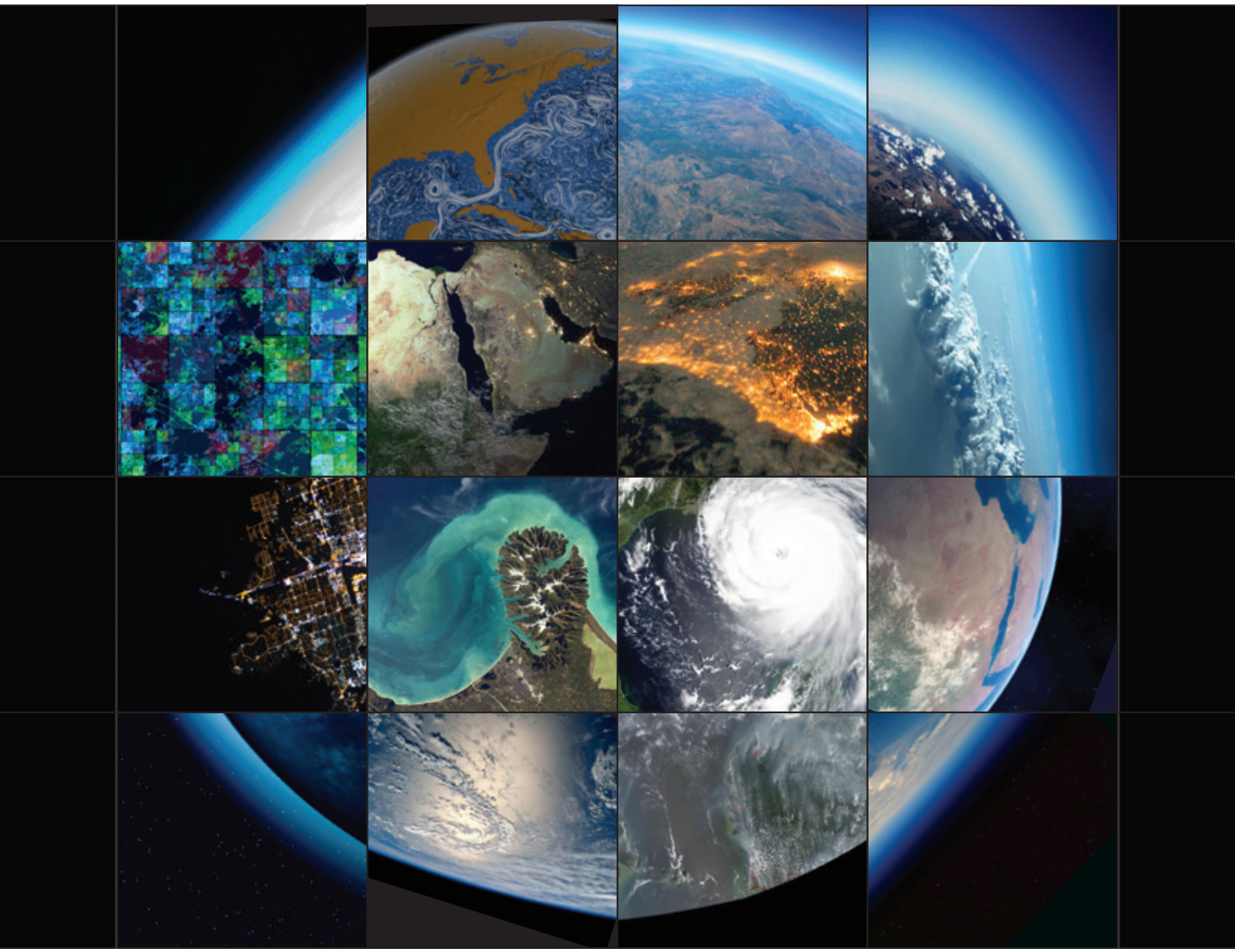
LCTPi
Led by wbcsd

Low Carbon Technology Partnerships initiative



Impact Analysis

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About this report

This document was written by Oliver Willmott, Jonathan Grant and colleagues from PwC UK's Sustainability & Climate Change team, based on plans developed by the nine LCTPi working groups, and in close collaboration with the WBCSD.

As with any projection that spans decades, there is uncertainty in the findings presented in this report. This includes our analyses of the LCTPi's greenhouse gas mitigation potential, and of the business opportunities it could support including its contribution to employment. To help ensure they are based on assumptions that reflect the ambition of the LCTPi as closely as possible, PwC conducted analysis to produce the numbers presented here using data and assumptions provided by the LCTPi working groups and supplemented with additional third party research, such as from the International Energy Agency, as required. PwC provides no assurance over such data and assumptions.

Throughout this report, numbers may not cast due to rounding.

Foreword

2015 will prove to be a historic year, when the world is starting the transformation to bring our economies in balance with nature.

Never has the necessity of building a sustainable world been so real and so urgent. I have been inspired to see an increasing number of businesses stepping up to tackle the climate challenge and lead governments in adopting ambitious measures.

Leadership on business action on climate change – channeled through collaborative efforts from the We Mean Business Coalition – is essential for making the transition to a low carbon world. The Low Carbon Technology Partnerships initiative is a promising way forward and an important part of this journey.

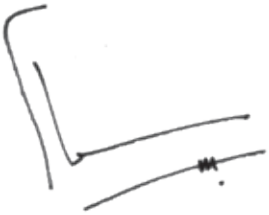
LCTPi is an unprecedented business collaboration that brings together over 140 companies and 50 partners to scale up the development and implementation of low carbon technology solutions. Our goal is to show that business can and will play a critical role in helping to limit the rise in global temperatures to below the 2° ceiling.

This report, developed by the PwC Sustainability and Climate Change team, tells the story of the LCTPi. A story of business leadership, collaboration and action. It shows the potential global impact that could be reached if more companies across industry sectors get serious about taking climate action. This is a story of deep emissions reduction, business opportunity, investment stimulation and new employment.

I am grateful to PwC for providing a deep analysis of the cumulative ambition of the LCTPi working groups. These figures are compelling. They demonstrate the power of the private sector, and the strength of partnerships with governments to deliver some of the solutions presented by the LCTPi groups.

Together, we can bring about the technological transformation that the world urgently needs.

Geneva, November 2015



Peter Bakker
President and CEO
World Business Council for Sustainable Development

Executive summary

The Low Carbon Technology Partnerships initiative is a major new platform for businesses to work together to fight climate change, convened by the WBCSD.

This report shows the magnitude of the potential benefits of the initiative for the climate, the businesses opportunities it could provide, and how it could contribute to the UN Sustainable Development Goals. It has been written by PwC UK's Sustainability & Climate Change team, based on plans developed by the nine LCTPi working groups, and in close collaboration with the WBCSD.

Key findings:

- **If its ambitions are met, the LCTPi could get society 65% of the way to a 2 degrees emissions pathway.**
- **The LCTPi could help channel $5-10 trillion of investment toward low carbon sectors of the economy and support 20-45 million person-years of employment.**
- **The LCTPi provides a platform for businesses to play a leading role in helping achieve the UN Sustainable development goals.**

For full details of the analysis and more information about the LCTPi please refer to the full report. For information about the LCTPi, please check www.lctpi.wbcsdservers.org.

The LCTPi could get society 65% of the way to a 2 degrees pathway

The magnitude of the climate challenge is evident – according to the Intergovernmental Panel on Climate Change (IPCC), to avoid dangerous climate change global greenhouse gas emissions need to be cut by over a third in 2030 compared to business as usual[1]. If it achieves its ambition, the LCTPi could get 64-68% of the way to achieving this – a significant contribution to climate change mitigation (Figure 1). In the longer term, the LCTPi could help provide low-cost, scalable low carbon technologies and infrastructure for deep decarbonisation. This contribution is complementary to

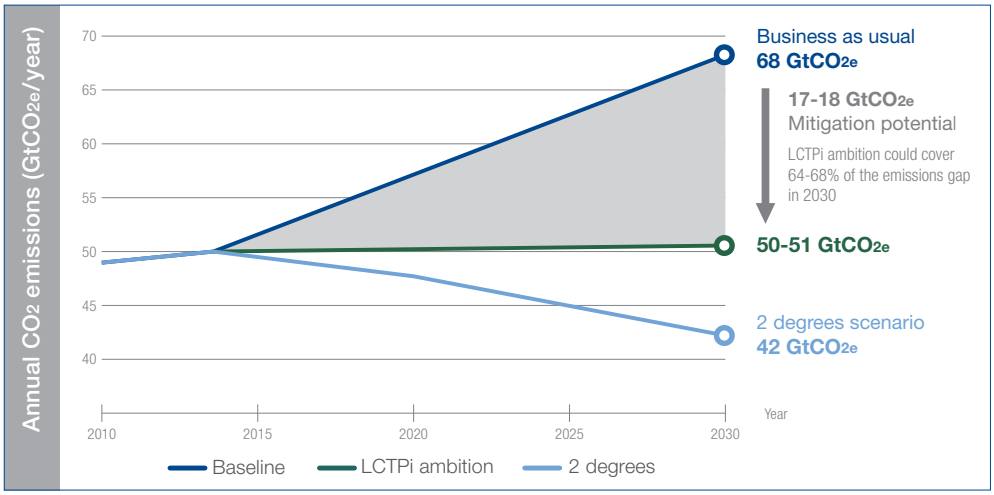


Figure 1: Comparison of LCTPi ambition with baseline and two degrees emissions pathways
Source: IPCC; LCTPi working groups; PwC analysis

[1] IPCC (2014). See www.mitigation2014.org [Accessed 21-10-2015]

government actions, such as the Intended Nationally Determined Contributions – the climate plans submitted by over 150 countries to the UN at the time of writing. The initiative is not additional to the national climate plans, but this analysis shows that business has a central role to play in helping countries achieve their climate targets.

The LCTPi could help channel $5-10 trillion of investment toward low carbon sectors of the economy and support 20-45 million person-years of employment

Limiting global warming to below two degrees is likely to have substantial economic benefits in the long term, which will benefit companies around the world. The transition to a low carbon economy would require a rapid increase in investment in low carbon technologies. This demand for technology, construction and expertise could create a huge opportunity for business to add value to the economy and support employment.

If it is successful in meeting its ambition, the LCTPi could help overcome market barriers and failures to create new investment opportunities and channel finance towards the low carbon economy, providing **$5-10 trillion of business opportunities** between today and 2030[1]. In doing so it could support **5-10 million jobs**[2] each year around the world. This expenditure will then ripple through the economy, potentially supporting 15-35 million jobs in the wider economy each year. These figures relate to the sectors targeted by the LCTPi and we have not considered other parts of the economy, and the extent to which investment and jobs are displaced from other sectors[3].

The LCTPi provides a platform for business to play a leading role in meeting the UN's Sustainable Development Goals

LCTPi actions could have far reaching impacts, not only for emissions reductions but for sustainable development more broadly. The UN's recently announced Sustainable Development Goals (SDGs) provide a common agenda for governments and business to work towards. Climate change and sustainable

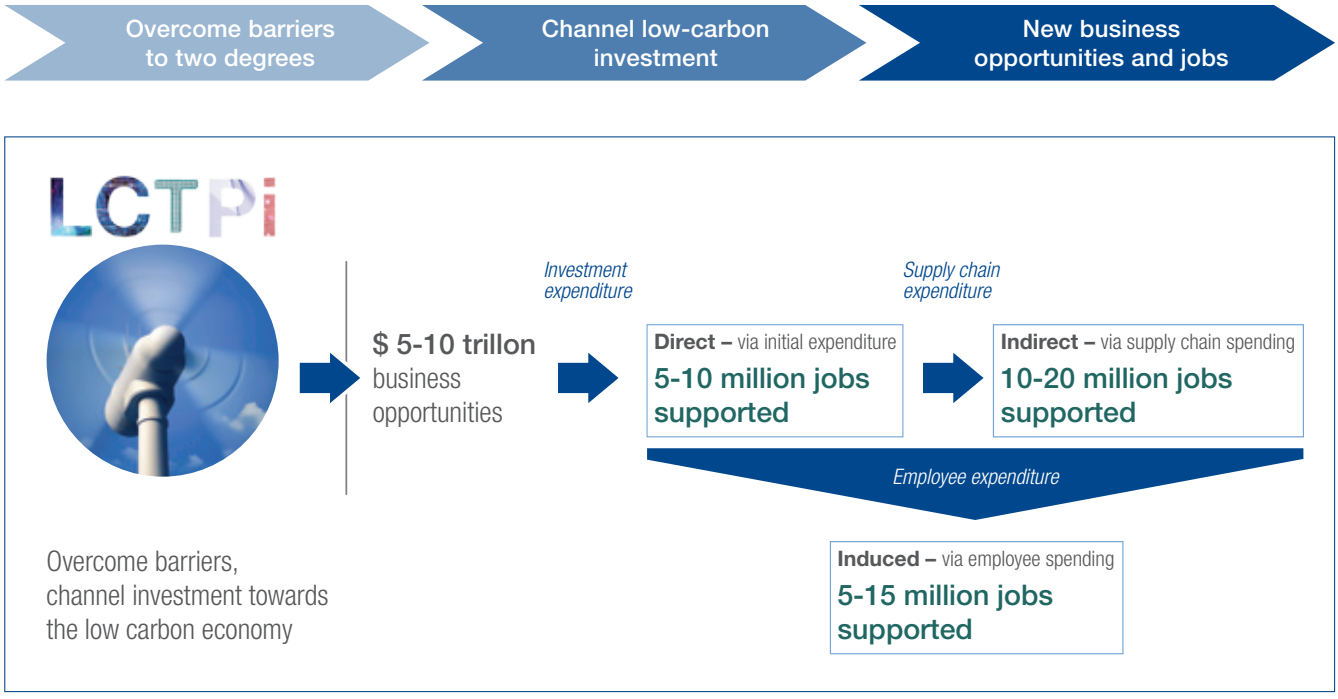


Figure 2: Economic and business contribution of the LCTPi

Source: PwC analysis

[1] 'Business opportunities' here are measured by to the gross amount of investment required to meet the LCTPi's ambitions.

[2] In this report, 'jobs' refers to person-years of employment.

[3] Specifically: We have analysed how the investment needed to achieve the LCTPi ambitions might flow through the global economy and support jobs, based on the relationships observed in the world economy today. However it is important to note that a low-carbon transition would mean far-reaching changes to the world economy. Our analysis does not focus on the change in investment flows elsewhere in the economy or what this might mean for net employment, investment or economic activity. Our analysis also does not consider the ongoing economic contribution of low carbon sectors beyond capital spending up to 2030 or beyond.

development are intrinsically linked and mitigation and adaption to climate change is a fundamental pillar of the SDGs (SDG 13). By addressing climate change mitigation, the LCTPi is already aligned with the SDG agenda. However, its potential contribution is much broader, from energy access, to sustainable infrastructure and cities, and ecosystems and land use (Figure 3).

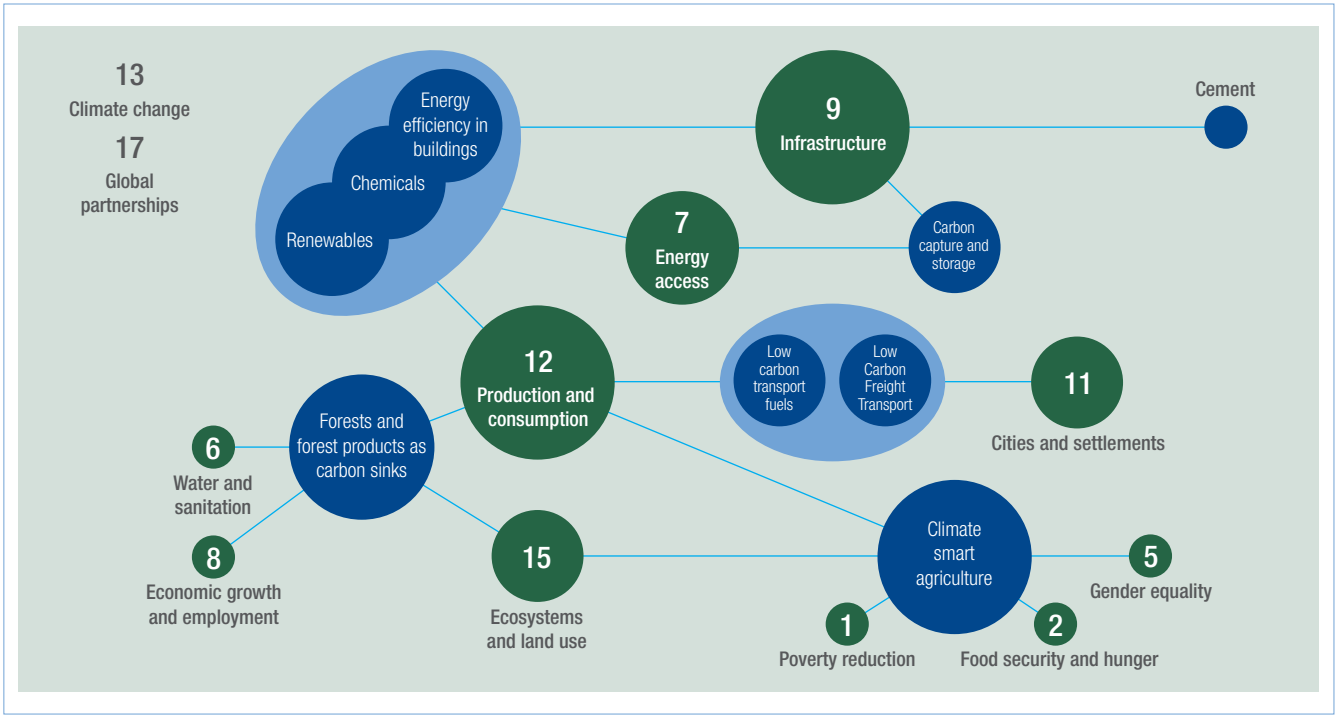


Figure 3: Links between the LCTPi and the UN Sustainable Development Goals. Blue bubbles indicate LCTPi focus areas, green bubbles indicate Sustainable Development Goals. Width of bubble is proportional to number of links. Goals 13 (climate change) and 17 (global partnerships) are linked to all LCTPi focus areas.

Table 1: The actions and ambitions of the LCTPi areas

AREA	ACTIONS	AMBITIONS
Renewables	Scaling green bond finance for renewable energy	Support the deployment of 1.5 TW of additional renewable energy capacity by 2025 in line with the IEA's two degrees scenario
	Scaling corporate renewable energy procurement via power purchase agreements	
	Deploying low-carbon micro-grids	
	Improving integration of renewables into grids and electricity markets	
Carbon Capture and Storage	Developing an innovative CCS funding solution	Support the deployment of 500-1,000 CCS projects to store 1 $GtCO_2$/year by 2030
	Developing a global map for CO_2 storage	
Chemicals	Further strengthen the aspiration for more sustainable solutions	Help unlock 1 $GtCO_2e$ savings per year by 2030 through chemical products serving sectors including buildings, automotive, packaging and food. Reduce barriers for up to 0.4 $GtCO_2e$ reduction per year in the industry's emissions by 2030, on top of anticipated efficiency gains, through new breakthrough technologies.
	Intensify R&D for new technologies and disruptive innovation	
	Work on new alliances with strategic partners	

AREA	ACTIONS	AMBITIONS
Cement	Enhancing the coverage of the sector's CO_2 and energy database, with a specific focus on China (representing about 60% of cement worldwide production)	Scale-up CO_2 emission reductions in the range of 20-25% in 2030 compared to business as usual, based upon CSI best in class 2020 targets
	Enhancing energy efficiency of the cement manufacturing process	
	Scaling up the collection, availability and usage of alternative fuels and raw materials, including waste from other sectors in a circular economy concept	
	Further reducing the clinker content in cement to minimize the share of the energy-intensive part of the process	
	Developing new cement with lower energy and calcination requirements	
	Engaging the full building and infrastructure value chain in local markets to identify and maximize the avoided emissions by usage of cement and concrete products	
	Evaluating cross-sectoral initiatives, particularly on the opportunity to capture, use and store carbon at scale	
Energy Efficiency in Buildings	Engaging the full building value chain at local level to develop and implement action plans addressing the key market barriers for EEB	Reduce projected energy use in buildings by 50% by 2030 through energy efficiency in buildings
Low Carbon Transport Fuels	Convening private and public stakeholders for next generation biofuels	Use sustainably produced biofuels for 27% of total transport fuel by 2050 to avoid around 2.1 Gt CO_2 emissions per year (compared to BAU)
	Boosting demand, especially in target markets	
Low Carbon Freight Transport	Creating a new freight ecosystem by connecting freight road agents in order to improve freight movement efficiency and reduce road freight carbon footprint.	Achieve CO_2 neutral (net zero emissions) freight transport within the 21st century
Climate Smart Agriculture	Building smallholder resilience	Produce 50% more available and nutritious food (compared to today) and strengthen the climate resilience and incomes of farming communities. Reduce agricultural and land-use change emissions from commercial agriculture by at least 3.7 Gt CO_2e per year by 2030 (50%). Achieve a 65% emissions reduction by 2050.
	Scaling-up investment in CSA	
	Improving businesses' ability to trace, measure and monitor CSA progress	
	Eliminating agriculture-driven deforestation and sustainable land-use commitments	
Forests and Forest Products as Carbon Sinks	Enhancing sequestration in conservation forests	Increase forest carbon stocks by 3 $GtCO_2$/year
	Increasing area and yield in production forests and implementing SFM	

Source: LCTPi working groups

Contents

Introduction

The Low Carbon Technology Partnerships initiative

The Low Carbon Technology Partnerships initiative (LCTPi) is a joint public and private initiative to accelerate low carbon technology development. It aims to accelerate low-carbon technology development, and scale up the deployment of these technology solutions, to a level and speed consistent with the objective of limiting global warming to below two degrees Celsius compared to pre-industrial levels. This is consistent with the WBCSD vision on climate change:

With the goal of limiting global temperature rise to 2°C above pre-industrial levels, the world must, by 2020, have energy, industry, agriculture and forestry systems that simultaneously:

- Meet societal development needs;
- Are undergoing the necessary structural transformation to ensure that cumulative net emissions do not exceed one trillion tonnes of carbon; and,
- Are becoming resistant to expected changes in climate.

Nine LCTPi focus areas are expected to deliver action plans which develop and deploy low carbon technologies and solutions, supported by individual company commitments. Each focus area brings together leading international companies, to develop a vision of their sector's contribution to the climate challenge and an action plan to help achieve that vision.

Working towards and achieving the LCTPi vision also has the potential to contribute to economic and social change more broadly. By contributing to the Sustainable Development Goals, the LCTPi could provide significant business opportunities and in doing so support jobs across the world economy.

As such, the LCTPi is a platform for businesses to work together, across sectoral and national boundaries, to overcome common challenges and meet common goals. It shows a way to work with governments that is more environmentally sustainable, socially equitable and economically inclusive – and therefore better for business.

Purpose and structure of this report

This report outlines the ambition and potential of the LCTPi as a whole. It answers three key questions:

1 **What is the LCTPi's potential contribution to climate change?**
2 **What is the scale of the business opportunity provided by the LCTPi, including how many jobs might this support?**
3 **How might the LCTPi contribute to meeting the Sustainable Development Goals?**

The answers to these questions help provide a case for businesses to work together on sustainable development not only as corporate responsibility but also as good business sense. By working with business, governments can help meet their own climate change and international development policy goals.

By working together on common goals, business can help make a significant contribution to the big challenges of our time. This report shows that businesses have this ambition. To transform this vision into reality will take careful planning, hard work, and above all continued and enhanced support from government policy, key stakeholders and the growing number of companies embracing this vision.

This report is structured around three pillars: climate change, economic opportunities and sustainable development (Figure 4).

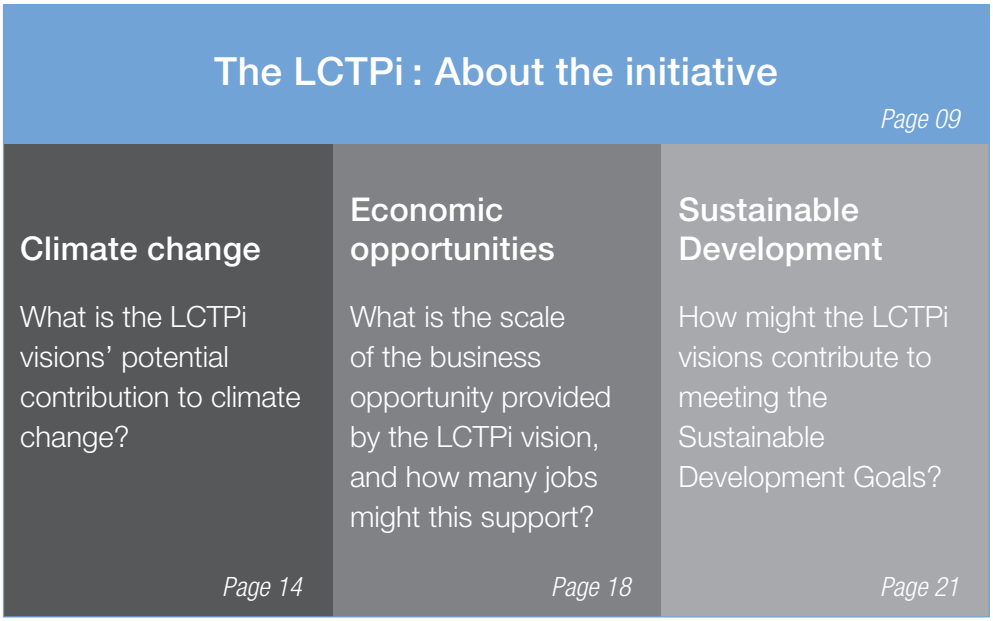


Figure 4: Structure of this report

About the initiative

The UN climate talks in Paris provide a key moment for business to support climate action

The United Nations climate talks in Paris in December at COP21 [1], where governments aim to adopt a global climate agreement, are a key moment for all stakeholders to contribute to serious climate action. Many solutions to climate change require existing technologies to be made available at scale or new technologies to be developed. To achieve this, the WBCSD is trying to help remove the barriers that are preventing existing technologies from being deployed at scale, and help companies to develop new technologies that will benefit multiple climate solutions.

The LCTPi brings together companies to limit global warming to 2 degrees

Launched at the COP20 climate talks in 2014, the LCTPi aims to present a series of concrete action plans at COP21 for the large-scale development and deployment of low-carbon technologies. It brings together the WBCSD's Action 2020 Business Solutions, the SDSN's Deep Decarbonisation Pathways and the IEA's Technology Roadmaps to:

- Accelerate the diffusion of existing technologies by removing technological, market and social barriers and introducing required policy and financial instruments, and
- Develop public-private partnerships on the research, development, demonstration and deployment (RDD&D) of potentially new low carbon technologies.

It is supported by the French Presidency of COP21 and is part of the Lima-Paris Action Agenda. Overall, the LCTPi seeks to create a solid framework for low carbon investment through a strengthened dialogue between business and government.

Under the LCTPi, businesses have been developing ways to help boost deployment of low carbon technology

Through the nine focus areas of the LCTPi, businesses have been developing plans to catalyse the research, development, demonstration and deployment (RDD&D) of low carbon technologies across the key areas of the economy that must be decarbonized if society is to limit climate change to below two degrees. These focus areas and their contribution to RDD&D are summarized in Table 2. The LCTPi ambition depends on deploying at scale the low carbon technologies that already exist. The working groups hope to back this up with strategic research, development and demonstration to provide a pipeline of commercially viable technologies ready to deploy in the next 15 years.

[1] This is the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) – also known as COP21.

Table 2: LCTPi focus areas and contribution to RDD&D

MITIGATION SECTOR	LCTPI FOCUS AREA(S)	CONTRIBUTION OF WORKING GROUP TO RESEARCH, DEVELOPMENT, DEMONSTRATION AND DEPLOYMENT OF LOW CARBON TECHNOLOGIES			
		Research	Development	Demonstration	Deployment
Energy	Renewables				√
	Carbon Capture and Storage	√	√	√	√
Industry and materials	Chemicals	√	√	√	√
	Cement	√	√	√	√
Buildings	Energy Efficiency in Buildings				√
Transport	Low Carbon Transport Fuels		√	√	√
	Low Carbon Freight Transport		√	√	√
Landscapes	Climate Smart Agriculture				√
	Forests and Forest Products as Carbon Sinks		√	√	√

Source: PwC analysis

Businesses have set out their low-carbon ambitions and concrete steps to make them reality

Through the LCTPi platform, businesses have developed strategies to unlock low-carbon development in each focus area. These are led and driven by businesses, but ask for appropriate policy support from governments. Each of these strategies has four main parts:

- **Ambition:** Businesses' ambitions (or visions) for achieving greenhouse gas emission reductions by 2030 as a result of the LCTPi platform.
- **Challenges:** The market, policy or financial barriers to achieving the ambition that businesses face.
- **Action plan:** How the businesses involved in the LCTPi plan to overcome the barriers to developing and deploying low-carbon technologies at a scale consistent with limiting climate change to 2 degrees above pre-industrial levels.
- **Policy asks:** Business does not operate in a vacuum, so it needs an appropriate policy environment to deliver the full potential of the actions plans and achieve the vision of a low-carbon economy. Each focus area has developed a set of "policy asks" that it believes are needed to unblock the barriers to cutting emissions.

The vision set out by each focus area is designed to be ambitious but realistic:

- **Ambitious:** Cutting greenhouse gases in line with a 2 degrees climate change scenario will mean huge changes in the economy and require significant investment and collaboration from businesses, and support from governments.
- **Realistic:** Businesses and government need something achievable and concrete to work towards.

The action plan and ambition for each focus area are summarized in Table 3 (below). For full details of the action plans, policy asks and ambitions, refer to the documents produced by the individual LCTPi working groups.

The action plans have been developed through a series of roundtable events and regional dialogues that are being held on every continent[1)] in the run up to COP-21 in Paris (see Appendix 1). In 2015, the WBCSD held dialogues with more than 1,000 participants in the United States, Brazil, France, the UK, South Africa, India, China, Japan and Australia.

[1)] Except Antarctica

Businesses and governments need to scale up their actions to achieve the LCTPi's full potential

The action plans set out a way forward, but they are not sufficient to achieve each focus area's ambition. Instead, they set up a platform for collaboration on low-carbon technology development and deployment. The action plans themselves are the first step to kick-start the low-carbon economy, and are expected to evolve over time as more companies become involved and lessons are learned from implementing the initial plans. The ways in which the action plans are expected to contribute to the vision are set out in Table 3. But to help achieve the full potential of the LCTPi, smart government policy is needed and businesses would need to scale up their involvement in the LCTPi.

Table 3: Summary of LCTPi areas' action plans and how they might contribute to the LCTPi's vision

AREA	ACTIONS	AMBITIONS	HOW THE ACTION PLAN MIGHT CONTRIBUTE TO ACHIEVING THE AMBITION
Renewables	Scaling green bond finance for renewable energy Scaling corporate renewable energy procurement via power purchase agreements Deploying low-carbon micro-grids Improving integration of renewables into grids and electricity markets	Support deployment of 1.5 TW of additional renewable energy capacity by 2025 in line with the IEA's two degrees scenario	• The green bond program could contribute to unlocking institutional investment to scale cost effective finance for RE projects via a commitment to transparency and working together with investors, banks and DFIs to share knowledge and de-risk projects. • Proactively engaging with policymakers and regulators in providing recommendations based on global business experience could help to facilitate greater and more efficient RE integration. • Corporate renewable energy procurement may help reduce credit risk and improve bankability of RE projects helping substituting demand away from fossil fuel sources and towards RE technologies. • Microgrids are likely to play a key role in improving energy access and provide economic and social opportunities, particularly for those living in rural areas in developing countries without reliable or affordable access to energy.
Carbon Capture and Storage	Developing an innovative CCS funding solution Developing a global map for CO_2 storage	Support the deployment of 500-1,000 CCS projects to store 1 $GtCO_2$/year by 2030	• Increasing CCS funding could help deploy the next generation of CCS plants, particularly in the power sector, leading to learning-by-doing, including technological advances and cost reductions. • The funding solution is intended to bridge the gap between the current lack of systematic funding for CCS and government support via systematic carbon pricing or an equivalent policy, which would be needed in the longer term to support CCS deployment to 2030. • After the initial wave of CCS projects stimulated by the funding solution, if CCS technology is to diffuse worldwide, potential developers and investors will need reliable and granular data on CO_2 storage potential around the world – similar to what the oil and gas exploration industry currently uses when exploring new sites.

AREA	ACTIONS	AMBITIONS	HOW THE ACTION PLAN MIGHT CONTRIBUTE TO ACHIEVING THE AMBITION
Chemicals	Further strengthen the aspiration for more sustainable solutions Intensify R&D for new technologies and disruptive innovation Work on new alliances with strategic partners	Help unlock 1 $GtCO_2e$ savings per year by 2030 through chemical products serving sectors including buildings, automotive, packaging and food. Reduce barriers for up to 0.4 $GtCO_2e$ reduction per year in the industry's emissions by 2030, on top of anticipated efficiency gains, through new breakthrough technologies.	• Scaling up the consistent measurement and communication of sustainability indicators for chemical products is likely to increase comparability and understanding of sustainability performance, and could help stimulate deployment of low carbon technologies. • Collaboration between chemical companies and value chain partners, other sectors, investors and policy makers could help address barriers to deployment of low carbon technologies and practices across the value chain. • Research and development, including through new open innovation platforms and existing platforms, could provide new mitigation options for the chemical industry.
Cement	Enhancing the coverage of the sector's CO_2 and energy database, with a specific focus on China (representing about 60% of cement worldwide production) Enhancing energy efficiency of the cement manufacturing process Scaling up the collection, availability and usage of alternative fuels and raw materials, including waste from other sectors in a circular economy concept Further reducing the clinker content in cement to minimize the share of the energy-intensive part of the process Developing new cement with lower energy and calcination requirements Engaging the full building and infrastructure value chain in local markets to identify and maximize the avoided emissions by usage of cement and concrete products Evaluating cross-sectoral initiatives, particularly on the opportunity to capture, use and store carbon at scale	Scale-up CO_2 emission reductions in the range of 20-25% in 2030 compared to business as usual, based upon CSI best in class 2020 targets	• Engaging with the cement industry worldwide to make the business case for best-in-class cement production techniques could encourage their diffusion. • This engagement is may generate knowledge of market-specific barriers to the deployment of best-in-class technologies and practices, which would provide a basis for further engagement. • Developing new technologies could help provide further mitigation options for the industry. • Addressing market barriers across the value chain could help align incentives around a business case for emissions savings and diffusion of technology.

AREA	ACTIONS	AMBITIONS	HOW THE ACTION PLAN MIGHT CONTRIBUTE TO ACHIEVING THE AMBITION
Energy Efficiency in Buildings	Engaging the full building value chain at local level to develop and implement action plans addressing the key market barriers for EEB	Reduce projected energy use in buildings by 50% by 2030 through energy efficiency in buildings	• A key barrier to achieving energy efficiency in buildings, identified by the working group, is the fragmentation of the buildings value chain, such that incentives are not always aligned to make optimal investment decisions. • Convening stakeholders to build a common case and strategy for energy efficiency in buildings could help overcome those barriers.
Low Carbon Transport Fuels	Convening private and public stakeholders for next generation biofuels Boosting demand, especially in target markets	Use sustainably produced biofuels for 27% of total transport fuel by 2050 to avoid around 2.1 Gt CO_2 emissions per year (compared to BAU)	• Coordinating RDD&D of next generation biofuels could help them become commercially viable more quickly than without coordination. • Increasing demand for biofuels will provide a rationale for additional investment in the development and deployment of biofuels, and therefore help increase supply in the medium term.
Low Carbon Freight Transport	Creating a new freight eco-system by connecting freight road agents in order to improve freight movement efficiency and reduce road freight carbon footprint	Achieve CO_2 neutral (net zero emissions) freight transport within the 21st century	• Optimized freight movements, inter-modal transfers and truck loads could help to reduce unnecessary mileage and therefore emissions. • Promoting eco-friendly driving behaviors among the drivers may result in reduced fuel consumptions.
Climate Smart Agriculture	Building smallholder resilience Scaling-up investment in CSA Improving businesses' ability to trace, measure and monitor CSA progress Eliminating agriculture-driven deforestation and sustainable land-use commitments	Produce 50% more available and nutritious food (compared to today) and strengthen the climate resilience and incomes of farming communities Reduce agricultural and land-use change emissions from commercial agriculture by at least 3.7 Gt CO_2e per year by 2030 (50%). Achieve a 65% emissions reduction by 2050	• Increasing investment in smallholder farmers will provide opportunities for income, boosting resilience directly, as well as increasing the use of farming techniques that mean crop yields are less vulnerable to weather and climate variations. • Improving traceability, measuring and monitoring of progress on CSA means that more businesses can implement and invest in CSA techniques, expanding their use and helping to make them more mainstream in international supply chains. • Cutting demand for agricultural commodities produced through deforestation would reduce the incentive to convert land at the forest margin, although careful planning will be needed to minimize displacement of land conversion to other valuable ecosystems. • Agricultural supply chains have the potential to greatly reduce deforestation because of their global reach. • The plan includes livestock as well as arable farming so has the potential to contribute across the spectrum of the agricultural sector.
Forests and Forest Products as Carbon Sinks	Enhancing sequestration in conservation forests Increasing area and yield in production forests and implement SFM	Increase forest carbon stocks by 3 $GtCO_2$/year	• Increasing the yield of SFM may help increase its share of the global forest product market at the margin and thereby increase carbon sequestration from forests in cases where SFM increases carbon stocks relative to alternative uses of forests.

Source: LCTPi working groups

If successful, the LCTPi provides a platform to address important cross-cutting issues

One of the potential strengths of the LCTPi is that it brings together businesses from different sectors in a single platform. This provides an opportunity to address common issues and tackle cross-cutting issues. The key cross-cutting issues addressed by the LCTPi areas are identified and discussed in Table 4.

The table below shows that five focus areas have the greatest potential for cross-benefits or overlaps with other areas: climate smart agriculture, low carbon transport fuels, renewables, chemicals and carbon capture and storage. However, across all areas there is an opportunity to explore cross-sector synergies to ensure that efforts are not duplicated, enhancing efficiency versus a more silo-based approach. As the LCTPi progresses, more cross-cutting issues may emerge and could form the basis for further cross-sector and public-private collaboration.

Table 4: Cross-cutting issues addressed by the action plans

ACTION PLAN	CROSS-CUTTING ISSUES ADDRESSED BY ACTION PLAN	RELATED FOCUS AREAS	EXPLANATION
Chemicals	Low-carbon building materials	Energy efficient buildings	Chemicals innovation may help enhance insulating potential
Climate smart agriculture	Deforestation	Forests and forest products	Reducing deforestation rates affects carbon sequestration from forests
Low carbon transport fuels	Sustainable biofuel production and use	Climate smart agriculture	Biofuels affect land use decisions and farmers' incomes and emissions
		Chemicals	Chemical sector could contribute to new types of low carbon fuels
		Freight	Biofuels provide an emissions abatement option for freight
		Renewables	Sustainable biofuels are a potential renewable energy option
Renewables	Investment in renewable energy capacity	Low carbon transport fuels	
		Energy efficient buildings	Renewable energy could help reduce buildings' emissions (directly and via the electricity sector) and it affects the benefits from energy efficiency
	Direct purchase of renewable energy	Cement	Cement and chemicals companies can procure renewable energy directly to reduce scope 2 emissions
		Chemicals	
Carbon capture and storage	Investment in carbon capture and storage	Energy efficient buildings	Carbon capture and storage could help reduce buildings' emissions via the electricity sector and it affects the benefits from energy efficiency
		Cement	Carbon capture and storage is a potential abatement technology for the cement industry
		Chemicals	Carbon capture and use (in production) is a potential abatement technology for the chemicals industry

What is the LCTPi's potential contribution to climate change mitigation?

Current greenhouse gas emissions are approximately 50 $GtCO_2e$/year. Based on current trends, without action on climate change the world could warm by 3-4 degrees by 2100 compared to pre-industrial levels – and higher in the longer term[1].

To avoid dangerous climate change, society must cut global emissions by over a third in 2030

Without action on climate change, greenhouse gas emissions are expected to continue to grow, reaching approximately 68 $GtCO_2e$/year in 2030[2]. To limit climate change to 2 degrees above pre-industrial levels in 2100, emissions must peak and fall towards zero during the 21st century.

To limit warming to 2 degrees, emissions pathways provided by the IPCC suggest that global emissions must fall to approximately 42 $GtCO_2e$/year in 2030. This implies an emissions gap of 26 $GtCO_2e$/year in 2030 compared to baseline emissions. This means that emissions in 2030 must be approximately 15% less than emissions in 2010 and 38% less than business-as-usual.

The LCTPi could get society 65% of the way to a two degrees pathway

Each of the LCTPi focus areas has announced its ambition to cut greenhouse gas emissions in 2030 compared to business as usual. If this vision were achieved, the LCTPi would reduce greenhouse gas emissions by approximately 17-18 $GtCO_2e$/year by 2030 compared to business as usual. Based on the emissions pathways produced by the IPCC, this could get 64-68% of the way towards a two degrees pathway compared to baseline emissions in 2030 – a significant contribution to climate change mitigation. This is shown in Figure 5 (next page).

[1] IPCC (2014) Climate Change 2014: Mitigation of Climate Change. Available at: www.mitigation2014.org [accessed 21-09-2015]

[2] Ibid. For additional discussion, see Global Commission on the Economy and Climate (2015): http://static.newclimateeconomy.report/wp-content/uploads/2015/01/NCE-technical-note-emission-reduction-potential_final.pdf [Accessed 21-09-2015]

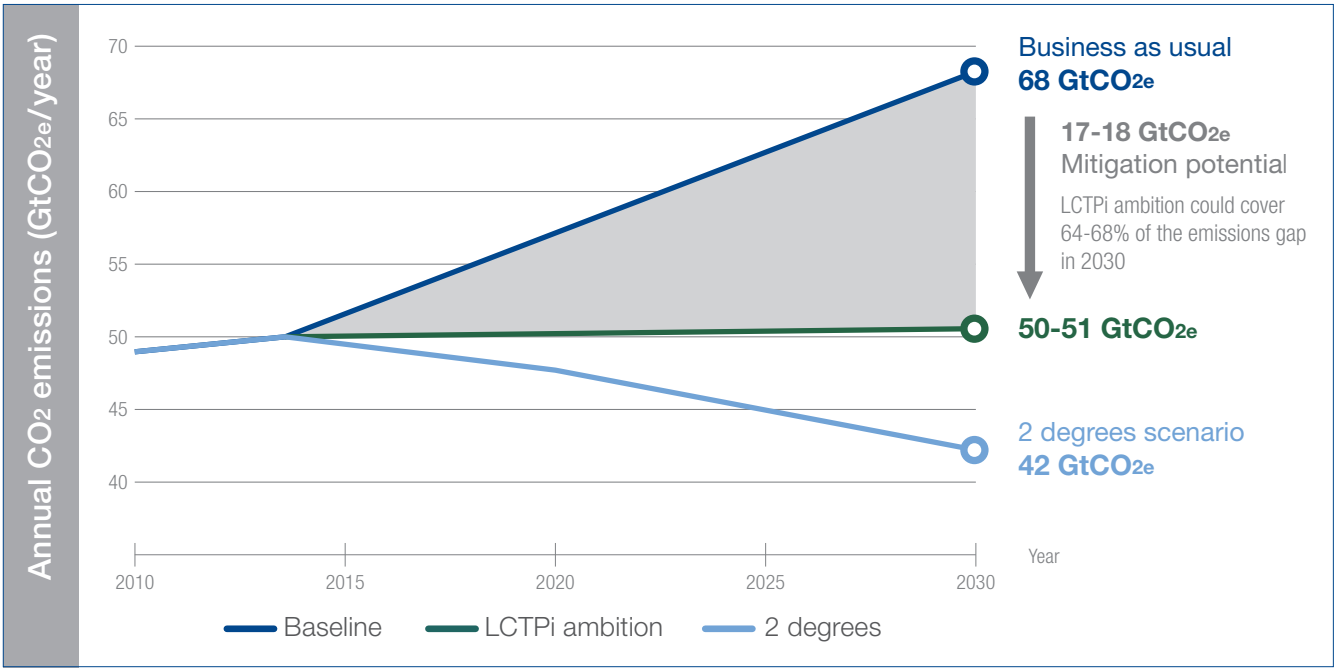


Figure 5: Comparison of LCTPi ambition with business-as-usual and two degrees emissions pathways

Source: IPCC; LCTPi working groups; PwC analysis

BOX 1:
TECHNICAL NOTE ON GREENHOUSE GAS EMISSIONS PATHWAYS USED IN THIS REPORT

We use two emissions pathways provided in the IPCC's Fifth Assessment Report, published in 2014[1]. These show how annual GHG emissions change over time. They include emissions from all sources, including energy, industrial processes and land use. The two pathways used are:

- **Baseline:** We use the median baseline emissions from the IPCC's most recent review of climate change mitigation. In 2030 median baseline emissions are approximately 68 $GtCO_2e$/year (range: 61-73 $GtCO_2e$, based on 10th-90th percentile of projections).
- **Two degrees:** We use the IPCC's median value for 2030 emissions consistent with a likely chance (more than 66% probability) of limiting climate change to two degrees or less. In 2030 median two degrees compatible emissions are approximately 42 $GtCO_2e$ (range: 28-52 $GtCO_2e$, based on 10th and 90th percentile of projections).

The difference between these pathways indicates an emissions gap in 2030 of 26 $GtCO_2$/year, with a range of 21-33 $GtCO_2$/year if we take the 10th and 90th percentiles of the baseline and two degrees scenarios.

The baseline scenario does not include the Intended Nationally Determined Contributions (INDCs) – contributions that over 100 of governments around the world have announced to the UN in advance of the COP21 climate talks in Paris. The LCTPi is complementary to these targets and its ambition should not be treated as additive to national climate targets – businesses and governments will need to work together to achieve both groups' climate reduction pledges.

Defining emissions pathways compatible with two degrees depends on the profile of emissions both before and after 2030. For simplicity, we have analysed the contribution of the LCTPi based on the emissions gap in 2030 itself and assumed a linear build-up of reductions between today and 2030.

[1] IPCC (2014). The same approach was used by the Global Commission on the Economy and Climate: www.static.newclimateeconomy.report/wp-content/uploads/2015/01/NCE-technical-note-emission-reduction-potential_final.pdf [Accessed 21-09-2015]

The mitigation ambitions of the individual LCTPi areas are summarized in Table 5.

Table 5: Potential contribution of the LCTPi ambition to a two degrees emissions pathway

MITIGATION SECTOR	LCTPI FOCUS AREA(S)	GREENHOUSE GAS EMISSIONS REDUCTION VERSUS BUSINESS-AS-USUAL IN 2030 *($GtCO_2e$/year)*
Energy	Renewables	5
	Carbon Capture and Storage	1
Industry and materials	Chemicals	0.2-0.4
	Cement	0.6-0.9
Buildings	Energy Efficiency in Buildings	3-3.5
Transport	Low Carbon Transport Fuels	0.5
Landscapes	Climate Smart Agriculture	3.7
	Forests and Forest Products as Carbon Sinks	2.7
LCTPi ambition ($GtCO_2e$/year)		**16.7-17.7**
Emissions gap in 2030 ($GtCO_2e$/year)		**26 (range: 21-33)**
LCTPi ambition (% of emissions gap)		**64-68% (range: 51-84%)**

Source: IPCC; LCTPi working groups; PwC analysis. The LCTPi is in its scoping phase. As a result, the CO_2 reduction ambition for Low Carbon Freight Transport is not included in our analysis due to the current maturity of data. As the LCTPi develops the estimates above may need to be refined.

In aggregating these numbers, it is important to avoid double counting between focus areas. We have considered several areas where this is a particular issue:

- **Renewables, cement and chemicals:** Increases in renewable energy may help reduce emissions in the chemicals and cement industries. To avoid double counting, the emissions reductions for chemicals and cement focus on the deployment of production technology and efficiency.
- **Renewables, CCS and energy efficiency in buildings:** Emissions from buildings are affected by renewables and CCS deployment, particularly as growing renewable energy penetration lowers the carbon intensity of local grids. Energy efficiency GHG reductions were therefore calculated taking into account the effect of renewables and CCS in decarbonizing the electricity system as outlined in the CCS and renewables plans to avoid double counting. To calculate this we assumed that 50-100% of CCS deployment under the LCTPi would be in the power sector and applied the percentage of electricity consumed by buildings in 2030 under business-as-usual, based on the IEA's World Energy Outlook 2014. In the table above, we have subtracted the double-counted emissions from the energy efficient buildings emission reduction potential rather than the reduction potential for renewables.
- **CCS and cement:** CCS provides a potentially significant mitigation technique for the cement sector. To avoid double counting, the emissions reductions for cement do not include reductions from CCS.
- **CSA and forests:** Agriculture is responsible for approximately 50% of global deforestation, and the CSA group has an ambition to halt agriculture-driven deforestation. To avoid double counting, for the forests group we have only included emissions reductions from increased forest cover and carbon stocks, including avoided degradation, and have not included emission reductions from avoided deforestation.
- **Chemicals and forests downstream contributions:** Both the chemicals and forests working groups see the downstream impact of products as providing greenhouse gas mitigation opportunities, for example through construction materials for buildings and low carbon transport fuels. To avoid potential double counting with other focus areas, we have not included these in our estimate of the total mitigation potential.

The LCTPi can help lock-in low-carbon technologies for the long-term

To avoid dangerous climate change substantial cuts in emissions by 2030 must be made. However, to create lasting change a paradigm shift in industry towards new technologies on a commercial scale must happen in parallel. Making current solutions more cost effective is likely to be essential for reducing emissions towards net zero in the second half of the 21st century.

The development and reduction in cost of these new technologies is the focus of the LCTPi. They include energy efficiency and low-carbon energy, such as renewables and low carbon transport fuels, as well as emissions-negative technologies to capture and use or sustainably store carbon dioxide from the atmosphere.

Smart policy is needed to help achieve this ambition and bridge the gap to 2 degrees

Targeted policy support is a key part of the LCTPi, as described in the 'policy asks' prepared by the working groups[1]. Smart policy will also be necessary to help bridge the remaining emissions gap to two degrees. The LCTPi alone does not reduce emissions enough to move the world to an emissions trajectory compatible with two degrees. Further emissions reductions will be needed to close the 35% gap not covered by the LCTPi to limit global warming to 2 degrees. Smart policy could help bring governments and businesses together to address the 'policy asks' of the working groups and find alliances between the Intended Nationally Determined Contributions and the LCTPi. These synergies could also encourage businesses and governments to act on policy and address the remaining greenhouse gas emissions from sources outside the scope of the LCTPi. These might include:

- Transport – fuel efficiency and new technologies such as electric cars.
- Other industrial sectors – such as textiles, waste and consumer goods.
- Process emissions from other sources – emissions from mining, gas leakage from processing plants and SF6 release from the electricity industry.
- Energy sector – for example increased fuel efficiency of the remaining fossil fuel power plants, coal to gas fuel switching and the phasing out of the least efficient coal power plants.
- Other land use emissions.

[1] To retain a focus on the working groups' actions and ambitions, we have not detailed these in this report. For information, please refer to the separate reports on each focus area, which we expect to be released in November-December 2015.

What is the scale of the business opportunity provided by the LCTPi vision?

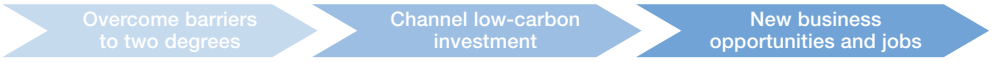
The transition to a low carbon world is likely to alter investment flows through the economy

Climate change is one of the most significant market failures ever seen[1]. Addressing this failure and limiting global warming to below two degrees is likely to have substantial economic benefits in the long term[2], which will benefit companies around the world. To achieve these benefits, the drive for low carbon technology deployment will require significant investment and therefore provide opportunities for business and support employment in related sectors of the world economy. This can only happen if barriers and market failures are addressed, making low carbon technologies more attractive as investment options. This section presents analysis of the business opportunities and employment that the LCTPi could support, based on assumptions about the gross investment needed to achieve the LCTPi's ambitions. This analysis relates to the sectors targeted by the LCTPi and therefore we have not considered other parts of the economy, and the extent to which investment and jobs are displaced from other sectors[3]. Details of our methodology are given in Appendix 2.

The LCTPi could help channel $5-10 trillion of investment towards the low carbon economy and support 20-45 million person-years of employment

The transition to a low carbon economy would require rapidly scaling-up investment in low carbon technologies. This demand for technology, construction and expertise could create a huge opportunity for businesses to add value to the economy and support employment.

If it is successful in meeting its ambition, the LCTPi could help channel investment towards the low carbon economy, providing **$5-10 trillion of business opportunities** in related sectors between today and 2030 from capital expenditure alone. In doing so it could support **5-10 million jobs** each year around the world[4]. This expenditure will then ripple through the economy, potentially supporting 15-35 million jobs in the wider economy each year. These investment-driven business opportunities are equivalent to 0.2-0.5% of projected global GDP over the time period (2016-2030)[5].



[1] Stern Review (2007). Available at: http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/media/4/3/Executive_Summary.pdf [accessed 21-10-2015]

[2] Ibid.

[3] This is a gross rather than a net analysis. More specifically: We have analysed how the gross investment needed to achieve the LCTPi ambitions might flow through the world economy and support jobs, based on the relationships observed in the world economy today. However it is important to note that a low-carbon transition would mean far-reaching changes to the world economy. Our analysis does not focus on the change in investment flows elsewhere in the economy or what this might mean for net employment, investment or economic activity. Our analysis also does not consider the ongoing economic contribution of low carbon sectors beyond capital spending up to 2030 and beyond.

[4] In this report, 'jobs' refers to annual average person-years of employment over the 15 years between 2015 and 2030. A person year is a level of employment equivalent to one person being employed for one year full time – for example, two people employed for a year or one person employed for two years on a 50% basis. As such, we are unable to comment on how many of these jobs are permanent or temporary.

[5] Based on PwC's World in 2050 model. See http://www.pwc.com/gx/en/issues/economy/the-world-in-2050.html [Accessed 23-10-2015]

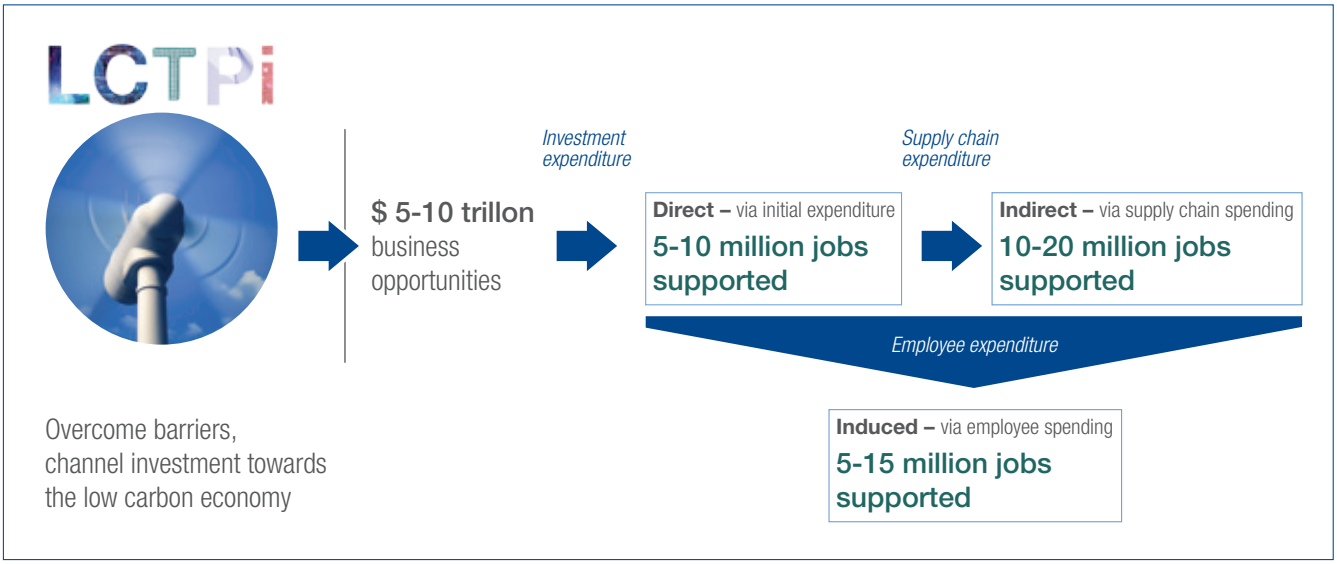


Figure 6: Economic and business contribution of the LCTPi - Source: PwC analysis

These estimates are based on the most capital intensive focus areas for which data and LCTPi plans are the most mature. Table 6 shows the results split by focus area. As the LCTPi action plans evolve and increase in maturity over the coming months and years, we anticipate that more information on the impacts and implications for investment flows may provide further information that could supplement our analysis.

Table 6: Summary of draft impact results

FOCUS AREA	GLOBAL BUSINESS OPPORTUNITIES[a]	GLOBAL EMPLOYMENT SUPPORTED[b]	WIDER EMPLOYMENT SUPPORTED THROUGH MULTIPLIER EFFECTS[b]	
	Investment	Direct employment	In the supply chain	Via employee spending
Renewables	$1.5 – 4 trillion	1 – 3 million	3 – 8 million	1.5 – 4.5 million
Carbon Capture and Storage	$0.6 – 1.2 trillion	0 – 0.5 million	1 – 1.5 million	0.5 – 1 million
Energy Efficiency in Buildings	$3 – 6 trillion	3.5 – 7 million	5 – 10 million	3.5 – 7 million
Low Carbon Transport Fuels	$0.03 – 0.04 trillion	0.00 – 0.05 million	0.00 – 0.05 million	0.00 – 0.05 million
Cement	$0.04 – 0.05 trillion	0.05 – 0.1 million	0.1 – 0.15 million	0.05 – 0.1 million
Total	**$5 – 10 trillion**	**5 – 10 million**	**10 – 20 million**	**5 – 15 million**

[a] cumulative investment to 2030 (2015 prices) [b] annual average person-years of employment 2015-2030 - Source: PwC analysis - Numbers may not cast due to rounding

We have focused on capital expenditure rather than operational expenditure because changes in infrastructure investment flows are at the heart of what the LCTPi aims to achieve. However, although not considered here, changes in investment are likely to be accompanied by changes in operational expenditure.

This process of redirecting investment flows towards low carbon sectors may have much broader economic, social and environmental consequences that are not captured here – such as reductions in air pollutant emissions if renewable energy replaces coal power generation, or ongoing energy cost savings for individuals and businesses from investment in energy efficiency in buildings. These costs and benefits, together with the emissions reduction potential and government policies, are what will drive individual and collective decisions to invest in low versus high carbon infrastructure.

INVESTMENT ASSUMPTIONS

The analysis above is based on a set of assumptions about the investment needed to achieve the LCTPi ambitions. These assumptions were developed by the WBCSD with research support from PwC. These are outlined in Table 7. To reflect the uncertainties involved in the levels of investment required to meet the ambition in each focus area and the number of jobs this may support, we have provided ranges instead of specific figures. This is based on the level of investment that may be required to achieve the level of technology deployment given in the LCTPi ambition statements, rather than analysis of specific sources of finance. Based on the investment assumptions used in our analysis, around half of the required capital investment could be in developing countries, including emerging economies. However, a number of factors could influence the levels of employment created by this investment in each country, including the specific nature of supply chains, how industries and supply chains evolve over the next 15 years, and decisions taken by both businesses and governments to promote local investment.

Table 7: Summary of investment assumptions

FOCUS AREA	INVESTMENT ASSUMPTIONS			
	Required investment (US dollars, 2015 prices, cumulative to 2030)	Geographical location of investment	Type of expenditure	Data sources used to inform assumptions
Renewables	$1.5 – 4 trillion	Based on IEA regional projections of installed capacity growth under two degrees scenario	80% technology/machinery 15% construction and civil engineering 5% project management and business services	IEA, Bloomberg New Energy Finance/World Energy Council
Carbon Capture and Storage	$0.6 – 1.2 trillion	Split between North America, Europe and China	80% technology/machinery 15% construction and civil engineering 5% project management and business services	IEA
Energy Efficiency in Buildings	$3 – 6 trillion	50% North America and Europe 50% Brazil, Russia, India, China	45% technology/materials 45% installation and construction 10% project management and business services	IEA, WBCSD, McKinsey, United Technologies Corporation
Low Carbon Transport Fuels	$0.03 – 0.04 trillion	50% developed countries, 50% emerging and developing countries	50% machinery and technology 50% construction	IEA
Cement	$0.04 – 0.05 trillion	Split based on projected cement production in 2030 (40% China, 20% India, 10% Europe and North America, 30% for rest of developing world.)	50% construction 50% machinery	Cement Sustainability Initiative, IEA
Total cumulative to 2030)	**$5 – 10 trillion**			
Total (annual average)	**$350 – 750 billion**			

Source: LCTPi working groups; PwC analysis. Numbers may not cast due to rounding.

How could the LCTPi contribute to sustainable development?

This section assesses how the LCTPi might contribute to sustainable development – economic development that is socially inclusive and environmentally sustainable – based on the UN's Sustainable Development Goals.

Action on climate change is fundamental to achieving sustainable development

Climate change poses a threat to economic development in the world's poorest countries and emerging economies. The large scale and coordinated emissions reductions that the LCTPi aims for therefore have the potential to make a significant contribution to sustainable development.

More broadly, actions that reduce greenhouse gases often have much wider benefits for development, such as improving public health, enhancing energy security, and providing access to energy in developing countries[1].

We can't achieve the United Nations' Sustainable Development Goals without business

The UN's recently announced Sustainable Development Goals (SDGs) provide a common set of targets for sustainable development[2]. Mitigating and adapting to climate change is a fundamental pillar to these goals. They seek to end poverty, achieve gender equality and ensure food security globally by 2030 – the same timescale over which the LCTPi seeks to fight climate change.

In September 2015, 193 countries signed up to the SDGs. However, these will be hard to achieve if the private sector does not take a leading role. It is business that gives people opportunities for income and jobs, that produces much of the world's food and energy. But business also stands to gain huge benefits from meeting the SDGs – ensuring a healthy and productive workforce, effective infrastructure, and helping conserve natural capital. It is therefore clear that business must be at the heart of the SDG agenda if it is to deliver its full benefit.

[1] See, for example, http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/07/F_Green_Nationally_Self_Interested_Climate_Change_Mitigation.pdf

[2] From January 2016 these will replace the UN's Millennium Development Goals, which expire at the end of 2015. The 17 SDGs are summarized in Appendix 3.

The LCTPi provides a platform for business to play a leading role in sustainable development

The LCTPi has the potential to make a significant contribution to the SDGs. These potential contributions are mapped in Table 8. The targets referenced in the table are detailed in Appendix 3. This suggests that renewables, climate smart agriculture, forests, chemicals and energy efficiency in buildings are the focus areas with the links to the greatest diversity of SDGs. The SDGs that are contributed to by the most areas are those on infrastructure (Goal 9) and on production and consumption (Goal 12), followed by energy access (Goal 7). Climate change (Goal 13) and global partnerships (Goal 17) are the foundation of the LCTPi and hence are linked to all areas. This is shown in Figure 7.

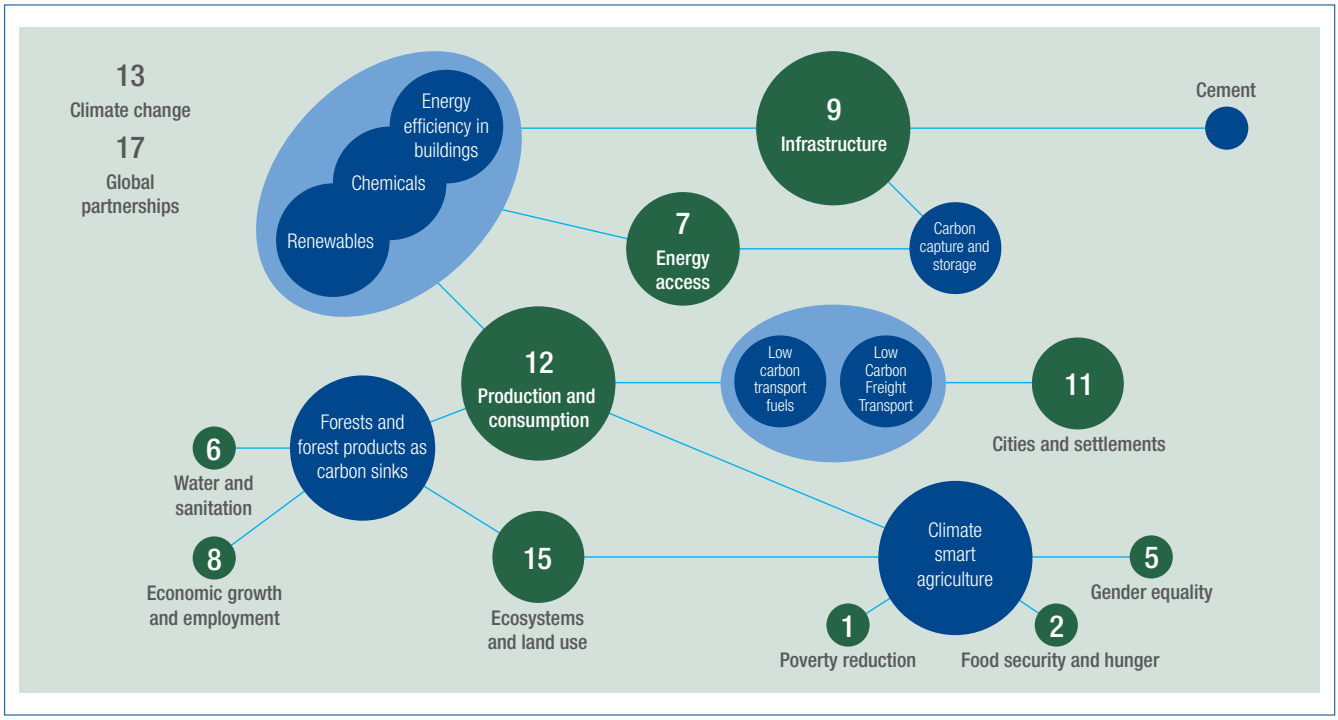


Figure 7: Links between the LCTPi and the UN Sustainable Development Goals. Blue bubbles indicate LCTPi focus areas, green bubbles indicate Sustainable Development Goals. Width of bubble is proportional to number of links. Goals 13 (climate change) and 17 (global partnerships) are linked to all LCTPi focus areas.

Table 8: Summary of potential LCTPi focus area contributions to the UN Sustainable Development Goals

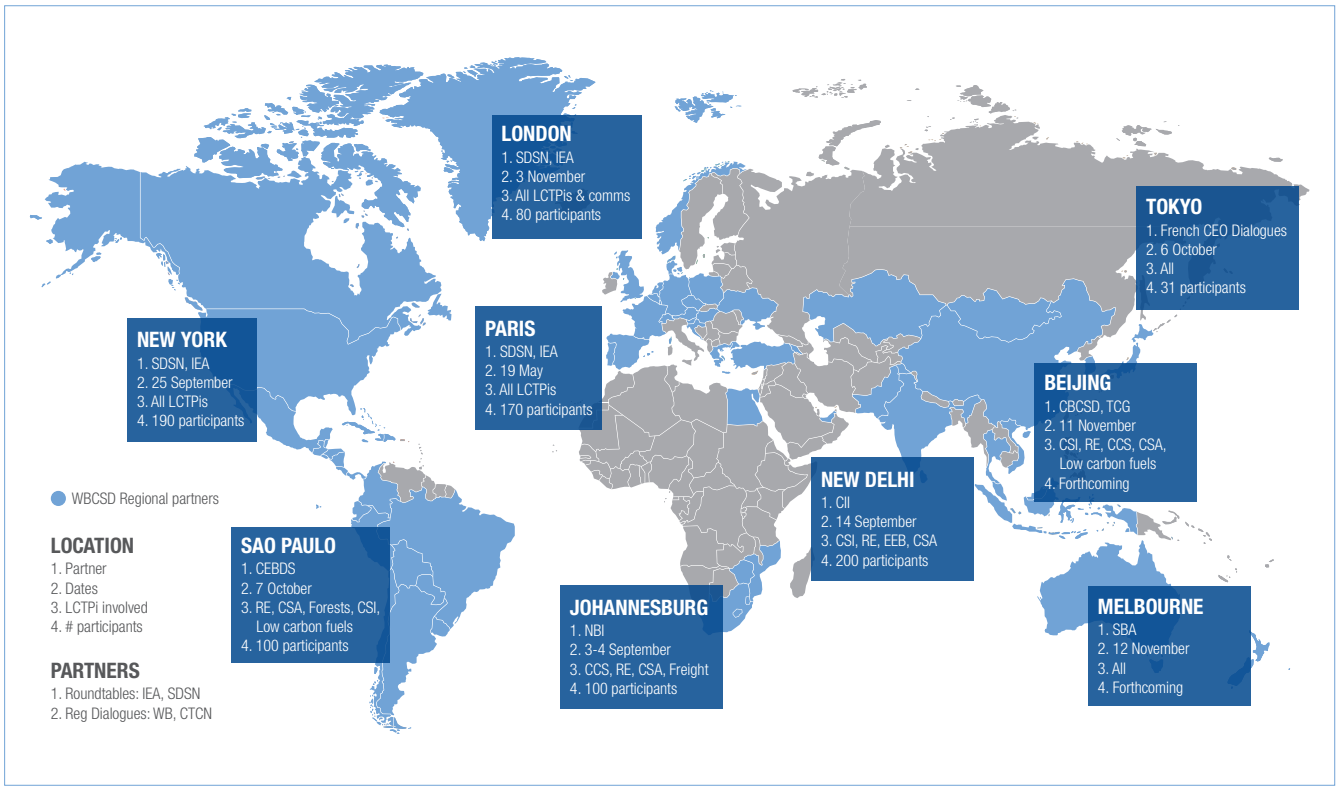
AREA	SDGS POTENTIALLY IMPACTED	ACTION AREA	POTENTIAL CONTRIBUTION TO THE SDGS
Renewables	7, 9, 12, 13, 17	Scaling green bond finance for renewable energy	Unlocking institutional investment to scale finance may act as an enabler to increase the share of renewable energy in the global energy mix (**Target 7.2**)
		Scaling corporate renewable energy procurement via power purchase agreements	May drive corporate interest in renewable energy and contribute to sustainable consumption (**Targets 12.1 and 12.6**)
		Deploying low-carbon micro-grids	Helps provide access to affordable, reliable and clean energy (**Targets 7.1 and 7.2**)
		Improving integration of renewables into grids and electricity markets	This may contribute towards encouraging the electricity industry to upgrade infrastructure to more sustainable, renewable alternatives. It may also act as an enabler to increase the share of renewable energy. (**Targets 7.2 and 9.4**)
Carbon Capture and Storage	7, 9, 13, 17	Developing an innovative CCS funding solution	Zero Emissions Credits could help to incentivize business to upgrade and retrofit existing infrastructure to become more sustainable (**Target 9.4**)
		Developing a global map for CO_2 storage	Pooling of resources from multiple stakeholders to identify areas for carbon storage on a global scale could help to share access to knowledge on CCS (**Target 7.a**)
Chemicals	9, 7, 12, 13, 17	Identifying and overcoming barriers to deployment of 'game changer' technologies	Use of more sustainable chemical technologies could help drive sustainable infrastructure (**Target 9.4**)
		Developing cross-industry and public private partnerships to reduce CO_2 emissions	Public private partnerships to reduce CO_2 emissions could contribute to integration of climate measures into policy (**Targets 13.2**)
		Developing new, or improving existing, materials and solutions to contribute to better insulation and increased energy efficiency	By contributing to reducing waste of energy, this may help to ensure access to energy at more affordable prices (**Targets 7.1 and 7.b**)
		Increasing reuse and recycling of resources and materials along the value chain	This could contribute to reducing the direct and indirect environmental impacts related to chemical industry operations (**Targets 12.2, 12.4 and 12.5**)

AREA	SDGS POTENTIALLY IMPACTED	ACTION AREA	POTENTIAL CONTRIBUTION TO THE SDGS
Cement	9, 13, 17	Enhancing the coverage of the sector's CO_2 and energy database, with a specific focus on China (representing about 60% of cement worldwide production)	Better knowledge of emissions could help the cement industry to understand their impact (**Target 13.3**)
		Enhancing energy efficiency of the cement manufacturing process	Upgrading or retrofitting cement manufacturing facilities could help them to become more resource-efficient, including energy efficient (**Target 9.4**)
		Scaling up the collection, availability and usage of alternative fuels and raw materials, including waste from other sectors in a circular economy concept	Adoption of clean and environmentally sound technologies and industrial processes may include usage of alternative fuels and raw materials (**Target 9.4**)
		Further reducing the clinker content in cement to minimize the share of the energy-intensive part of the process	Reduction in the usage of energy-intensive clinkers could increase resource-efficiency of large-scale infrastructure projects and reduce industrial carbon emissions (**Targets 9.4 and 13.2**)
		Developing new cement with lower energy and calcination requirements	Reduction in the usage of energy-intensive clinkers may increase resource-efficiency of large-scale infrastructure projects and reduce industrial carbon emissions (**Targets 9.4 and 13.2**)
		Engaging the full building and infrastructure value chain in local markets to identify and maximize the avoided emissions by usage of cement and concrete products	Integration of local markets into the value chain could help to increase the access of small-scale industry to the market place (**Target 9.3**)
		Evaluating cross-sectoral initiatives, particularly on the opportunity to capture, use and store carbon at scale	Encouragement of adoption of clean technologies and industrial processes could contribute to a more sustainable industrial infrastructure (**Target 9.4**)
Energy Efficiency in Buildings	7, 9, 12, 13, 17	Engaging the full building value chain at local level to develop and implement action plans addressing the key market barriers for EEB	Removing market barriers to lead to improved acceptance of EEB, increased energy efficiency, encouragement of sustainable consumption practices and promotion of sustainable infrastructure (**Targets 7.3, 9.1, 9.4, 12.2 and 12.6**)
Low Carbon Transport Fuels	11, 12, 13, 17	Convening private and public stakeholders for next generation biofuels	Funding for new technologies and understanding throughout the value chain could help to catalyse the shift away from fossil-fuels (**Targets 11.2 and 12.6**)
		Boosting demand, especially in target markets	Clear policy signals could help shift market demand to biofuel alternatives and reduce air pollution, especially in developing economies (**Targets 11.6 and 13.2**)

AREA	SDGS POTENTIALLY IMPACTED	ACTION AREA	POTENTIAL CONTRIBUTION TO THE SDGS
Low Carbon Freight Transport	11, 12, 13, 17	Creating a new freight eco-system by connecting freight road agents in order to improve freight movement efficiency and reduce road freight carbon footprint	Optimizing freight movements and promoting eco-friendly driving behaviors could contribute to improve road safety, reduce air emissions as well as fuel consumption (**Targets 11.2, 11.6 and 12.2**)
Climate Smart Agriculture	1, 2, 5, 12, 13, 15, 17	Building smallholder resilience	Climate resilience and empowerment of smallholders, with an emphasis on women (**Targets 1.2, 2.3, 5.1, 5.5 and 13.1**)
		Scaling-up investment in CSA	Increased visibility of supply-chains is likely to incentivize businesses to implement, and invest in, CSA practices (**Targets 1.5, 2.4, 12.6, 13.1 and 15.3**)
		Improving businesses' ability to trace, measure and monitor CSA progress	Ability to monitor progress may encourage businesses to adopt CSA practices as they can detect tangible change (**Target 12.6**)
		Eliminating agriculture-driven deforestation and sustainable land-use commitments	Compliance with deforestation and sustainable land use commitments could reduce ecosystem degradation and desertification (**Targets 15.2 and 15.3**)
Forests and forest products as carbon sinks	6, 8, 12, 13, 15, 17	Enhancing sequestration in conservation forests	Reductions in use of wood as primary fuel for cooking and heating could help increase forest carbon stocks (**Targets 6.6, 15.1 and 15.2**)
		Increasing area and yield in production forests and implement SFM	Increased productivity of production forests could help reduce the amount of extra forest subjected to deforestation. Practicing sustainable forest management encourages sustainable consumption practices and inclusive growth (**Targets 6.6, 8.4, 12.2 and 15.2**)

Source: LCTPi working groups; PwC analysis

Appendix 1: LCTPi roundtables and regional dialogues before COP21



Appendix 2: Methodology used to quantify business opportunities and jobs supported

Scope of analysis

We have focused on a simple scope that we believe is directly relevant to business, is easy to communicate, and has clear boundaries. The key aspects of scope needed to interpret our results are:

- **Ambition vs plans and policies:** This analysis focuses on what could happen if the vision or ambition of the LCTPi is achieved, rather than the specific actions or policy measures outlined by the working groups to boost investment and overcome market failures. We recognize that achieving this ambition is dependent not only on the LCTPi but on policy, technology and economics as well other actors.
- **Static vs dynamic:** Our analysis provides a static view of the business opportunities and the jobs that could be supported by the investment that is needed to deliver the LCTPi vision. By design, it does not capture the dynamic effects that infrastructure can have on the broader economy, or that may result from the structural transition to a low carbon economy or from climate change and its mitigation.
- **Capital investment vs operational expenditure:** Many aspects of the transition to a low carbon economy could provide business opportunities and support jobs. The focus of our analysis is on the capital expenditure that the LCTPi could directly redirect if it achieves its ambition, rather than operational expenditure or the effects of broader economic transformation.
- **Gross vs net:** Our analysis shows the additional investment in low carbon technology required to meet the LCTPi ambition, compared to a baseline scenario of no action on climate change. However, the analysis does not take into account the extent to which any part of this may be offset by changes elsewhere in the economy, for example reduced investment in high carbon industries, consistent with the LCTPi's focus on low carbon sectors. The analysis is 'gross' rather than 'net' and should not be taken to show a net increase in investment or employment at a national or global level. Our results are not directly comparable with techniques such as cost-benefit analysis, although we believe both approaches provide valuable information for decision makers to take into account.

Methodology

LCTPi working groups, with research support from PwC, reviewed the existing literature and identified the level of capital investment likely to be associated with meeting the LCTPi's ambition in an initial five areas: renewables, carbon capture and storage, energy efficiency in buildings, low carbon transport fuels and cement. PwC modelled the number of jobs that may be supported by this investment between 2015 and 2030. We take the capital investment assumptions directly as an indication of the business opportunities that may be provided, as this money would be spent with firms in sectors such as construction and technology.

The nature of the LCTPi means that any estimates of the business opportunities it could provide, or of the jobs it could support, are highly uncertain. As such, we have used data published by reputable third party sources (for example, the International Energy Agency) where possible; and engaged closely with LCTPi working group member company representatives to ensure assumptions reflect detailed industry knowledge as far as possible.

Our methodology is based on multi-regional input-output modelling, which describes how different industries in the economy and in different countries relate to each other. On this basis we can estimate how activity in one sector stimulates activity elsewhere in the economy and the world.

Our model is based on input-output tables produced by the World Input-Output Database, an EU-funded project to develop a global dataset for economic and trade analysis[1)], supplemented by economic statistics from the IMF and World Bank. The Input-Output tables show how much a typical business in each supplier's sector requires to produce one unit of output. Equally, it shows what inputs are required from other sectors to produce one unit of its own output. In this way we can estimate the input requirements through the entire supply chain for a given amount of expenditure in a given sector and country, and estimate the total value of production stimulated. This process of one company stimulating economic activity in other companies is referred to as the multiplier effect.

We also use statistics on employment in each sector to estimate the total employment associated with investment expenditure. For this, we used socio-economic accounts from the World Input-Output Database to help ensure consistency between countries and with the input-output tables. We derive the average output per head by sector and apply this to the total production value stimulated in each sector in the supply chain. In this way, we estimate the indirect employment supported by investment expenditure.

These steps get repeated to estimate the induced contribution, but through using wage data to estimate how much production is stimulated in the supply chain that supports the products employees buy, e.g. accommodation, food and entertainment.

The key steps of our methodology are summarized in Table 9.

[1)] See www.wiod.org for details

Table 9: Methodology for investment and jobs analysis

ANALYSIS STEP	KEY TASKS	OUTPUT
Understand the nature and scale of ambition	• Review documents on working group ambitions. • Discuss findings amongst WBCSD and member company representatives.	**Business opportunities provided by the low carbon investment that the LCTPi could unlock**
Develop investment assumptions	• Identify relevant third party estimates of capital investment requirements. • Adjust data to make it more representative of LCTPi ambitions, avoid double counting between focus areas, and ensure consistent scope. • Identify third party data to inform assumptions about where investment is likely to occur and their possible cost structure. • WBCSD agreement on investment assumptions.	
Develop global input-output model	• Gather input-output tables and socio-economic data on jobs and wages from the World Input-Output Database • Gather economic data on inflation and exchange rates from the IMF and World Bank. • Create economic model using input-output, economic and socio-economic data. • Generate employment multipliers.	**Employment supported by the low carbon investment that the LCTPi could unlock**
Estimate employment supported by required investment	• Apply employment multipliers to national and sectoral investment assumptions. • Aggregate employment estimates to a global level.	

The input-output modelling is based on the relationships between employment and output, and between the sectors of the economy, shown in (recent) historic economic data. Therefore it does not take into account any structural changes in the world economy over time or resulting from a low carbon economic transition. It is based on sector average data as this is where the most consistent data is available on a global basis and therefore may not fully capture the nuance of individual low carbons industries. Nonetheless, it is a tool widely applied to estimate economic impacts related to investment projects and, we believe, provides a credible indication of the gross level of employment that may be supported by a given level of investment.

Appendix 3: Details of the United Nations' Sustainable Development Goals

Number of targets per SDG

SUSTAINABLE DEVELOPMENT GOAL	NUMBER OF SDG TARGETS
Goal 1. End poverty in all its forms everywhere	7
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	8
Goal 3. Ensure healthy lives and promote well-being for all at all ages	13
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	10
Goal 5. Achieve gender equality and empower all women and girls	9
Goal 6. Ensure availability and sustainable management of water and sanitation for all	8
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	5
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	12
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	8
Goal 10. Reduce inequality within and among countries	10
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	10
Goal 12. Ensure sustainable consumption and production patterns	11
Goal 13. Take urgent action to combat climate change and its impacts	5
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	10
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	12
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	12
Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development	19

Description of SDG targets[1)]

SUSTAINABLE DEVELOPMENT GOAL	TARGET
Goal 1. End poverty in all its forms everywhere	1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
	1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
Goal 5. Achieve gender equality and empower all women and girls	5.1 End all forms of discrimination against all women and girls everywhere
	5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life
Goal 6. Ensure availability and sustainable management of water and sanitation for all	6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	7.1 By 2030, ensure universal access to affordable, reliable and modern energy services
	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix
	7.3 By 2030, double the global rate of improvement in energy efficiency
	7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology
	7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, and small island developing States
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead

[1)] Only targets referenced in Table 8 are included (with the exception of Goals 13 and 17 as these are related to all areas even when not explicitly stated). A full list of the SDG targets can be found at https://sustainabledevelopment.un.org/topics

SUSTAINABLE DEVELOPMENT GOAL	TARGET
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
	9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets
	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
	11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
Goal 12. Ensure sustainable consumption and production patterns	12.1 Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries
	12.2 By 2030, achieve the sustainable management and efficient use of natural resources
	12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment
	12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
	12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle
Goal 13. Take urgent action to combat climate change and its impacts	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
	13.2 Integrate climate change measures into national policies, strategies and planning
	13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
	13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible
	13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries, including focusing on women, youth and local and marginalized communities

SUSTAINABLE DEVELOPMENT GOAL	TARGET
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
	15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally
	15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world
Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development	17.1 Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection
	17.2 Developed countries to implement fully their official development assistance commitments, including the commitment by many developed countries to achieve the target of 0.7 per cent of ODA/GNI to developing countries and 0.15 to 0.20 per cent of ODA/GNI to least developed countries; ODA providers are encouraged to consider setting a target to provide at least 0.20 per cent of ODA/GNI to least developed countries
	17.3 Mobilize additional financial resources for developing countries from multiple sources
	17.4 Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress
	17.5 Adopt and implement investment promotion regimes for least developed countries
	17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism
	17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed
	17.8 Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology
	17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation
	17.10 Promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organization, including through the conclusion of negotiations under its Doha Development Agenda

SUSTAINABLE DEVELOPMENT GOAL	TARGET
Goal 17. (Continued)	17.11 Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020 23
	17.12 Realize timely implementation of duty-free and quota-free market access on a lasting basis for all least developed countries, consistent with World Trade Organization decisions, including by ensuring that preferential rules of origin applicable to imports from least developed countries are transparent and simple, and contribute to facilitating market access
	17.13 Enhance global macroeconomic stability, including through policy coordination and policy coherence
	17.14 Enhance policy coherence for sustainable development
	17.15 Respect each country's policy space and leadership to establish and implement policies for poverty eradication and sustainable development
	17.16 Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries
	17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships
	17.18 By 2020, enhance capacity-building support to developing countries, including for least developed countries and small island developing States, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts
	17.19 By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries

ISBN: 978-2-940521-38-8

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