WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

Industry Agenda

Scaling Up Climate Action through Value Chain Mobilization

In collaboration with Accenture

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Contents

Foreword

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The adoption of the Paris Agreement on 12 December by 195 governments is a major turning point in the global fight against climate change. To date, 190 governments have committed to specific actions to reduce their national greenhouse gas (GHG) emissions, covering over 95% of total global emissions. These efforts alone will not suffice in keeping the world climate-safe however. Even the most optimistic estimates suggest that all of the pledges taken together would only contain warming to 2.7°C above pre-industrial levels. But these bottom-up national pledges will provide a solid foundation from which ambition can be ratcheted up in the coming years.

At the same time, the momentum for action is increasing from the business community. Leading companies are disrupting the market by adopting innovative lower carbon, circular business models and leveraging digital technologies. The resulting new offerings promise growth without increasing emissions and often result in decreased emissions in other industries.

Many of the most impactful new offerings are built on collaboration. This report describes the potential for value chains to act as a lens or anchor to focus attention on a particular challenge, bringing together players from beyond typical ecosystems. Pooling resources and expertise in this way will not only help to solve the immediate challenge but will create new solutions capable of operating at the scale required to deliver real impact on global GHG emissions.

Building these collaborations is not straightforward, as the case study in this report from the aviation industry shows. But the potential benefits to businesses that get it right are significant. Businesses successfully engaging in a collaborative process as outlined in this report will not only unlock hidden value in their operations but will build real progress, jointly with other key players of their value chain, towards a low-carbon economy.

1 Context and Background

1.1 Business and world leaders recognize the importance of strong corporate leadership to drive impact

The international community is at a critical juncture in its endeavour to advance global climate change action. By articulating a clear long-term pathway for global emission reductions, supported by national action, the adoption of the Paris Agreement on 12 December 2015 by 195 governments is a major turning point in the global fight against climate change. The world's nations agreed to hold the rise in the global average temperature to "well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels". They also agreed to a review mechanism that will help ratchet up efforts every five years from 2018, as well as a floor for financial flows to developing countries.

The Paris outcomes are far more ambitious than had been expected – a collective recognition of the dangerous risks posed by climate change, as well as the cost of inaction. They are also sending unmistakable signals to the global markets that governments are willing to put aside their differences and do their part in tackling this biggest of global challenges.

At the same time, the Paris Agreement is clearly only one of many important milestones on the journey – and efforts to keep climate warming within 2°C will need to be ratcheted up in the next five years and beyond. The business community has the potential to play a key role by undertaking concrete climate action and commitments – whether individually or through collaborative, public-private initiatives.

Spurred by the mobilization at the United Nations Secretary-General's Climate Summit in 2014, new patterns of collaborative action on climate change have been emerging. The trend in recent years has been towards more public-private action to deliver climate and development solutions at scale. Such collaborative approaches focus on different topics, from innovative climate finance and insurance schemes, to natural resource management, as well as new value chain collaborations. An example of the latter is the Tropical Forest Alliance 2020.

The rise of these initiatives is not a substitute for clear long-term national plans, but is rather a means to facilitate their implementation, through private-sector engagement. The question is now how best to create an environment in which multiple and aligned solutions can emerge – whether from businesses, cities or other actors – and achieve scale. While many bottom-up initiatives have sprung up in response to climate and environmental challenges in a variety of key areas, such as energy efficiency, renewables investment, lighting and domestic appliances, few have achieved the scale required to address the climate challenge.

At World Economic Forum Annual Meetings 2014 and 2015, senior business executives discussed the development of a set of activities that could complement the intergovernmental climate negotiations, to support the delivery of concrete, scalable climate solutions. The leaders of more than 40 companies that are Partners or Members of the World Economic Forum recognized the importance of strong corporate leadership and agreed that business-driven initiatives are important not only for achieving the necessary long-term transformations but also to provide positive signals to governments.

1.2 Multistakeholder collaboration is crucial to foster large-scale change

Cross-sectoral, public-private mobilization is key to delivering large-scale, transformative change. Today, an understanding of the potential impact and contributions from new patterns of collaborative climate action is growing and experience is being gained. With clearly defined "coalitions of the willing and able", actors from across governments (including sub-sovereign actors, such as cities and regions/provinces), business and civil society can mobilize their combined skills, innovation and resources to make clear progress on climate change at scale, against specific, collectively defined goals.

Such practical and yet scaled collaborations cut across traditional boundaries of interest, expertise and nationality. They can be:

- Thematic, sector- or technology-based
- Linked to transforming global value chains
- Participative, transparent and accountable
- Designed to meet combined economic development and climate policy objectives
- Relevant to particular business strategies or national development objectives

To be successful, new collaborations on climate action need a clear aim and focus. They need to lead to creating the demand and market for technology, finance and regulatory innovations, be time-bound, and have measurable outcomes.

Case Study: The Tropical Forest Alliance 2020 (TFA 2020)

Aim

Following the announcement of the Consumer Goods Forum – an umbrella organization of over 400 companies and 25 non-governmental organizations and civil society groups – to achieve zero net tropical deforestation by 2020, several governments made the case to create a vehicle to enhance the capacity of committed businesses to achieve these goals throughout their supply chains. The Tropical Forest Alliance (TFA) was set up as this multistakeholder vehicle.

Solution

The production of soy, beef, paper and pulp, and palm oil is estimated to account for about half of the world's current tropical deforestation. The TFA is designed to help slow tropical deforestation through public-private cooperation. Its partners include seven national governments, 18 buyer and producer companies and the Consumer Goods Forum. Through TFA, they commit to voluntary collaboration to promote actions that support the goal of creating sustainable supply chains in these key agricultural commodities by 2020.

Lessons learned

Focus. The initiative focuses on the four commodity value chains that account for the most deforestation and, therefore, could have the biggest impact on reducing GHG emissions if sustainable production were brought to scale. Priority geographies have been identified.

Demand pull. From the beginning, the strong demand pull came through commitments from consumer goods companies. Buyers were already convinced and have policies in place to increase the sourcing of sustainable commodities to reach their no-deforestation goals.

Collaborative platform. The TFA acts as a platform for engagement in meaningful collaborations. One of its benefits was to bring retailers and financial institutions into a constructive dialogue with other players of the supply chain.

Time-bound targets. Most TFA members are signatories of the New York Declaration on Forests, which endorses a global timeline to cut natural forest loss in half by 2020 and strive to end it by 2030.

Source: Tropical Forest Alliance 2020[1]

1.3 Businesses recognize the need for more collaborative initiatives to address the climate challenge

In addition to publicly expressing support for policy-makers' efforts towards strong climate negotiation outcomes, businesses have also recognized the need to accelerate the development of collaborative initiatives that can deliver scaled sectoral or cross-sectoral climate solutions. Embracing a value chain approach to bring new impetus to emission reductions is increasingly recognized as a primary mechanism due to the challenges of delivering climate solutions through sectoral efforts alone and to the opportunities offered by joint, innovative efforts.

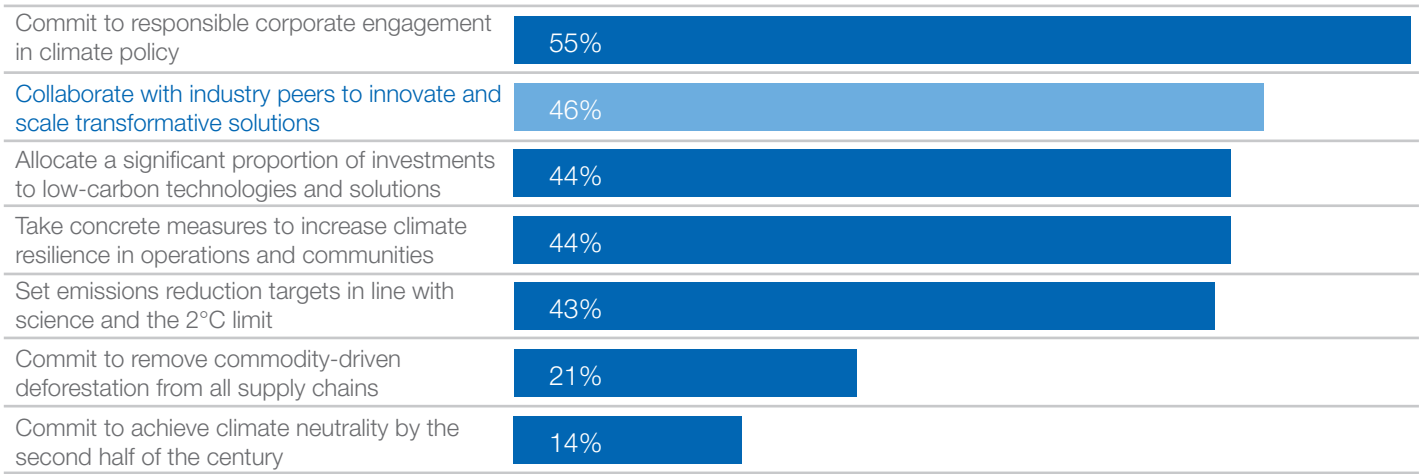
Collaboration to address climate change mitigation is more prevalent in certain industries than in others. According to the 2015 *United Nations Global Compact-Accenture CEO Study Special Edition: A Call to Climate Action*,[2] 46% of business leaders believe that collaboration is one of the most important leadership behaviours with respect to corporate action on climate change (Figure 1). Collaboration is the second most mentioned behaviour after commitment to corporate engagement in climate policy. Perspectives are broadly similar across all geographies.

The emphasis on collaboration is particularly strong in asset-intensive industries that need to overcome unique barriers to promote innovation: business leaders in the chemicals (61%), energy (61%) and mining and metals sectors (55%) place particular emphasis on collaboration with peers (Figure 2).

Many vehicles are emerging to facilitate collaborative efforts, including for example the UN Global Compact Business Partnership Hub. It enables companies to browse existing partnership projects and to showcase those that have potential for scalability and that seek to engage additional partners.

This report uses value chains as the starting point to identify collaborative opportunities to reduce GHG emissions, echoing the strong demand that emerged from businesses during the climate-related meetings and working sessions hosted by the World Economic Forum throughout 2015 (Figure 3).

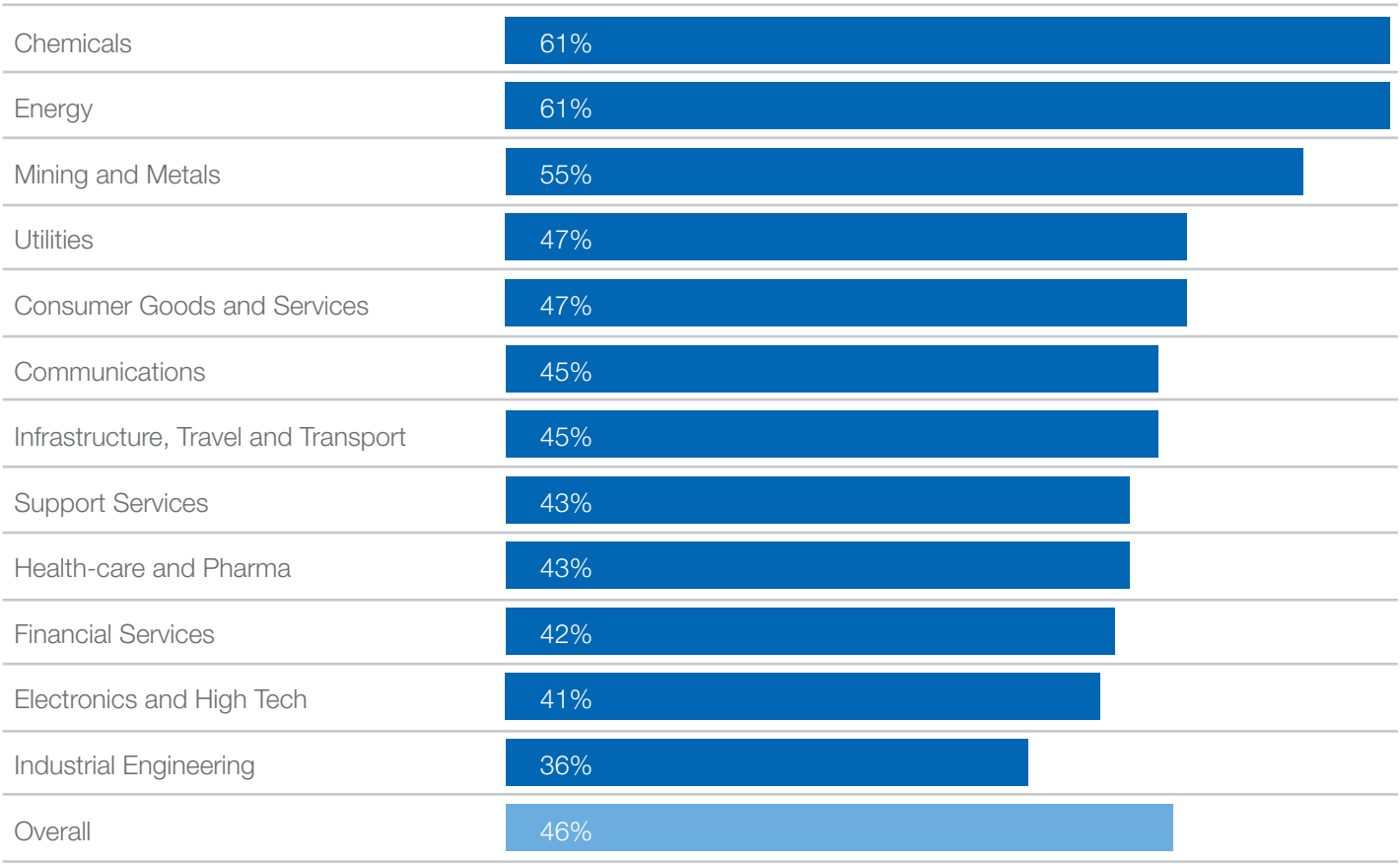
Figure 1: Business Leaders Stating Collaboration Is Critical to Business Leadership on Climate Change



Source: 2015 *United Nations Global Compact-Accenture CEO Study Special Edition: A Call to Climate Action*, p. 22

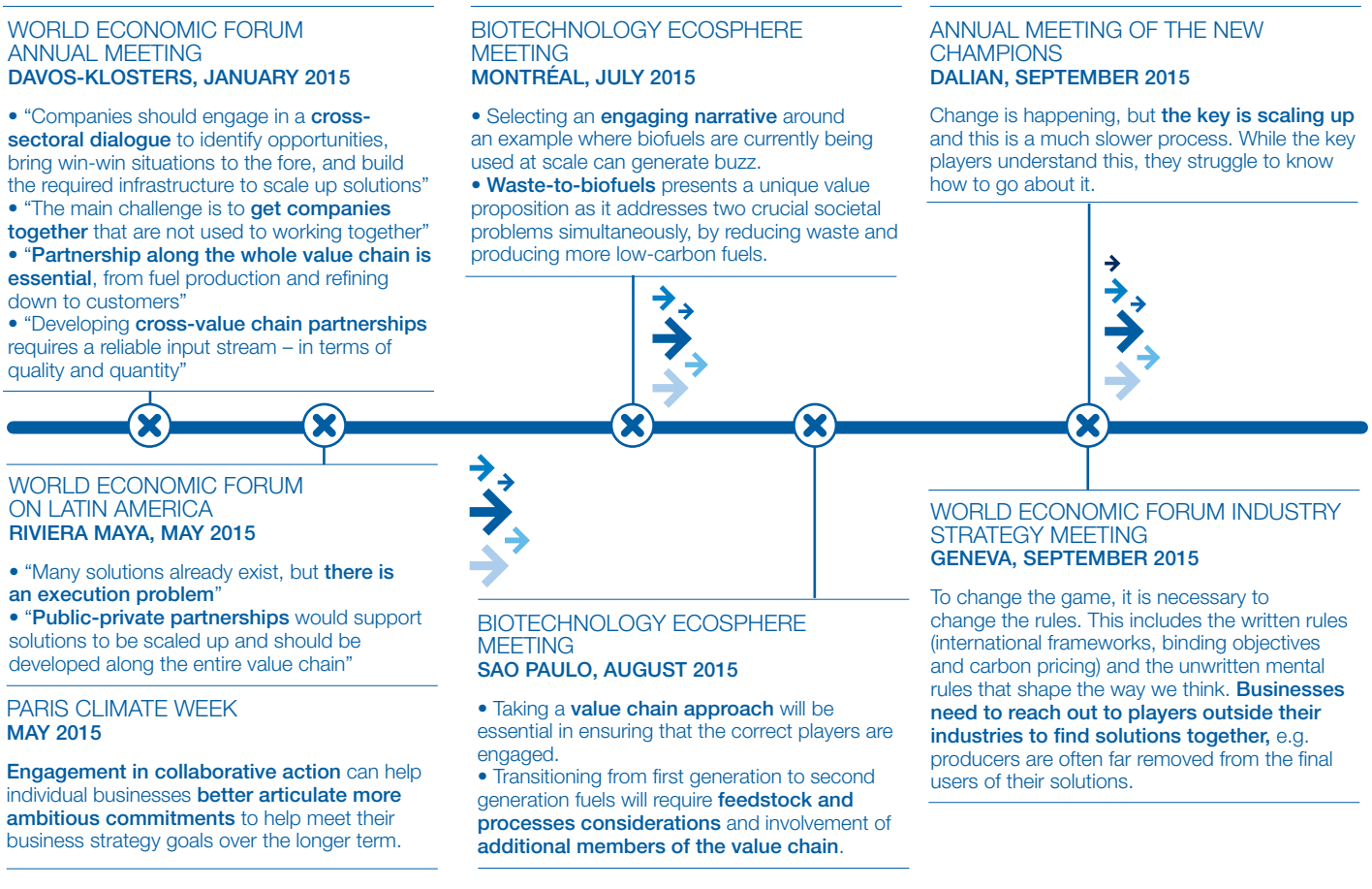
Note: data represents the proportion of respondents selecting each factor among their top three choices

Figure 2: Business Leaders Mentioning Collaboration as an Important Leadership Behaviour by Industry



Source: 2015 *United Nations Global Compact-Accenture CEO Study Special Edition: A Call to Climate Action*

Figure 3: Demand for Cross-Sectoral Collaboration to Foster Climate Action (World Economic Forum 2015 Private Sessions)



Source: World Economic Forum 2015 working sessions

2 How Value Chain Mobilization Can Help Scale Up Climate Action

This demand for scaling up climate solutions through collaboration creates new opportunities for climate actions. A key question is: **How can collaborative opportunities be leveraged through value chain mobilization to scale up climate change mitigation actions?** Such mobilization should help move from barriers to solutions (Figure 4).

This report describes the approach and benefits related to value chain mobilization to deliver climate action, provides cross-sectoral guidance for implementing these initiatives, and identifies specific opportunities for collaboration in the value chains of bio-based solutions.

The objective is not to highlight or quantify specific value chain segments that can make the most impact in climate change mitigation, but rather to highlight common spaces for collaboration through the value chain approach, and illustrate this approach with case studies.

2.1 Consideration of the end-to-end value chain is essential to embrace more holistic thinking

The delivery of climate solutions involves many economic sectors. A value chain approach can help identify potential emissions reduction opportunities as well as assist and enhance their delivery across the whole product life cycle. This approach also drives companies to embrace more holistic thinking for upstream and downstream emissions, as well as their direct emissions.

For the purposes of this report, a value chain is defined as the set of processes or activities that add value to a product, across its initial design through sourcing, production and distribution, to use, end-of-life and, ultimately, to product disposal (Figure 5). The value chain includes suppliers, direct operations, customers, disposal and logistics. Its overall carbon impact can be assessed following the GHG Protocol methodology, which differentiates direct (Scope 1) from indirect (Scope 2 and 3) GHG emissions.

2.2 Value chains need to be reinvented to drive for non-incremental emissions reductions

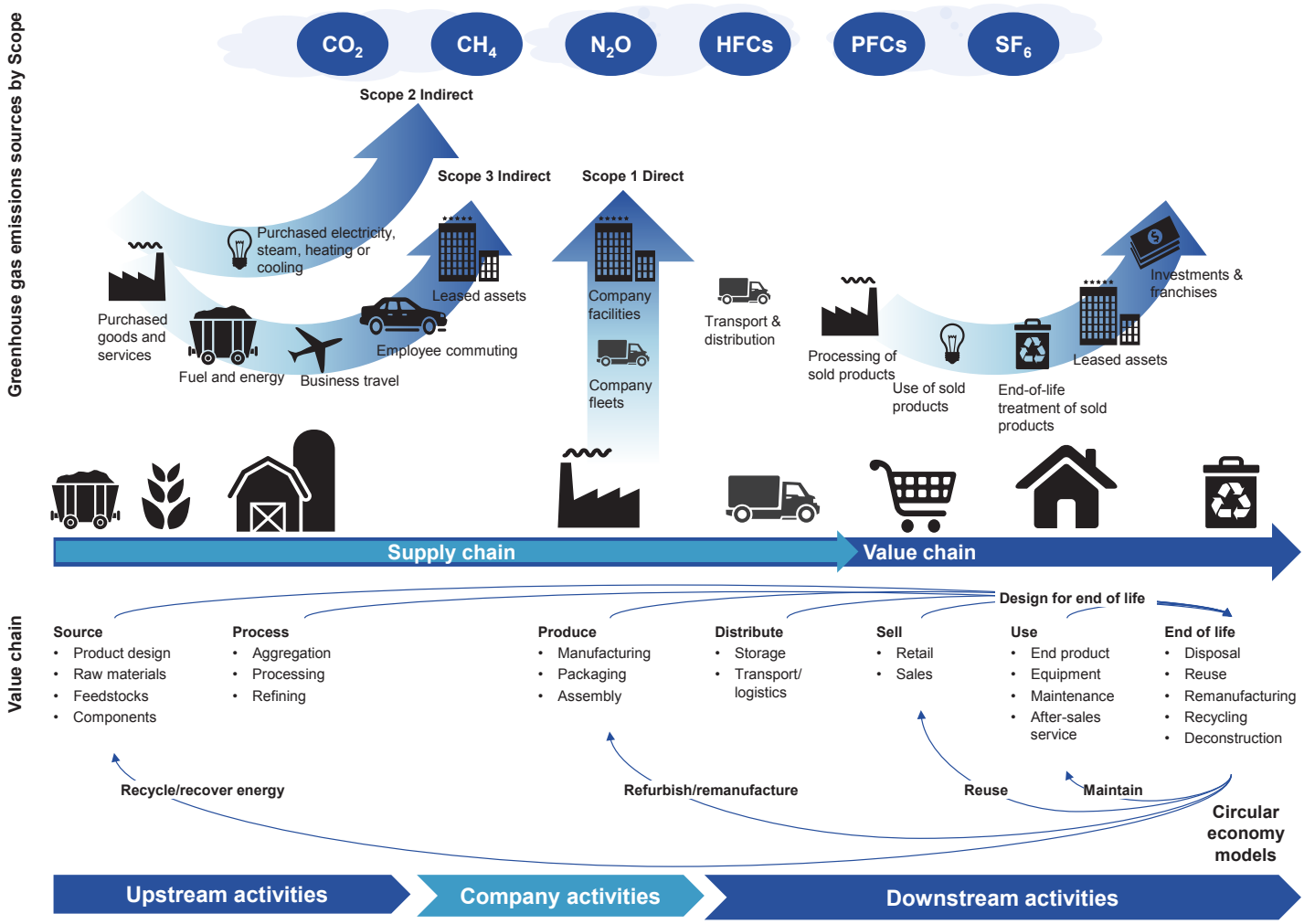
To identify opportunities for climate change mitigation, it is essential to consider both the early design stages as well as the in-use and end-of-life stages. This is often where the carbon impact is the greatest, or where decisions are made that define ultimate emission pathways and footprints. This also means that these stages may represent the best opportunities for collaboration to reduce carbon emissions. For example:

- Reducing the embodied carbon of a product by using different raw materials
- Reducing the end-of-life impact by designing the product for easy disassembly for reuse or remanufacturing
- Optimizing distribution to minimize carbon emissions
- Redesigning a product to produce less carbon emissions during its use by consumers

Figure 4: From Barriers to Scale to Collaborative Solutions

Source: Accenture, based on research

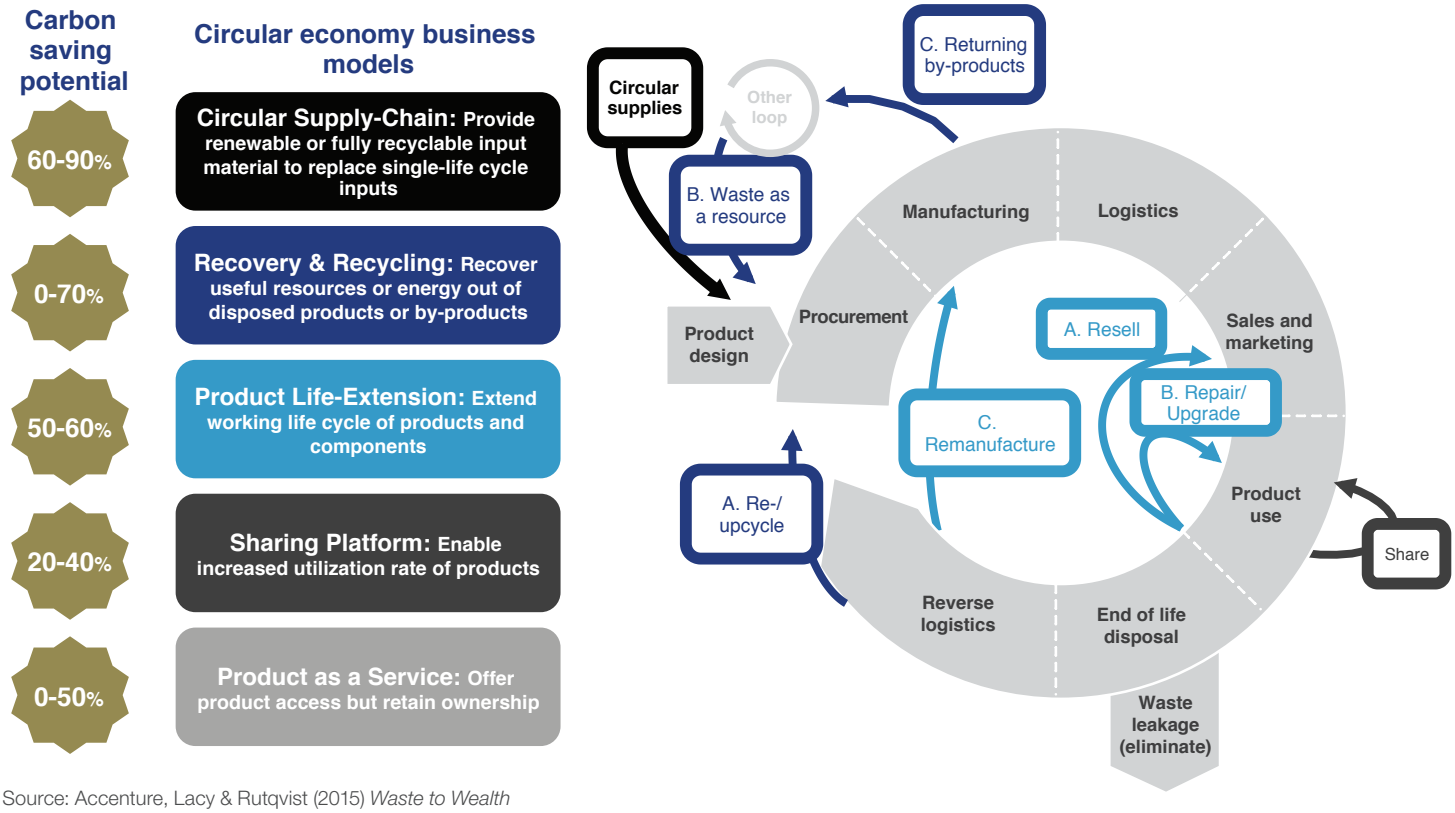
Figure 5: Overview of Activities and Emissions across the Value Chain



Source: Accenture; *Corporate Value Chain (Scope 3) Accounting and Reporting Standard, Greenhouse Gas Protocol*[3]

Zoom In on the Circular Economy

Five circular economy business models enable business growth and carbon emissions reduction through value chain collaboration



Source: Accenture, Lacy & Rutqvist (2015) *Waste to Wealth*

2.3 Value chains are ideal for identifying cross-sectoral collaboration opportunities to deliver climate action

The four largest economic sectors contributing to global GHG emissions (Figure 6) are **industry** (32% of direct and indirect emissions); **agriculture, forestry and other land use** (25%); **buildings** (18%); and **transport** (14%). These shares of global emissions include indirect emissions related to the sectors' electricity and heat consumption. Value chains associated with activities in these sectors are likely to have high climate change mitigation potential.

Further, the carbon impact of an industry extends far beyond its immediate direct activities (Figure 7). For example, around 10-20% of total GHG emissions from the oil and gas sector are from its direct operations, while the remaining 80-90% come from the use of oil and gas products in industry, power plants, buildings and transport.

Case Study: Value Chain Mobilization in the Oil and Gas Industry

Challenge

Energy companies have a major role to play in addressing climate change. One critical issue is energy efficiency, both from the operational and user perspectives. Currently, **80-90% of total GHG emissions from the oil and gas sector come from the end use of oil and gas products** in industry, power plants, buildings and transportation. In other words, a 1% savings in these areas is equivalent to at least a 4% improvement in operational efficiency.[5]

This understanding is reflected by collaborative initiatives, such as the Oil and Gas Climate Initiative, an industry effort led by chief executives and founded on the principle of enabling powerful and constructive collaboration in order to improve the industry's collective response to climate change. Launched in September 2014 and facilitated by the World Economic Forum, it aims to accelerate and help guide the oil and gas industry towards practical actions to address climate change. Its membership as of December 2015 included 10 companies, accounting for 20% of global oil and gas production and 10% of global energy supply.

Potential for value chain mobilization

Opportunities exist for collaboration between the oil and gas and transportation sectors to tackle energy efficiency. A total of 60% of oil produced is consumed by transportation[6] (accounting for a quarter of the energy sector's GHG emissions), and the anticipated growth of the global car fleet over the next 15-25 years will be a major issue for emissions reduction efforts.

Examples of collaboration between the automotive industry and oil and gas companies already exist – around engine efficiency, alternative fuels, or even regarding in-motion/on-board carbon capture in vehicles. Such models should continue to be developed and built upon to improve the efficiency of road vehicles. While the results in this area have been encouraging over the past 10 years, ongoing effort is critical – particularly as developing countries increase their shares of the global car fleet by over 80% by 2050.

By utilizing a value chain approach, industries such as oil and gas and automotive can improve the understanding of their collective value chains, refine synergies that exist between them, and identify how to best implement climate solutions or bring new business models to scale. Looking to the future, using more holistic value chain approaches could help companies in these areas better identify synergies with other players. For example:

- **Leveraging existing oil and gas infrastructure.** When looking at ways to support the adoption of cleaner vehicles, oil and gas players could play an important role by installing quick-charge, 100% renewable-fuelled charging terminals in their service stations. Leveraging existing infrastructure is a key enabler to accelerate the scale-up of cleaner solutions.
- **Educating customers.** Creative, carbon-friendly solutions can be imagined to create new services available directly at the fuel pump. For example, odometers could report fuel consumption per kilometre, with price discounts allocated to the most carbon-efficient vehicles. This would also help build loyalty among customers and promote a positive brand identity.
- **Supporting emission performance standards for car fleets.** Engaging in a value chain approach to bring different players to the table could help strengthen and move forward on regulatory decisions.

The level of influence a particular industry has on reducing GHG emissions in other industries varies considerably, with some industries producing key inputs or services for others. Some – such as information and communications technology (ICT) or finance – can enable as well as scale mitigation in other sectors.

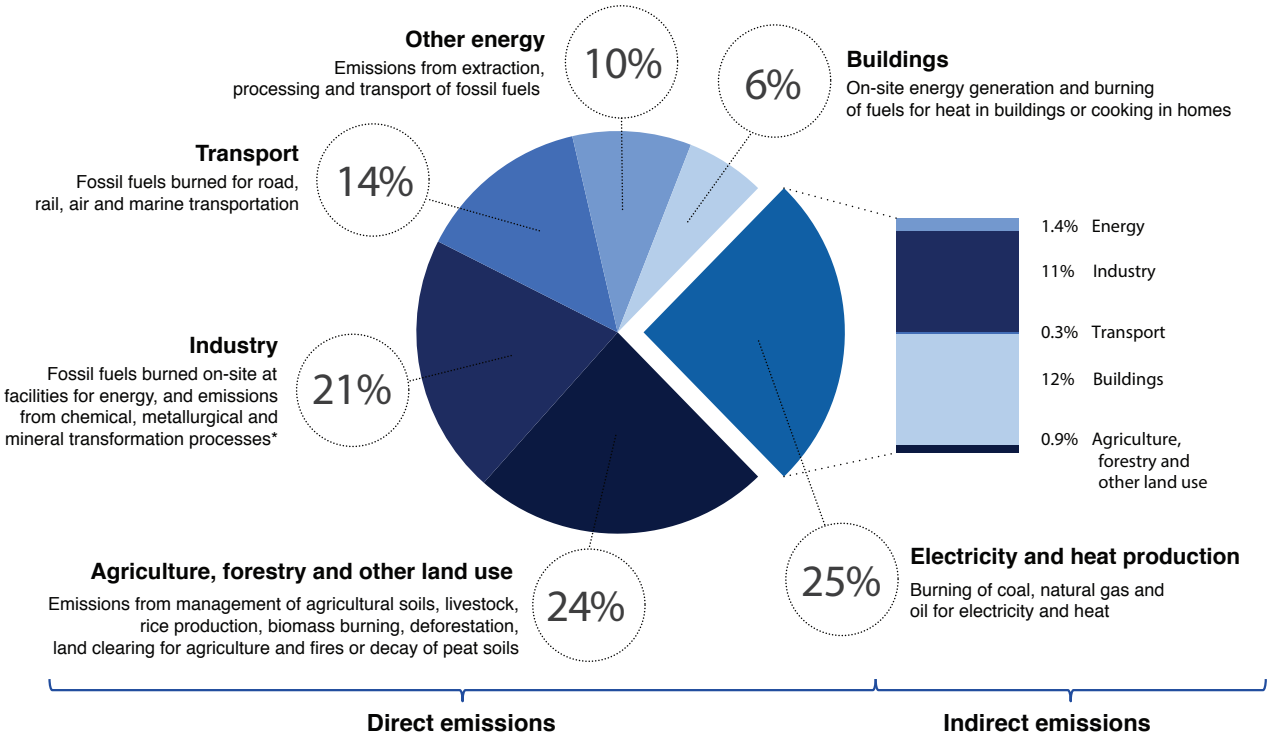
According to the Global e-Sustainability Initiative SMARTer 2030 report,[7] ICT devices have the potential to deliver profound environmental, economic and social benefits. These include a 20% reduction in global carbon emissions by 2030, and over $11 trillion in new economic benefits. For example, IT-enabled smart grids can potentially save 6.3 billion MWh of electricity and reduce global emissions by 1.8 gigatons (Gt) carbon dioxide equivalent (CO_2e) by 2030. IT-enabled agriculture has the potential to avoid 2.0 Gt CO_2e and increase average farmer income by $300 by 2030.

IT has the potential to enable new carbon-efficient and digital business models and practices across many industries, effectively enabling collaborations and the emergence of the circular economy. There will be similar opportunities to collaborate and release shared benefits in all value chains, but a structured approach is needed to find and act on them.

2.4 A value chain approach requires collaboration beyond the known ecosystem of players

A number of mainly sector-oriented collaborative climate change mitigation initiatives already exist (Figure 8). They could be leveraged as a starting point to implement a value chain approach, connecting players across sectors to scale up climate action.

Figure 6: Global Breakdown of Greenhouse Gas Emissions by Economic Sector



*Industries include petrochemicals, aluminium, iron and steel, pulp and paper, and waste and wastewater treatment

Source: IPCC, *Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change 2014*, p. 9[4]

Figure 7: Magnitude of Emissions by Industry

Industry	Scope 1 and 2 Emissions (% of total CDP 500)*	Scope 3 Emissions (as a ratio of scope 1 and 2 emissions)*	Level of Impact on Other Industries
Energy: Oil & Gas	28.3	4.25 / 1.00	High
Utilities & Energy Technologies	33.0	1.00 / 1.20	Medium
Infrastructure & Development	26.2 (referred to as Materials)	3.25 / 1.00	Medium
Mining & Metals			High
Chemicals			Medium
Aviation & Travel	3.7 (referred to as Industrials)	3.50 / 1.00	Low
Supply Chain & Transportation			High
Automotive	0.2	10.00 / 1.00	Medium
Agriculture, Food & Beverage (Consumer Staples)	3.0	2.50 / 1.00	Medium
Information Technology	0.9	10.00 / 1.00	High
Telecommunications	1.1	2.50 / 1.00	Low

Note: The "level of impact on other industries" column provides an indication of the extent to which each industry supports or enables carbon reduction in other industries.

Source: Carbon Disclosure Project *CDP Global 500 Report 2011* and *CDP Global 500 Climate Change Report 2013* including 2011 and 2013 data; Accenture

= 100% emissions Scope 3 Scope 1 and 2

*Carbon Disclosure Project 500 2011 and 2013 data

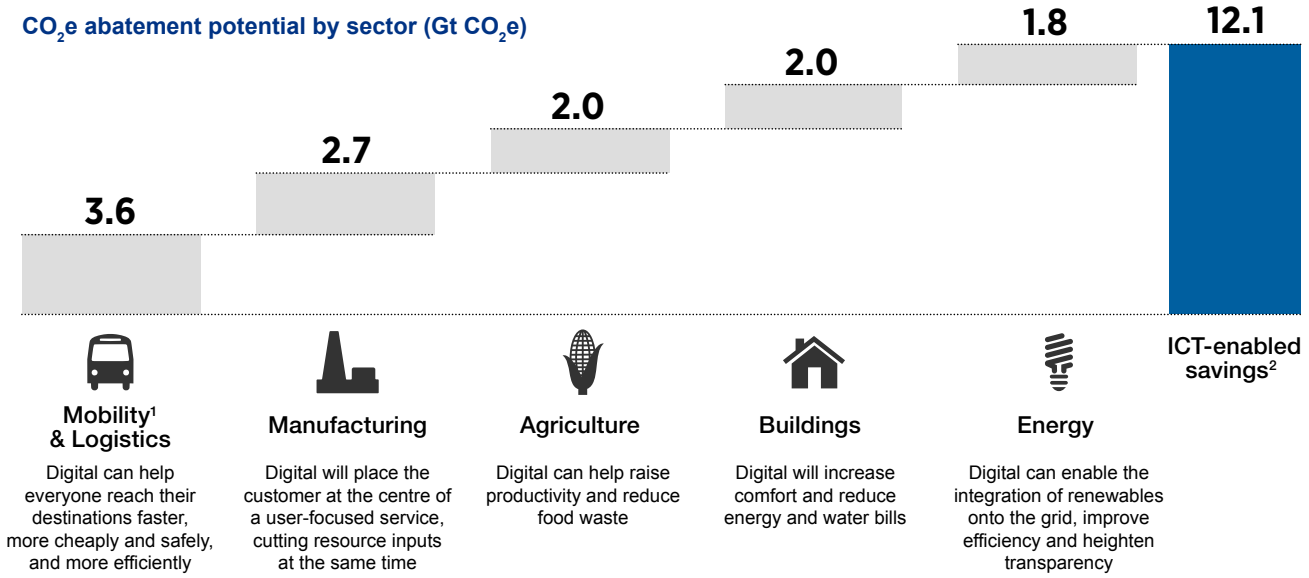
Figure 8: Magnitude of Collaborative Mitigation Initiatives

Industry		Active Global Mitigation Initiatives (examples)	Lima-Paris Action Agenda Initiatives
Energy: Oil & Gas		Global Gas Flaring Reduction, Global Methane Initiative, Oil & Gas Climate Initiative	Oil & Gas Methane Partnership
Utilities & Energy Technologies		Clean Power Plan, IEA Demand Side Management, Africa Clean Energy Corridor initiative	Africa Renewable Energy, Global Geothermal Alliance, RE100
Infrastructure & Development		Better Buildings Partnership, Low Carbon Livable Cities, LCTPi Energy Efficiency in Buildings, LCTPi Cement	Global Alliance for Buildings & Construction, Building Efficiency Accelerator, Cement Sustainability Initiative, LC2RTI
Mining & Metals		World Economic Forum Mining & Metals Industry Partnership	
Chemicals		Reaching Full Potential, LCTPi Chemicals	Refrigerants Naturally, HFCs
Aviation & Travel		IATA Offset Program, IATA Alternative Fuels, Global Market Based Measures	Aviation's Climate Action Takes Off, Aviation's Climate Action Framework
Supply Chain & Transportation		CDP Supply Chain, Low Carbon Rail Transport Challenge, LCTPi Low Carbon Freight	Global Green Freight Action Plan, MobiliseYourCity
Automotive		Urban Electric Mobility Initiative, Low Carbon Vehicle Partnership, Hybrid Partnership	C40 Clean Bus Declaration, Global Fuel Economy Initiative
Agriculture, Food & Beverage		Global Alliance for Climate-Smart Agriculture, Full Circle Plan, LCTPi Climate Smart Agriculture	Blue Growth, Life Beef Carbon, 4/1000, Adaptation for Smallholders, Zero Deforestation Commitment
Information Technology		Global e-Sustainability Initiative (GeSI), ICTs for Sustainable Energy Partnerships	Global Energy Efficiency Accelerator Platform, ITS for Climate
Telecommunications		GeSI, Connect 2020 Agenda, Dynamic Coalition on Internet and Climate Change (DCICC)	

Source: Accenture, based on research

Potential Impact of Active Initiatives: Low <--> High

Zoom In on the Potential of Digital Technology



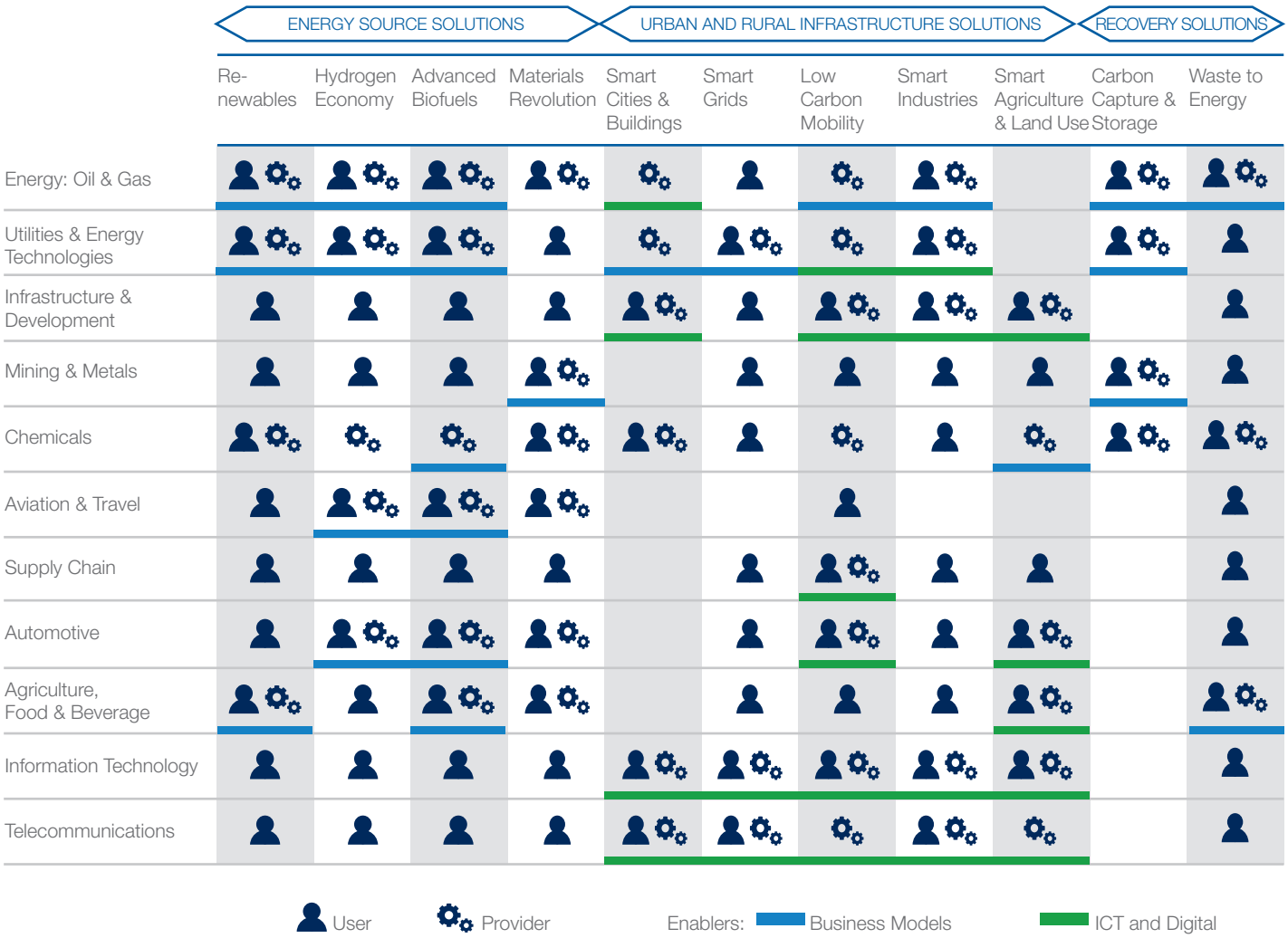
[1] Smart mobility solutions consider improved driving efficiency but also the reduced need to travel from various sectors, including health, learning, commerce, etc.

[2] 12 Gt CO_2e reduction in 2030 enabled by ICT includes 2 Gt CO_2e abatement from the integration of renewable energy production into the grid. In its business-as-usual emissions forecast for 2030 the Intergovernmental Panel on Climate Change (IPCC) already considers the CO_2e abatement potential from renewable energy. Therefore, the additional ICT-enabled CO_2e reduction against the IPCC emissions forecast for 2030 is 10 Gt CO_2e.

Source: Accenture Strategy (2015) *Digital Carbon Disruptors* report[8]; based on data from GeSI, WRI, IPCC, World Bank, Accenture analysis & CO_2 models

Several solutions are often proposed as promising responses to climate change mitigation challenges,[9] as illustrated in Figure 9. Many of these solutions involve players from multiple industries. Some value chains involve multiple industries as providers of as well as users of the solutions. These value chains consequently present good opportunities for multistakeholder collaboration.

Figure 9: Main Cross-Industry Climate Solutions, Related Value Chains and Players



Source: Accenture, based on research

3. To Implement a Value Chain Approach, Businesses Should Follow a Step-by-Step Process

3.1 Creating impact at scale requires pooling resources and capabilities across the value chain

Collaboration along value chains is often driven by businesses that are best placed to benefit from its implementation by, for example, reducing their costs or risks, increasing revenues or enhancing intangibles, such as brand reputation or trust. However, it cannot be achieved in isolation. Finding the right opportunities requires a good understanding of the value chain, its regulatory context, carbon impact and key upstream and downstream players. Once these are identified, acting on the opportunities requires strong partnerships among key value chain players to run shared activities and build shared value.

Three key principles should guide companies setting up collaborative initiatives:

1. **Harness the end-to-end value chain to create market power to reduce carbon emissions**

   Identifying common opportunities with other players in the value chain will increase the scale of the action that can be taken, and consequently the impact that it has, both in climate and economic terms. Initiatives that cannot be achieved solely by an individual company can become very attractive when delivered in partnership.
2. **Convene the right players beyond the familiar ecosystem and identify shared value**

   Finding the right partners to involve in a value chain initiative requires looking beyond one's own circle of known organizations; the challenge is to find the ideas best suited to addressing the specific value chain challenge, and create partnerships with the organizations with the best ability to realize those ideas. Building successful partnerships requires a good understanding of the sources of value (social, economic and environmental) to all stakeholders and ensuring that they are shared equitably and proportionately to the effort expected of that partner. Without this shared value, the partnership will fail.
3. **Leverage resources and define roles to build a scalable initiative**

   Scaling up an initiative requires commitment and investment (both time and resources) from all partners, and the careful monitoring of performance to ensure that plans can be refined quickly to address issues. Defined roles and priorities for each organization ensure that resources are used as efficiently as possible to achieve the maximum impact.

3.2 Businesses should follow a structured approach to mobilize collaborative action

The key steps business leaders should take to build value chain collaboration are outlined in Figure 10. This describes a pragmatic approach, starting with developing a good understanding of the value chain and its surrounding context: regulations, technical or business model innovations, broader stakeholder interests. This understanding can be used to identify hotspots of high potential for collaboration to deliver both business and climate benefits.

Once hotspot targets for action are identified, partners are required to build initiatives to act on them. This involves an understanding of both the technical skills and effort needed, but also the value that will be generated and how it should be shared between partners.

Finally, committing time, money and resources is required to launch the initiative, monitor it carefully, refine it as necessary and scale it up to achieve the maximum impact possible.

Figure 10: Step-by-Step Guide to Implementing a Value Chain Approach

1

STEP 1.

ANALYSE YOUR VALUE CHAIN

HARNESS THE END-TO-END VALUE CHAIN TO CREATE MARKET POWER TO REDUCE CARBON EMISSIONS

KEY ACTIVITIES

UNDERSTAND YOUR INDUSTRIAL VALUE CHAINS
- Material flows
- Players and roles

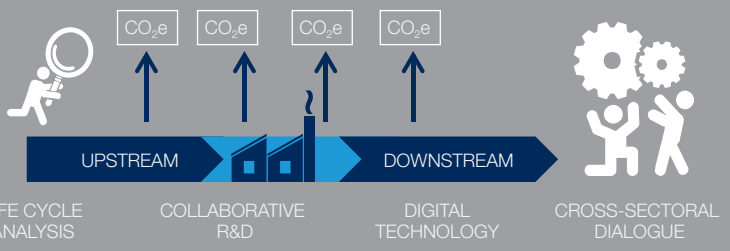
UNDERSTAND THE RELATED CARBON INTENSITY THROUGH A LIFE CYCLE ANALYSIS APPROACH
- Carbon emissions sources
- Climate actions and related impact

UNDERSTAND THE CONTEXT
- Current trends in industry conduct and performance
- Existing and emerging regulation (e.g. carbon pricing or trading, energy efficiency)
- Potential for innovation (technical, process, business model)
- Stakeholder interest (consumer, NGO, media)

IDENTIFY OPPORTUNITIES FOR COLLABORATION
- Identify hotspots for collaborative action in the value chain (technological, financial, regulatory, etc.)
- Prioritize hotspots based on criteria, such as carbon impact and ease of implementation

DEPARTMENTS TO INVOLVE
- Operations
- Sourcing & procurement
- Compliance & risk
- Sustainability/Corporate citizenship
- Corporate affairs/Marketing

VALUE CHAIN COLLABORATION ENABLING PLATFORM



EXAMPLES

By taking a **life cycle analysis approach** and looking at all potential opportunities to reduce CO_2 emissions, **ArcelorMittal** identified a new productive use for their waste gas, converted into bioethanol thanks to LanzaTech's carbon-recycling technology.

Source: Accenture, based on research and case studies

2

STEP 2.

MOBILIZE FOR ACTION

CONVENE THE RIGHT PLAYERS BEYOND YOUR KNOWN ECOSYSTEM AND IDENTIFY SHARED VALUE

CONVENE UPSTREAM AND DOWNSTREAM PLAYERS

- Identify key value chain players on climate action – big emitters and action champions
- Engage in dialogue – including cross-sectoral dialogue, as well as with end-users
- Review existing efforts and lessons learned

IDENTIFY CHAMPIONS TO DRIVE COLLABORATION

IDENTIFY BUSINESS OPPORTUNITIES: EXPLORE BUSINESS AND STAKEHOLDER VALUE, INCLUDING INTANGIBLES

- Revenue increase with new low-carbon products or new business models (e.g. alternate input sources, new uses for by-product)
- Cost reduction (e.g. energy savings)
- Brand and reputation (e.g. sustainable sourcing)
- Risk reduction

DEFINE SHARED GOAL AND NARRATIVE

- Agree on overall carbon impact objective, in line with individual or sectoral commitments
- Identify common, scalable solutions
- Agree rules to share burden and benefits, including governance

- Research & innovation
- Operations
- Sourcing & procurement
- Strategy & finance/Business development
- Sustainability/Corporate citizenship

3

STEP 3.

DELIVER AND SCALE UP

LEVERAGE RESOURCES AND DEFINE ROLES TO BUILD A SCALABLE INITIATIVE

ENGAGE PARTNERS AND DEFINE ROLES

- Identify required capabilities and match to best organization

AGREE SCOPE AND TIMELINES

- Identify priority geographies and select locations
- Define time-bound targets aligned with overall objective
- Identify critical success factors and measurable outcomes

MOBILIZE INVESTMENT

- Define legal entity
- Identify financing sources and access funds

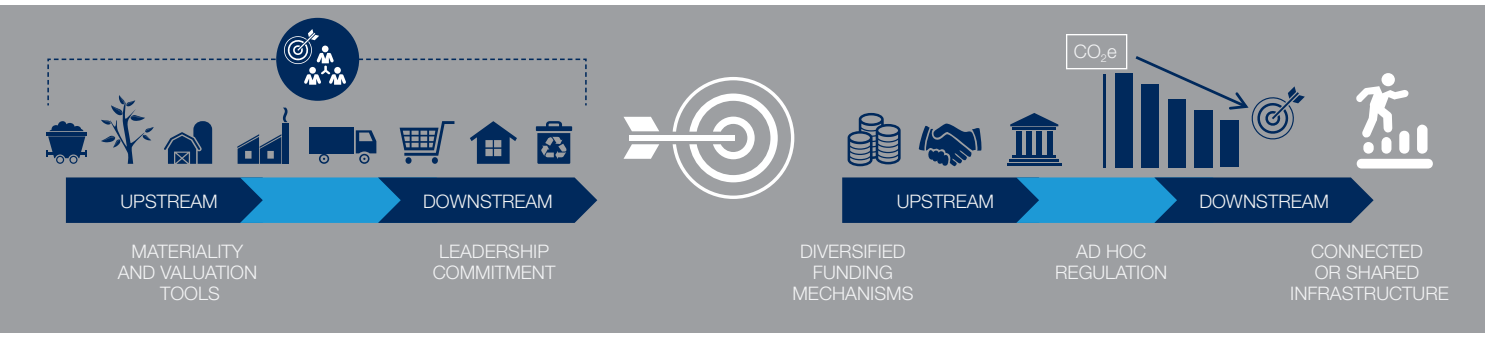
CREATE PILOT

- Test approach and partnerships
- Monitor measurable outcomes and refine processes

SCALE UP AND ROLL OUT

- Communicate on intermediate results
- Refine key success factors and enablers
- Educate and engage other value chain players
- Extend scope

- Research & innovation
- Operations
- Sourcing & procurement
- Strategy & finance



The **Tropical Forest Alliance**, designed to help slow tropical deforestation, acts as a platform for engagement in action-oriented collaborations. One of its benefits was to bring retailers and financial institutions into a **constructive dialogue** with other players of the supply chain.

SkyNRG BioPort initiative acts as a facilitator **on the supply side**, by streamlining relationships from feedstock to producers to develop local jet biofuel supply chains, and also **on the demand side**, by developing financing mechanisms to reduce the biofuel price premium.

3.3 The collaboration's success depends on access to the right tools and enablers

At each step, businesses will need to draw on expertise, tools and enablers to support their efforts. In particular, considering alternate, circular economy business models could identify new possibilities for collaboration and action. Similarly, leveraging the right digital technologies will likely unlock hidden carbon reduction potential and business opportunity in the value chains.

An open access, digitally connected value chain collaboration platform could provide a straightforward way of collecting and sharing this information among players along relevant or strategic value chains, greatly reducing the effort and transaction costs involved in scoping and implementing collaboration. Depending on the nature of the initiative – the problem to solve, the collaboration needed, the barriers to be addressed collaboratively – the platform can play different roles to support collaboration between value chain players. For example, it can serve as an online information and partner hub, providing a searchable database of key contextual information, such as legislation, value chain maps and collaboration case studies to inspire and support organizations planning new collaborative initiatives. It can also enable organizations to search for partners to join their initiative, according to the organization's capabilities, its demand for inputs or availability of outputs, as well as its geographical location.

Digital industry platforms are recognized as an effective way of broadening an ecosystem of collaborators to drive open innovation. This kind of platform would greatly reduce the cost associated with finding the right partners for a collaborative initiative and create a quick, low-cost way of sharing data on value chain activities, issues and opportunities.

Equally importantly, companies are increasingly recognizing that the best new ideas may not come from within. A close relationship with start-ups and entrepreneurs can help provide access to innovations that can support the business, without exposing the business to the full risk associated with developing these innovations from scratch. Conversely, start-ups need to leverage the market power and scale of larger organizations to become truly successful. Developing "ecosystem innovation", where large and small players work collaboratively on new ideas, is the key to creating disruptive change.[10]

4 Value Chain Mobilization Applied to Transportation and Waste-to-Energy

Similar barriers are holding back the large-scale deployment of the technology at each step in both biofuel for transportation and waste-to-energy value chains. The main barriers identified are summarized in Figure 11. Value chain mobilization is the key to unlocking collaborative opportunities and helping to move from barriers to scaled-up solutions.

Figure 11: Barriers to Overcome

1. Design	2. Feedstock Production	3. Collection and Transportation	4. Conversion and Processing	5. Distribution and End Use
1.1 Technology development Fostering innovation in developing scalable, cost-efficient and low-carbon technologies in the short and long terms, while preserving intellectual property rights	**2.1 Availability of feedstock/waste** Ensuring availability of feedstock at the right cost, quantity and quality. Unlocking the value of high-potential feedstock (tyres, organic waste, oil, etc.)	**3.1 Feedstock trading** Leveraging trade globalization (governance, facilitation, regulations) while preventing price volatility and reducing protective trade barriers	**4.1 Investment costs** Developing financial tools to construct infrastructure at commercial scale	**5.1 Economic/ contractual model** Establishing sound PPPs, viable commercial models, long-term agreements between producers and the end-use industries
	2.2 Social and ecological concerns Ensuring sustainable practices in feedstock production, especially regarding land use and local economic development	**3.2 Feedstock collection** Developing and optimizing collection processes		**5.2 Access to market** Strengthening and developing markets, product use and products

0.1 Licence to operate
Repositioning bio solutions as a sustainable and credible solution through public acceptance and perception of the bioindustry (e.g. the food vs fuel debate)

0.2 End-to-end regulatory framework
Ensuring clear legislative and regulatory policies regarding land use and uncertainty in pricing and availability, fostering technology development and securing investment costs

Space for Private-Private Collaboration

Space for Public-Private Collaboration

Source: Accenture, based on research and interviews

4.1 Potential for collaboration in the biofuel value chain

As illustrated by the dramatic reduction in the cost of photovoltaic panels in recent years, new technologies typically reduce in price as the scale of their production increases. Advanced biofuel production is expected to follow a similar trajectory, as the volumes produced increase. The short-term challenge is to ensure a consistent and growing demand for the fuel, despite its relatively higher price than conventional fossil fuels.

This can be achieved through government regulations and policies, as has been discussed widely and implemented successfully in certain regions and industries.[11] It can be a lengthy and challenging process to establish, however, as the competing interests of different stakeholders necessarily impact on policy development and implementation. Businesses can play a role in driving biofuel development forward by identifying and working to overcome key barriers.

The most promising opportunities for collaboration in biofuels include regulation, investment, supply and demand.

Opportunities for collaborative action to promote the scale-up of the biofuel value chain can be grouped into four common themes:

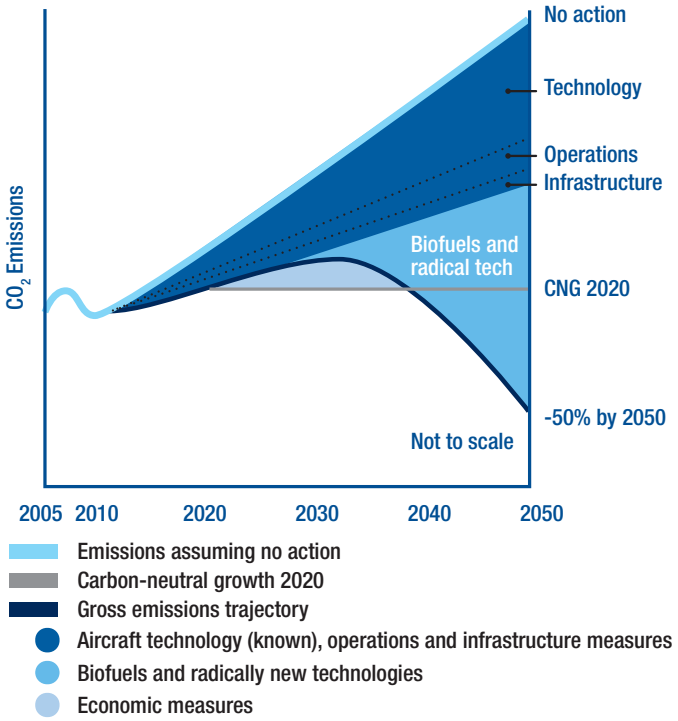
- **Regulations and policies.** Consistent policies are needed across time, geographies and sectors (aviation, shipping, road transport) to create a level playing field. This could include financial incentives. For example in the Netherlands, airlines that use biofuel are eligible for a subsidy per ton of biofuel used.
- **Investment.** Financial institutions can enable the creation of the infrastructure needed to produce, distribute and use biofuel both through investment financing and support for new business models. For example, Sweden has established a crowdsourcing platform that brings together airlines and fuel producers, as well as forest owners. The former contributes to an investment fund, which is then used by the latter to develop their feedstock production. Examples of more direct co-investment include supporting an airline to vertically integrate by buying a bio-refinery.
- **Demand.** An impactful demand pull requires the aggregation of demand as no player can drive the market alone.
- **Supply.** Improved logistics are needed as demand may outstrip total supply available locally.

Case Study: Mobilizing the Aviation Value Chain to Scale Up the Use of Alternative Fuels

Aim

The aviation sector set an ambitious goal for the reduction of CO_2 emissions in 2005: to achieve a 50% reduction by 2050. A key path to reducing emissions is the application of alternative fuels to replace conventional fossil fuels. The industry has run many pilots over the past five years to assess the technical and commercial feasibility of such fuels.

2050 scenario: Carbon abatement potential of biofuels and other technologies in the aviation sector



Source: IATA Technoloy Roadmap 2013[12], p. 8

Challenges

Despite having successfully tested and demonstrated the technical feasibility of various applications, challenges persist. The key barriers to the more widespread use of alternative fuels, and biofuels in particular, include:

- **Price premium.** Biofuels are approximately two times more expensive than fossil fuels.
- **Competitive environment.** The airline industry operates at low margins in a highly competitive market where small fluctuations in cost have a large impact. Airline executives are often reluctant to take unilateral action at risk of competitive distortion. Although studies conducted by Lufthansa between 2011 and 2013 consistently showed a majority of consumers are supportive of biofuels and would be willing to pay $1 more to fly on biofuels, even just $1 can make a difference in the attractiveness of a fare to the consumer. Similarly, airports also face competition and are consequently reluctant to impose restrictive conditions on airlines, such as mandating the use of biofuels.
- **Supply availability.** It is not clear if the biofuel supply chain today would be able to satisfy global demand.
- **Public perception.** The general perception that biofuels contribute to the disruption of food supply systems remains and, therefore, the public might not support the use of biofuels in aviation.

– **Cross-sectoral collaboration.** Successfully introducing biofuels will require large-scale, close collaboration between feedstock suppliers, financial institutions, governments, energy suppliers, airports, airlines and aerospace companies. As yet, no large-scale regional or global project has been proposed or implemented to test the viability of this approach.

Potential for value chain mobilization

The traditional aviation value chain is "airline-centric". Indeed, airlines have a key role to play as they are buying (or leasing) aircraft from the manufacturers, utilizing the infrastructure, such as airports, creating demand for a wide range of services (maintenance, repair and operations, catering, etc.) and providing a transport service for passengers and freight.

This value chain can be directly linked to bio-based solutions' end users, such as bio-based materials for aircraft manufacturing and electricity and heat for airport infrastructure. However, biofuels remain the main focus, as emissions from aircraft fuel are the biggest contributor to overall sector emissions and, consequently, represent the biggest opportunity for mitigation.

Of all the aviation-sector actors, airlines are central to any transformation and will be key drivers of any biofuel adoption. Some are already actively working in this area and developing new biofuel value chains – examples of airline-driven initiatives include KLM's Corporate BioFuel Programme and the Swedish Fly Green Fund, enabling companies to fly a portion of their business travel on sustainable biofuel. By co-funding premiums in this way, companies not only reduce their carbon footprint from business travel but also contribute to the development of this market.

A key role can also be played by sustainable jet fuel suppliers, such as the Dutch company SkyNRG. SkyNRG sources, blends and distributes sustainable jet fuel and guarantees sustainability throughout the supply chain. At the same time, the company acts as a facilitator of relationships between airlines, airports, biofuel producers, corporates, governments, localities and NGOs. SkyNRG acts both on demand and supply, while partnering to help co-fund the additional cost of biofuels.

The SkyNRG BioPort Example[13]

Currently under development at a regional level with the creation of BioPorts in the Netherlands (BioPort Holland) and Karlstad (with SkyNRG Nordic), the BioPort aims to create a dedicated and local value chain around a defined airport to enhance a regional supply chain for biofuel production (from feedstock to the aircraft fuel tanks). However, these projects face ongoing challenges, including issues with legislation, certification and logistics (feedstock, transport, storage).

Several approaches exist to reduce the price premium and support these BioPorts. Economic support via government incentives and policies, and corporate programmes (e.g. KLM Corporate BioFuel Programme) exist to help finance this new energy while improving the sustainability performances of companies. A "Fly Green Fund" is also being developed based on a similar model in the Nordics, using corporations and partners to cover the premiums.

Next steps

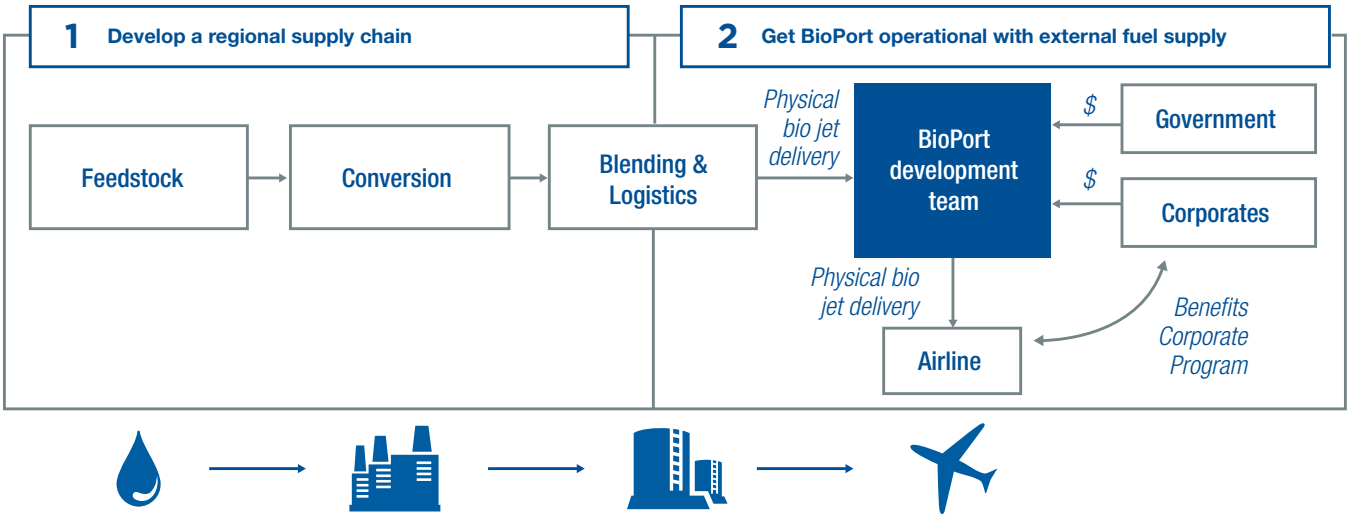
According to key players from the aviation sector, **two main changes are needed** to encourage the increased use of biofuels:

1. **Consistent policies** with a global reach to support the use of biofuels for long-term investment and planning purposes. This would also provide a baseline to match demand and supply while establishing a stable and cost-efficient supply chain and reducing the unit price of biofuel.

2. **Collaborative efforts** to vertically integrate the value chain from technical design and biomass production, through infrastructure and distribution to end users (airports, airlines and passengers), facilitated by overarching global policies and access to financial institutions to secure funds and financial support. This would include establishing a communication strategy for all stakeholders and messaging to the end consumer in aviation (business and leisure travellers).

Only through collaborative efforts will demand and supply-matching be enabled to reduce the current price differential while also scaling up a global supply chain. Airports could also play a key role as orchestrators and drivers. They are in a good position to act as intermediaries between airlines, governments and fuel suppliers to bring economies of scale by aggregating demand over several airlines. This could potentially be incentivized by governments to support local air-quality targets.

SkyNRG BioPort structure

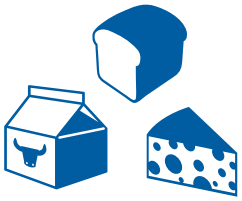


Source: SkyNRG "Climate Smart Supply Chains", p. 8

Potential Impact of Aviation Bio-Jet Fuel Collaboration

860 million litres
of jet fuel are consumed daily worldwide

Replacing half of all jet fuel with bio-kerosene produced from municipal waste would reduce carbon emissions by
300-460 million metric tons of CO_2e
per year and create **2-3 million jobs**



0.5-0.7 billion tonnes of waste
are required to produce half of all the jet fuel required annually; capturing and using **global annual food wastage** would more than cover this demand

Source: Accenture based on data from:
US Energy Information Administration, International Energy Statistics
British Airways Media Centre (April 2014) "GreenSky project prepares to land in Thurrock"
Food and Agriculture Organization of the United Nations (2015) "Foods wastage: Key facts and figures"

4.2 Potential for collaboration in the waste-to-energy value chain

Waste-to-energy technology exists in a variety of forms, each suited to particular types of waste streams and end uses. In most cases, the technology is well established and has been developed in response to the decreasing availability of land for landfill waste disposal sites. Landfill sites can emit significant quantities of greenhouse gases, especially carbon dioxide and methane due to the decomposition of organic matter in the waste.

Waste-to-energy consequently has a double carbon benefit: it avoids emissions from landfill and also displaces emissions from the use of fossil fuels in energy production.[14] It also solves a pressing social issue of waste management - which in many cases is the primary driver and main economic consideration for the development of a waste-to-energy plant.

In countries with established waste management industries, waste-to-energy is an established and widely used technology. However, despite widespread recognition of its benefits, in certain regions it can be challenging to establish viable waste-to-energy plants, due to a variety of barriers. Consequently, business can play a role in bringing together the players, technology and expertise necessary to overcome these barriers and drive forward the deployment of these solutions.

The most promising opportunities for collaboration in waste-to-energy are infrastructure, regulation, research and development and information exchange.

Opportunities for collaborative action to promote scaling up the waste-to-energy value chain can be grouped into four common themes:

- **Shared infrastructure.** The creation of hubs for the transportation and storage of raw materials would increase cross-industry collaboration; infrastructure is seen as a key enabler to connect different players, such as joint storage potential with other industries. This would facilitate the valorization of a company's waste as an input material for another company (for example a hydrogen pipeline between a steel producer and an oil producer).
- **Regulation.** Consistent regulation is needed to support the use of waste as an "unrealized asset" and encourage its productive use rather than disposal. For example, in certain locations, such as Spain, waste is more regulated than raw materials. The need to join forces across industries to overcome the legal challenges is clear. Consistent carbon pricing would support the productive use of waste materials.
- **Worldwide collaborative R&D on carbon use.** A collaborative space for innovation would enable key discussions at the start-up level, between investors, innovators and conveners. This should focus not only on storage, but also on transportation and the reuse of CO_2 and hydrogen.
- **Information exchange.** A collaborative platform between industries would enable companies to make better use of by-products or waste by providing information on supply and demand for particular waste materials. This could be an "e-bay" style platform specific to waste (for example similar to the National Industrial Symbiosis Programme Network in the United Kingdom[15]). This platform would support the European Union circular economy approach.

Case Study: Bioethanol from Steel Blast Furnace Waste Gas

Challenge

The steel industry is a significant emitter of greenhouse gases, contributing to about 6.7% of global CO_2 emissions.[16] The majority of these emissions result from the chemical reaction of carbon to reduce iron ore to steel in a blast furnace. A by-product of this reaction is carbon monoxide gas, which cannot be emitted due to its toxicity and is typically burned to provide some process heat for the reaction, then emitted as carbon dioxide.

Solution

However, more productive ways to put carbon monoxide into use exist. As a reactive gas, it can be an ideal feedstock for chemical or biochemical conversion into larger molecules, such as ethanol, acetone or even kerosene. **A partnership between ArcelorMittal, Lanzatech and Primetals has developed a biochemical approach to ethanol production** and is piloting it at a new facility at the ArcelorMittal steel plant in Ghent, Belgium. Biochemistry was preferred over direct chemical conversion as it is more robust and better suited to an industrial context, giving better overall energy efficiency, as classical chemistry is more susceptible to catalyst poisoning due to the sulphur content of the coal used in steel production.

The process is highly efficient, using waste heat from steel production in the form of low pressure and temperature steam that normally has no productive use today and is simply lost. The whole process has low operational costs, comprising only a small amount of electricity to compress the blast furnace exhaust gas before it is converted, and the opportunity cost of the waste gas itself.

The technology's potential for the transport sector is significant: **about 50% of the carbon used in steel making leaves the process as carbon monoxide, and ethanol produced in this way can reduce carbon emissions by 80% compared with conventional fossil fuels**. Further, coupled with advanced combustion engine technology, it can increase engine efficiency by 20-25%, augmenting the potential for carbon gains in the automotive sector, for example. The operational costs to produce this type of bioethanol are also competitive with first generation bioethanol, although still about twice as expensive as fossil fuel. In the longer term, it might be possible to extend this technology to bio-ethylene, bio-acetone, bio-plastics and jet fuel production.

Barriers to scale

The partnership has ambitions to roll out the technology, but recognizes that further development is required to make it truly commercial. The **capital cost** of the plant is currently very high. The pilot plant required an investment of €87 million to produce 47,000 tons of bioethanol per year, treating just 8% of the blast gas of the plant. The **regulatory framework** is also seen as a barrier, as in certain countries industrial waste gas is not yet recognized as a renewable feedstock for biofuel production, despite a better overall carbon balance than some conventional biofuels.

Enablers and key success factors

- **Production-side partnerships.** Collaboration between ArcelorMittal and the biotech and industrial engineering industries has been crucial in developing the technology.
- **Demand-side partnerships.** Working closely with the automotive sector, and the aviation sector in the longer term, will also be crucial to ensure the fuel produced is used at scale.
- **Stable legal framework.** Governments, through regulation, have a role to play to accelerate the market development, and thus ensure the certainty of demand to justify investment.

Next steps

- Large-scale demonstration of the technology, and assessment of the overall GHG impact using a Life Cycle Assessment approach, planned at the ArcelorMittal plant in Gent
- Formal recognition of steel waste gas biofuel as a renewable fuel by EU Member States under the Renewable Energy Directive[17]
- Creation of partnerships to lobby for similar legal recognition in other regions
- Identification of options for the technology's industrial-scale deployment

Glossary

Advanced biofuels

Fuels such as ethanol, diesel or kerosene produced by the conversion of non-food biological material (typically waste materials, wood or algae), usually via a chemical or biochemical process

Bio-based solutions

Products derived from biological material

Circular economy

An alternative economic model in which value chains are linked such that the outputs of one value chain become the inputs for another, reducing the dependence on new raw materials for inputs and end-of-life disposal for products

Climate change adaptation

Adaptation of processes, practices and infrastructure to improve their ability to function in the context of climate-change-driven impacts, such as flooding, drought or other extreme weather

Climate change mitigation

Changes to processes, infrastructure and practices to reduce greenhouse gas emissions that contribute to climate change

Collaboration hotspots

Areas of a value chain that present strong opportunities for collaboration to drive shared value to participants while reducing greenhouse gas emissions at scale

COP21

The 21st Conference of the Parties to the United Nations Framework Convention on Climate Change; a global forum at which heads of state convene to agree what action is to be taken to address climate change

Cross-sectoral collaboration

Initiatives involving players from multiple sectors working together to address a particular issue or capitalize on a joint opportunity

Embodied carbon

Carbon emissions resulting from the raw material acquisition, production, processing, distribution and transportation of the components that make up a given product

Greenhouse Gas Protocol

A set of standards developed by the World Resources Institute and the World Business Council on Sustainable Development to support organizations to measure, manage and report greenhouse gas emissions

Scope 1 emissions

Direct emissions from the industry's own activities

Scope 2 emissions

Indirect emissions resulting from the purchase of electricity, heat or steam by the industry

Scope 3 emissions

Other indirect emissions resulting from activities across the industry's associated upstream and downstream activities – for example the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. transmission and distribution losses) not covered in Scope 2, outsourced activities, waste disposal, etc.

Supply chain

The set of organizations involved in providing the inputs an organization requires to create a given product or service

Value chain

The set of processes or activities that add value to a product, across its initial design through sourcing, production and distribution, to use, end-of-life and, ultimately, to product disposal; the value chain includes suppliers, direct operations, customers, disposal and logistics

Waste-to-energy

The process of converting waste materials into energy, through processes such as incineration, pyrolysis, gasification or anaerobic digestion

Endnotes

1 See Tropical Forest Alliance 2020, available at *http://www.tfa2020.com/index.php/about-tfa2020*

2 See the report, available at *https://www.accenture.com/t20151107T020447__w__/us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Strategy_7/Accenture-UNGC-CEO-Study-A-Call-to-Climate-Action.pdf*

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9 See, for example, the Low Carbon Technology Partnerships initiative, available at *http://lctpi.wbcsdservers.org/*

10 See Accenture's *Harnessing the Power of Entrepreneurs to Open Innovation* 2015 report, available at *https://www.accenture.com/us-en/~/media/Accenture/next-gen/B20/Accenture-G20-YEA-2015-Open-Innovation-Executive-Summary.pdf*

11 See, for example, the International Institute for Sustainable Development's *Biofuels – At What Cost?* report, available at *https://www.iisd.org/gsi/sites/default/files/bf_awc_germany.pdf*

12 See IATA Technoloy Roadmap 4th edition, June 2013, available at *https://www.iata.org/whatwedo/environment/Documents/technology-roadmap-2013.pdf*

13 See "Climate Smart Supply Chains" SkyNRG, June 2015, available at *http://www.climate-kic.org/wp-content/uploads/2015/06/3b-Presentation-Break-Out-Session-Climate-Smart-Value-Chain1.pdf*

14 See chapter 10, Bogner, J., M. Abdelrafie Ahmed, C. Diaz, A. Faaij, Q. Gao, S. Hashimoto, K. Mareckova, R. Pipatti, T. Zhang, "Waste Management", in *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, available at *http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter10.pdf*

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16 World Steel Association, "Steel's contribution to a low carbon future and climate resilient societies", available at *https://www.worldsteel.org/publications/position-papers/Steel-s-contribution-to-a-low-carbon-future.html*

17 European Parliament, Fuel quality directive and renewable energy directive, available at *http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2015-0100+0+DOC+XML+V0//EN*

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http://www.weforum.org/global-challenges/environment-and-resource-security/projects/climate-change-solutions

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