

Low Carbon Technology Partnerships initiative



Forests and Forest Products as Carbon Sinks

Forests globally store approximately 638 Gt of carbon, more than the total amount of carbon in the entire atmosphere





Executive Summary

WBCSD's Low Carbon Technology Partnerships initiative (LCTPI) is a joint public and private initiative to accelerate low-carbon technology development. The Forests and Forest Products as Carbon Sinks is one of the business solutions that the WBCSD and its member companies have identified as a critical sector in which global commitment to action is needed to reach the two degree Celsius global warming target of Paris COP 21.

The Forests and Forest Products as Carbon Sinks working group has identified and quantified the emissions mitigation potential of a range of proven solutions in the forest sector value chain and the associated abatement cost per ton of carbon dioxide equivalent (CO₂ e). The combination of these actions summarized in this action plan demonstrates the potential of the sector to deliver large-scale abatement solutions at low cost. The report finds that approximately 6 Gt of CO₂ e per annum, equivalent to 15% of global GHG emissions¹⁾, could be mitigated at cost of under US\$ 20 per ton through the implementation of the actions.

A key objective of listing the solutions in action areas is to demonstrate the potential of the entire forests and forest products value chain to make a significant contribution to climate change mitigation through the sustainable production and consumption of forest products and sustainable forest management (SFM).

Forests globally store approximately 638 Gt of carbon²⁾, more than the total amount of carbon in the entire atmosphere. Products from sustainably managed forests store carbon, and displace materials that are emissions intensive or derived from fossil fuels.

In the Fourth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC), stated that:

In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber or energy from the forest, will generate the largest sustained mitigation benefit³⁾.

The sustainable production and consumption solutions proposed by the working group reflect the need to increase yields and forest carbon stocks over the long term and can be clustered into three priority action areas:

1. Sustainable forest management (SFM)
2. Forest products and the bioeconomy
3. Resource efficiency and breakthrough technologies

The solutions identified under the three priority action areas and documented in this action plan will need to take into account the different regional perspectives on sustainable forest management, the diversity amongst forest owners and growers, linkages with other LCTPI groups and to apply credible social and environmental principles during the design and implementation of actions.

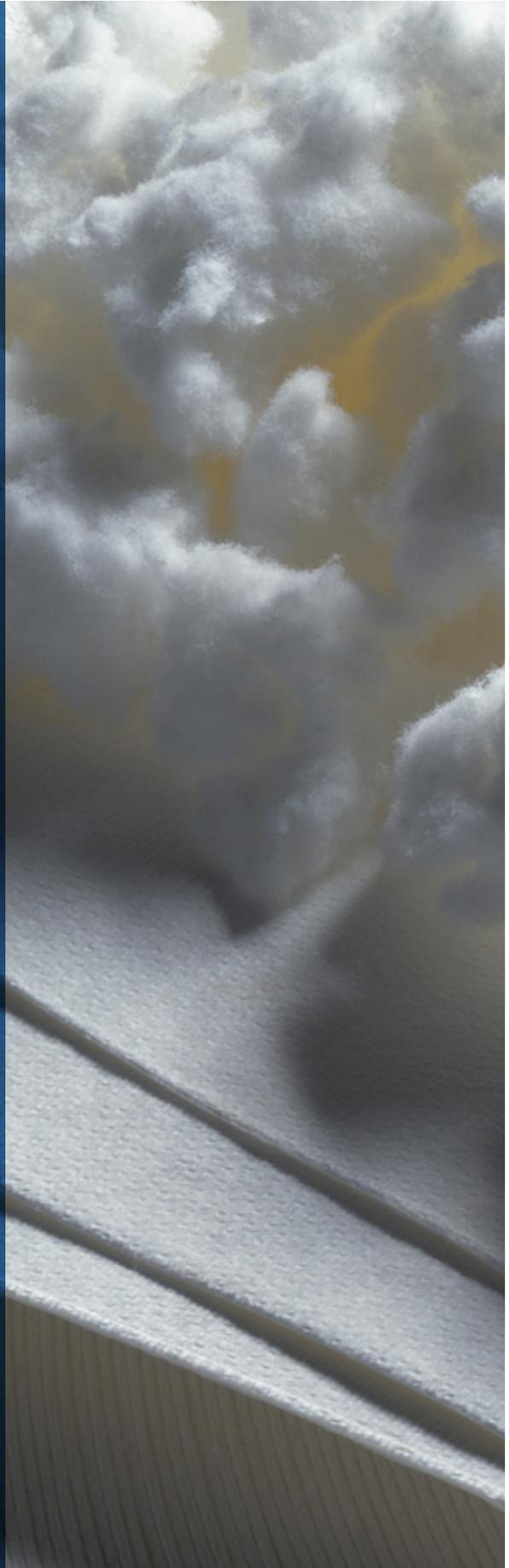
¹⁾ www.unfccc.int/ghg_data/ghg_data_unfccc/ghg_profiles/items/4625.php GHG emission profiles for Annex I Parties and major groups

²⁾ This standing carbon is combined with a gross terrestrial uptake of carbon, which was estimated at 2.4 Gt a year, a good deal of which is sequestration by forests. Approximately half of the total carbon in forest ecosystems is found in forest biomass and dead wood. www.unfccc.int/land_use_and_climate_change/lulucf/items/4122.php

³⁾ www.ipcc.ch/publications_and_data/ar4/wg3/en/ch9s9-es.html

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The logo for LCTPi, where 'L' is blue, 'C' is purple, 'T' is white with a grid pattern, 'P' is white, and 'i' is red.

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Action Plan

FORESTS AND FOREST PRODUCTS
AS CARBON SINKS

Statement of Ambition

In developing the statement of ambition, the working group has taken into account the views shared by WBCSD members, expert advisors, the FSG members, the objectives set out in WBCSD’s Vision 2050 and the United Nations Sustainable Development Goals, specifically SDG 15:

“Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss¹⁾”

The Ambition

Scaling up sustainable forest management and replacing energy intensive products with forest-based products that store carbon is the most efficient way to mitigate climate change.

The working group therefore supports measures that:

- Bring the world’s forests under sustainable management to
 - stabilize forest cover by 2030; and
 - restore forest cover to 1990 levels by 2050
- Meet the tripling global demand for forest products from sustainably managed forests by 2050²⁾
- Fast track bio economy development through cross-sector and value chain collaboration

The statement of ambition is not a commitment or a deliverable for any specific organization or FSG member and serves to highlight where collaborative action could yield the largest contribution to climate change mitigation.

In each case, the formation of regionally appropriate partnerships and clusters will be necessary for the implementation of actions. Forest Solutions Group members and LCTPi participants do not contribute to deforestation, either directly through operations or indirectly in the value chain. Therefore deforestation related solutions could be supported by the skills and knowledge resources of the FSG members, however full implementation of deforestation related solutions would require major national and transnational private and public partnerships.

Overall policy recommendation

To meet this ambition a consistent and predictable policy framework is needed for climate change mitigation and for cost efficient energy. This is a prerequisite for business investment as long-term policy certainty is needed to reduce regulatory risks. A binding global agreement from 2020 is needed to create a level playing field with emissions intensive sectors and to foster a supportive investment environment in the forest sector value chain.

¹⁾ www.sustainabledevelopment.un.org/topics

²⁾ WWF 2011, The Living Forests Report, Chapter 3 The Demand for Wood Products, p8

Priority Action Area 1 – Sustainable Forest Management

The Contribution to Climate Change Mitigation

Globally, forests store 638 Gt of carbon, more than the amount of carbon that is stored in the entire atmosphere. In the northern boreal forests, which make up one third of global forest cover, just 2% of the carbon stored in these forests equates to the total annual volume of anthropogenic GHG emissions.

In tropical forests, agricultural driven deforestation has seen the loss of on average of 10 million hectares per annum since 1990. The cessation of deforestation by 2030 would avoid emissions between 30 and 54 Gt of CO₂ e.

Currently, planted forests account for only 6.6% of world's forests. The ambition and the recommendation of the working group is to increase this area by 158 million hectares, equivalent to 17% of the US landmass, by 2050, with a focus on the potential for degraded land to be restored¹⁾.

These combined actions of improving forest management, ending agriculture-driven deforestation and restoring global forest cover to 1990 levels equate to over 122 Gt of CO₂ e, approximately 27 times the annual emissions of the European Union.

Recommended Actions

Action 1: Promote best practices for sustainable fiber sourcing, including certification, to ensure production from sustainably managed forests

- Work with forest certification bodies to increase the area accredited under forest certification standards through dialogues that identify the solutions to scaling-up and overcome barriers to adoption
- Engage the full forest products value chain in promoting sustainable fiber sourcing from key geographies where ambitious plans for increasing the area of sustainably managed forests are being implemented
- Over time, in the WBCSD members' sourcing policies, develop a 100 % commitment to obtain purchased wood, fiber and other forest products from legal and controlled sources by using and promoting third-party certification, wood-tracing systems, contract requirements, capacity building, and education and outreach programs

¹⁾ The Global Partnership on Forest and Landscape Restoration estimates that over 2 billion hectares of deforested and degraded landscapes worldwide can potentially be restored

- Support efforts to reduce deforestation by 5 million hectares per annum in line with the New York Declaration on Forests¹⁾ Specifically, use the full forest sector value chain to support actions among signatories to deforestation related commitments to source forest products from sustainably managed forests and identify tools and resources such as the Sustainable Procurement Guide for Wood and Paper-Based Products that can be used to develop robust policies in support of deforestation related goals
- Encourage key industry sector participation in The Forests Dialogue’s Understanding Deforestation Free program of works and widely support the dissemination of key findings



Action 2: Increase the global planted forest area by 60% focusing on degraded and forested land

- Evaluate carbon market and climate fund potential to create a robust private sector business case to expand planted forest areas using degraded and deforested land
- Explore public partnerships with the private sector to create viable business opportunities for large-scale planted forests based on a strong demand-side pull for forest products
- Work with NGOs and philanthropic organisations to create conservation based planted forests in areas ill-suited to production forests such as rocky outcrops, steep slopes and saline soils that would otherwise be underutilized

Key Enabling Conditions

- Improved coverage and implementation of sustainable procurement practices across all forest products
- Sustainable forest management policies should support the forest private-sector’s license to operate and the basis of carbon neutrality
- Simplified global GHG accounting rules for forests and forest products. Reporting requirements should be enforced or facilitated for all countries, not just the Annex 1 countries of the Kyoto Protocol

¹⁾ The Climate Smart Agriculture LCTPI commits not to contribute to deforestation through agricultural activities and therefore calculations for avoided emissions from agriculture-driven deforestation are incorporated into the CSA LCTPI mitigation potential calculations.

Priority Action Area 2 – Forest Products and the Bioeconomy

The Contribution to Climate Change Mitigation

Wood-based products, from sustainably managed forests, contribute to carbon sequestration, annually adding 189 million tons per year¹⁾. Forests and its products are therefore one of the most effective and completely natural systems for the sequestration and storage of carbon. Forests and forest products are in a unique position to provide the only low cost solution to remove carbon from the atmosphere and store the carbon in products that displace GHG emissions intensive materials. Renewable resources are also a solution to resource scarcity.

The Forests and Forest Products as Carbon Sinks LCTPi working group envisages economic development in the forestry sector and the basis for a bioeconomy only within the context of sustainably managed forests.

Recommended Actions

Action 1: Target 50% of all materials in the economy be made from forest-based renewable resources by 2050

The bioeconomy is both the solution to resource scarcity and a way to mitigate climate change. Forests and forest products, in both their traditional form and in innovative materials, can empower the bioeconomy. Chemicals, intelligent packaging, plastic composites, fabrics, personal care products and almost anything made from fossil fuel resources can be made from renewable forest resources (refer to the full LCTPi Forests and forest Products as Carbon Sinks report for supporting case studies).

The carbon storage benefits of increasing production of wood and paper products are significant, as are carbon benefits of substituting forest-based materials for other materials, with the benefits depending on the product and its application. In addition, the demand for wood keeps land in forest that might otherwise be deforested and provides incentives for afforestation.

The opportunities for reducing atmospheric greenhouse gases by increasing the fraction of forest-based renewable resources in the economy to 50% are too numerous and too varied to quantify. Several key opportunities, however, are highlighted below. Public and private sector partnerships must be prioritised to fast-track bioeconomy development and over time reduce the reliance on fossil and emissions intensive materials.

¹⁾ Pan et al 2011

Action 2: Scale-up biorefining to increase the share of forest-derived drop-in liquid biofuels

Biofuels currently only provide around 3% of total road transport fuel globally, largely through ethanol production in Brazil, and this share could be significantly increased from forest based biofuels.

Biofuel is likely to be produced from dedicated agricultural crops and crop residues. Under the assumption that that only 5% of the 2050 benefits from biofuels projected by the International Energy Agency¹⁾ are attributable to forest-derived side streams and residues, the mitigation potential in 2050 is 0.1 GtCO₂e per year. If this is ramped up linearly, so that the emissions savings in 2050 is 0.1 Gt CO₂e per annum, the cumulative emissions avoided by using forest-derived biofuels is 0.34 Gt CO₂e in 2030 and 1.8 Gt CO₂e in 2050.

Action 3: Support the widespread adoption of wood-based construction materials

Some of the materials used in the construction sector are emissions intensive. Traditional wood products such as house frames and timber flooring have a relatively small carbon footprint and could make a greater contribution to GHG mitigation and carbon storage through their more widespread use. New and innovative products such as cross laminated timber and plastic composites containing forest derived biomaterials have the triple benefit of storing carbon, displacing emissions intensive materials and improving material performance so that GHG emissions are reduced through its usage compared to conventional materials.

It is possible that the forest sector could harvest three times more industrial roundwood from planted forests by increasing the area of sustainably managed forests by 60% and increasing the yield by a factor of 2.1. The construction sector could play a significant role in creating the demand conditions that would support this expansion.

The cumulative GHG substitution benefits of increasing production of wood-based building materials just 25% over trend line growth is 1.9 Gt CO₂e to 2050. In addition to the substitution benefit, the additional carbon stored in wood products during use increases the mitigation benefits by another 1.0 Gt CO₂e²⁾. Thus, there is a total cumulative mitigation benefit of 2.9 Gt CO₂e in 2050 associated with increasing rate of growth in the use of wood in construction by 25% over the trendline³⁾.

¹⁾ IEA 2011

²⁾ Sathre 2010

³⁾ In press "Forests, wood products and climate change mitigation: opportunities, economics and the way forward", United Nations Food and Agriculture Organization, Rome

Action 4: Increase the recovery of used paper and the share of renewable forest-based biomass residues in the energy mix

As a carbon neutral, renewable energy, biomass from forest derived materials such as bark and logging residues should comprise a larger share in the energy mix, especially in locations heavily dependent on fossil fuels. Approximately 0.4-4.4 Gt CO₂e per annum could be mitigated from the use of forest residues⁴⁾ in biomass energy generation.

In addition, end-of-life paper that cannot be recycled, could be used as a readily available bioenergy feedstock instead of being landfilled. The GHG benefits of increasing paper recovery and phasing out landfilling of used paper products, and instead using non-recyclable paper products as a source of energy, equates to a potential cumulative reduction of 4.58 Gt CO₂e to 2050⁵⁾.

Key Enabling Conditions

- Public and private sector recognition of the fact that forest-based products, when made from wood grown and harvested according to reasonable principles of sustainable forest management, are at least carbon neutral, if not a net-positive carbon store
- Simplified GHG accounting for forests and for forest products to ensure that GHG accounting for forests and forest products does not become overly complex, especially for raw materials
- Public purchasing and procurement policies that preference renewable raw materials, such as the bio-preferred policies of the USDA⁶⁾, could better establish new products in the market place and provide a demand for new products to scale up development in the sector. Public perception and acceptance of forest products could be improved by public sector procurement, thus stimulating demand and growing the market conditions needed for the expansion of sustainably managed forests
- Public and multilateral institutions to work with the private sector in de-risking biorefining investments for private finance by scaling-up and commercially proving investments
- Avoidance of too many different certification requirements for same material used for many purposes
- Promotion of the optimal use of forest resources that reflect the benefits of value adding. For example, renewable energy policies should not negatively affect value-adding production chains
- Special emphasis of side-stream and residue-based advanced biofuels in regulations

⁴⁾ www.ipcc.ch/publications_and_data/ar4/wg3/en/ch9s9-es.html Biomass from forestry can contribute 12-74 EJ/yr to energy consumption, with a mitigation potential roughly equal to 0.4-4.4 GtCO₂/yr depending on the assumption whether biomass replaces coal or gas in power plants

⁵⁾ FAO in press

⁶⁾ www.biopreferred.gov/BioPreferred/faces/pages/AboutBioPreferred.xhtml The USDA biopreferred program includes mandatory purchasing requirements for federal agencies and their contractors

Priority Action Area 3 – Resource Efficiency and Breakthrough Technologies

The Contribution to Climate Change Mitigation

The pulp and paper sector uses on average more than 50% renewable energy (this figure is 63% in the Forest Solutions Group¹) due to the widespread use of biomass for energy generation. New breakthrough technologies in pulp and paper processes have the potential to dramatically reduce energy consumption and make more available emissions-free energy to power grids or to other emissions intensive industrial processes.

For example, there are currently technologies in the pre-commercialization phase that reduce the emissions intensity of pulp processing by up to 70%, which could then displace processes that use fossil fuels and free up surplus energy from biomass to be exported to the electricity grid.

From the LCTPI consultation with the Confederation of European Paper Industries (CEPI) throughout the regional dialogues, the working group has documented examples of such technologies that were identified as part of the CEPI “Two Team” process.

In addition, actions such as the light-weighting of heavy haulage transport, energy efficient water treatment and heat recovery for industrial processes are all being considered and implemented by the members in the working group.

The FSG members are committed to resource efficiency and innovation in their operations and products, including working on incremental resource efficiency gains that can be scaled across the sector and through partnerships in the value chain. The following actions were developed through the regional dialogues and from the Forest Solutions Group Membership Principles and Responsibilities².

¹ FSG key performance indicator results 2014

² FSG members endorse and adhere to Membership Principles and Responsibilities and report annually on the associated key performance indicators.

Recommended Actions

Action 1: Promote and apply the efficient use of raw materials throughout our operations

Action 2: Optimize the beneficial reuse of waste and thereby reduce waste sent to landfill

Action 3: Promote the recyclability and recovery wood, fiber and other forest products and appropriate reuse of materials

Action 4: Foster the use of innovative technologies in our operations and products when feasible

Action 5: Use media channels to raise awareness of the technological application and the low emissions profile of the pulp and paper sector in general to provide emissions free energy to support low carbon economy development

Action 6: Track and monitor the development of key technologies through their commercialization cycle to adoption

Key Enabling Conditions

- Policies that support PPPs to develop the most promising energy-saving technologies at scale
- Schemes that financially assist companies decommission less efficient equipment at faster rates could be considered by policy makers and carbon financing organizations
- Green investment from clean energy funds and other sources of climate finance, especially where pulp and paper production is reliant on a high proportion of fossil fuels in the energy mix
- R&D and start-up public funding to develop a level competitive playing field for the bioeconomy

Conclusion

In its Fifth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC), has stated that: **“Mitigation can be more cost-effective if using an integrated approach that combines measures to reduce energy use and the green-house gas intensity of end-use sectors, decarbonize energy supply, reduce net emissions and enhance carbon sinks in land-based sectors¹⁾”**

The integrated solutions proposed by the Forests and forest Products as Carbon Sinks working group, emphasize the need for forest sector value chain and cross sectoral partnerships in order to optimize the climate change mitigation potential from the sector. The full LCTPi report documents the potential for partnerships across a range of industries and other LCTPi working groups, including the cement, automotive, renewable energy and the construction sectors. The contributions from each of the priority action areas is summarized in table 1 below.

¹⁾ www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

Table 1: Quantification of GHG mitigation potential for each priority action area (no value is entered where there are high degrees of variability or uncertainty).

Solution	GHG benefit 2030 CO ₂ e to 2030	GHG benefit 2050 CO ₂ e to 2050	Cost per ton of CO ₂ e (US\$)
Sustainable Forest Management			
1. Promote sustainable fiber sourcing			Zero abatement cost
2. Increase the area of global planted forest by 60%	24.9 Gt	58.1 Gt	\$12-\$20
Forest Products and the Bioeconomy			
1. Target 50% of all materials in the economy be made from forest-based renewable resources by 2050	Savings of 1.6 – 1.9 t of CO ₂ e from each cubic meter of wood used to displace emissions intensive materials are estimated	Savings of 1.6 – 1.9 t of CO ₂ e from each cubic meter of wood used to displace emissions intensive materials are estimated	
2. Scale up biorefining to increase the share of forest derived drop-in liquid biofuels	0.34 Gt	1.8 Gt	–
3. Support the widespread adoption of wood based construction materials	-	2.9 Gt	–
4. Increase the recovery of used paper and the share of renewable forest-based biomass in the energy mix	Approximately 0.4-4.4 Gt per annum. 4-44Gt from 2020-2030	Approximately 0.4-4.4 Gt per annum. 12-132 Gt from 2020-2030 4.58 Gt from end-of-life biomass waste diversion	–
Breakthrough Technologies and Resource Efficiency			
1. More efficient resource use			
2. Adoption of breakthrough technologies in pulp and paper processes	Sectoral energy savings of 25%-40% are estimated	Sectoral energy savings of 25%-40% are estimated	–

The total volume of GHG mitigation from the solutions identified in the action areas to 2050 is between 77 Gt and 197 Gt not including energy efficiency savings and the displacement of emissions intensive materials.

The total cost of mitigation from the sector ranges from a zero abatement cost, where the cost of storing carbon and displacing energy intensive materials is intrinsically included in the purchase price, to approximately US\$ 20 a ton of CO₂ e for afforestation activities.

Case studies that illustrate the viability of these solutions and potential to scale up are included in the full Forests and Forest Products as Carbon Sinks LCTPI report.

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Acknowledgements

The Low Carbon Technology Partnerships initiative working group on Forests and Forest Products as Carbon Sinks has brought together a range of organizations to collaboratively develop this report and its findings. The following organizations have made contributions to the LCTPi for Forests and Forest Products as Carbon Sinks and have actively participated in regional dialogues and roundtables.

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Svenska Cellulosa AB (SCA).

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UPM, Metsä Group International Paper, Stora Enso, Suzano, Mondi, CMPC, Weyerhaeuser, Fibria, Grupo Portucel Soporcel, APRIL Group, Unilever, NCASI.

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NCASI, Beyond Zero Emissions, Climate KIC, Climate Change Coalition Brasil, CEPI, Consumer Goods Forum, Forest Trends, Essential Change Advisory Services, FAO, ICFPA, The Mullion Group, WWF, FPAC, SFI, UNEP FI, Conservation International, ICRAF, Landcare International, TNC and CDP.

The working group and report writing has been led by the WBCSD Forest Solutions Group. The LCTPi process has been led by María Mendiluce, Managing Director of Climate and Energy and Helen Baker, LCTPi Programme Manager seconded from PwC UK.

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This publication is released in the name of the World Business Council for Sustainable Development (WBCSD). This document, and the action plans within it, are the result of a collaborative effort between WBCSD and representatives from organisations participating in the Low Carbon Technology Partnerships initiative (LCTPi). A wide range of LCTPi members reviewed the material, thereby ensuring that the document broadly represents the majority view of the LCTPi working group. It does not mean, however, that every company within the working group agrees with every word in the report.



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