring and incremental revisions of the Chemical Sector SDG Roadmap are ongoing. For this reason, the analysis of this intra-sector collaboration and the recommendations provided can guide and support the development of future roadmaps or intra-sector initiatives and deliver a preliminary assessment of the ability of this type of collaboration to achieve its purpose and fill the current gaps in terms of SDGs integration for the private sector. Additionally, the recommendations may be of interest to the Chemical Sector SDG Roadmap's contributors willing to reflect on their contribution to the tool and potentially implementing actions in that regard.

Last, the findings provide a knowledge base and a reference point for scholars and academics aiming at further investigating the dynamics and relevance of sector-level collaboration in the integration of SDGs, and in general, sustainability. Some suggestions for further research are provided in the next paragraphs.

Limitations and suggestions for further research

Since initiatives are emerging, this topic will likely gain increased traction over the next years. Therefore, research is strongly encouraged to support these rising ambitions. Some suggestions are given in that regard, based on the scope and limitations of the present research.

First, due to the newness of the topic, public information is currently limited as well as the number of cases available for assessment. However, as the Chemical Sector SDG Roadmap gains traction and other roadmaps are created, more substance will be available to enable quantitative analyses to be conducted on users of the roadmap for example, including companies, associations but also investors, customers or employees.

Second, although partly covered, a complete assessment of the accuracy of the technical contents of the Roadmap would require an in-depth scientific analysis from industry experts with extensive knowledge of the industry's problematics, which is out of the scope of the present research. Moreover, further research would be encouraged to evaluate the wording and vocabulary used in the Roadmap, as well as its design and layout, requiring a combination of expertise in sustainability, linguistics and marketing.

Third, this research mainly covers knowledge collaborations leading to the production and publication of an output, such as a document. Intra-sector collaborations aiming at sharing technical resources for the purpose of SDGs integration represent relevant areas of research which would raise additional concerns, including regulatory and compliance issues.

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